Atlantic
Norfolk, Virginia

Draft Final

UXO 13 Munitions Response Time-Critical Removal Action Quality Assurance Project Plan

Atlantic Fleet Weapons Training Area – Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

March 2024

This page intentionally left blank.

Atlantic
Norfolk, Virginia

Draft Final

UXO 13 Munitions Response Time-Critical Removal Action Quality Assurance Project Plan

Atlantic Fleet Weapons Training Area – Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

March 2024

Prepared for NAVFAC Atlantic
by CH2M HILL, Inc.
Virginia Beach, Virginia
Contract N62470-21-D-0007
CTO N6247021F4140

This page intentionally left blank.

Executive Summary

This Quality Assurance Project Plan (QAPP) presents the rationale and technical approach for a Munitions Response Time-Critical Removal Action (TCRA) for UXO 13, located within the former Vieques Naval Training Range (VNTR) in Vieques, Puerto Rico (Figures ES-1 through ES-3). Because the remedial action (RI) is still ongoing, a TCRA is warranted within UXO 13 to address the imminent threat based on the relatively close proximity of the site to the Municipality of Vieques (MOV), observations of trespassing, and the presence of certain munitions types (e.g., grenades and rockets).

The objective of the TCRA is to reduce the explosive hazard within the following areas of UXO 13 (Figure ES-4):

- UXO 13 Adjacent Beach Areas – Beaches located along the northern boundary of UXO 13, which are near the boundary between the wildlife refuge and the MOV
- Range Clearance Areas (i.e., Range 3: Hand Grenade Range, Range 4: M-79 Grenade Launcher/Rifle Grenade Range, Range 4A: Flame Range, and Range 4B: 3.5 inch [in] Rocket Launcher Range) based on the nature of the explosive hazards present
- Planned Public Use Areas – Areas planned for public use by United States Fish and Wildlife Service (USFWS) (i.e., parking areas, observation towers, roads, and trails [including Puerto Diablo Trail]), an earthen berm and cliff face associated with Range 4B, and a "Cove Beach" area (adjacent to the cliff face) located between Beach 25 and Beach 24 (Figure ES-4) where planning activities may result in higher exposure potential by USFWS, Naval Facilities Engineering Systems Command Atlantic (NAVFAC), and contractor personnel.
- Surface Clearance Only Areas – Areas not previously cleared due to the presence of steep slopes and sensitive archaeological and ecological features that required additional consideration and planning. Data collected during the UXO 13 RI indicate there may be higher explosive hazard densities in these areas than originally anticipated, which will be addressed as part of this TCRA.

This QAPP was prepared in general accordance with the following guidance:

- Uniform Federal Policy for Quality Assurance Project Plans, Munitions Response QAPP Toolkit, Module 2: Remedial Action (IDQTF, 2023)

The former VNTR consists of approximately 14,600 acres that when operational was divided into four separate areas that from west to east comprised the 11,000-acre Eastern Maneuver Area (EMA), the 2,500-acre Surface Impact Area (SIA), the 900-acre Live Impact Area (LIA), and the 200-acre Eastern Conservation Area (ECA) (Figure ES-2). Military operations at the former VNTR included ground warfare and amphibious training for Marines, naval gunfire support training, and air to ground training. Following cessation of military operations, the former VNTR was transferred to the Department of the Interior (DOI) on April 30, 2003, to be operated and managed by USFWS as a National Wildlife Refuge.

UXO 13 is located in the northwest portion of the former EMA, which was established in 1947, and encompasses approximately 1,784 acres (Figure ES-3). Large scale artillery exercises were completed in the EMA using live marine artillery including 76 millimeter (mm), 81 mm, 90 mm, 105 mm, 106 mm, and 107 mm rounds, fired toward targets located within the SIA and LIA. During 1966, six ranges (Ranges 1 through 6, including 4A and 4B (Figure ES-3), were established along the north coast in the area identified as UXO 13. These ranges remained operational through February 1999 when they were deactivated. These ranges were used for small arms, rifles, submachine guns, rifle and hand grenades, rocket launchers, and shape charges (NAVFAC, 2003b).

NOTE: THIS SUMMARY IS PRESENTED IN ENGLISH AND SPANISH FOR THE CONVENIENCE OF THE READER. EVERY EFFORT HAS BEEN MADE FOR THE TRANSLATIONS TO BE AS ACCURATE AS REASONABLY POSSIBLE. HOWEVER, READERS SHOULD BE AWARE THAT THE ENGLISH VERSION OF THE TEXT IS THE OFFICIAL VERSION.

This QAPP was prepared by CH2M HILL, Inc. (CH2M), a subsidiary of Jacobs, under the Comprehensive Long-term Environmental Action – Navy (CLEAN) Contract N62470-21-D-0007, Contract Task Order N6247021F4140, for submittal to NAVFAC, United States Environmental Protection Agency (EPA), Puerto Rico Department of Natural and Environmental Resources (PRDNER), and USFWS. NAVFAC, EPA, PRDNER, and USFWS work jointly to implement the Vieques Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Environmental Restoration Program.

Resumen Ejecutivo

Este Plan de Proyecto de Garantía de Calidad (QAPP, por sus siglas en inglés) presenta el razonamiento y el enfoque técnico para una Acción de Remoción de Tiempo Crítico (TCRA, por sus siglas en inglés) de Repuesta a Municiones para UXO 13, el cual se ubica dentro del antiguo Campo de Adiestramiento Naval de Vieques (VNTR, por sus siglas en inglés) en Vieques, Puerto Rico (Figuras ES- 1 a ES-3). Debido a que la acción correctiva (RA, por sus siglas en inglés) aún está en curso, se justifica una TCRA dentro de UXO 13 para atender la amenaza inminente basada en la proximidad relativamente cercana del sitio al Municipio de Vieques (MOV, por sus siglas en inglés), a las observaciones de invasión y a la presencia de ciertos tipos de municiones (por ejemplo, granadas y cohetes).

El objetivo de la TCRA es reducir el peligro de explosión dentro de las siguientes áreas de UXO 13 (Figura ES-4):

- Áreas de playa adyacentes a UXO 13: playas ubicadas a lo largo del límite norte de UXO 13, que están cerca del límite entre el refugio de vida silvestre y el MOV.
- Áreas limpiadas dentro del Campo de Tiro (es decir, Campo de Tiro 3: Campo de Tiro de granadas de mano, Campo de Tiro 4: Campo de Tiro de lanzagranadas/granadas de rifle M-79, Campo de Tiro 4A: Campo de Tiro de llamas y Campo de Tiro 4B: Campo de Tiro de lanzacohetes de 3,5 pulgadas según la naturaleza de los riesgos de explosión presentes.
- Áreas de uso público planificadas: áreas planificadas para uso público por el Servicio de Pesca y Vida Silvestre de los Estados Unidos (USFWS, por sus siglas en inglés) (es decir, áreas de estacionamiento, torres de observación, caminos y veredas [incluyendo la vereda Puerto Diablo]), una berma de tierra en el este y un acantilado asociados con el Campo de Tiro 4B, y una área de “Cove Beach” (adyacente a la pared del acantilado) ubicada entre la Playa 25 y la Playa 24 (Figura ES-4) donde las actividades de planificación pudieran resultar en un mayor potencial de exposición por parte del personal de USFWS, y contratistas del Comando de Sistemas de Ingeniería de Instalaciones Navales del Atlántico (NAVFAC, por sus siglas en inglés).
- Áreas donde sólo la superficie fue limpiada: áreas que no han sido limpiadas previamente debido a la presencia de pendientes pronunciadas y características arqueológicas y ecológicas sensibles que requirieron consideración y planificación adicional. Los datos recopilados durante el UXO 13 RI indican que puede haber densidades de peligro de explosión más alta en estas áreas de lo previsto originalmente, lo cual se atenderá como parte de esta TCRA.

Este QAPP fue preparado en general de acuerdo con la siguiente guía:

- Política Federal Uniforme la Planificación de Proyectos de Garantía de Calidad, Equipo de Herramientas QAPP de Respuesta a Municiones, Módulo 2: Acción Correctiva (IDQTF, 2023)

El antiguo VNTR consta de aproximadamente 14,600 acres; cuando éste estuvo en operación se dividió en cuatro áreas separadas que de oeste a este comprendían el Área de Maniobras del Este (EMA, por sus siglas en inglés) de 11,000 acres, el Área de Impacto de Superficie (SIA, por sus siglas en inglés) de 2,500 acres, el Área de Impacto con Bala Viva de 900 acres (LIA, por sus siglas en inglés) y el Área de Conservación del Este (ECA, por sus siglas en inglés) de 200 acres (Figura ES-2). Las operaciones militares en el antiguo VNTR incluyeron maniobras de guerra terrestres y adiestramiento anfibio para infantes de marina, adiestramiento de apoyo con disparos navales y adiestramiento aire-tierra. Tras el cese de las operaciones militares, el antiguo VNTR fue transferido al Departamento del Interior (DOI, por sus siglas en inglés) el 30 de abril de 2003, para ser operado y administrado por USFWS como Refugio Nacional de Vida Silvestre.

NOTA: ESTE RESUMEN SE PRESENTA EN INGLÉS Y EN ESPAÑOL PARA LA CONVENIENCIA DEL LECTOR. SE HAN HECHO TODOS LOS ESFUERZOS PARA QUE LA TRADUCCIÓN SEA PRECISA EN LO MÁS RAZONABLEMENTE POSIBLE. SIN EMBARGO, LOS LECTORES DEBEN ESTAR AL TANTO QUE EL TEXTO EN INGLÉS ES LA VERSIÓN OFICIAL.

UXO 13 está ubicado en la parte noroeste de la antigua EMA, la cual se estableció en 1947, y abarca aproximadamente 1,784 acres (Figura ES-3). Se completaron ejercicios de artillería a gran escala en la EMA utilizando artillería marina con bala viva, incluyendo proyectiles de 76 milímetros (mm), 81 mm, 90 mm, 105 mm, 106 mm y 107 mm, disparados contra objetivos ubicados dentro de SIA y LIA. Durante 1966, se establecieron seis campos de tiro (Campos 1 a 6, incluidos 4A y 4B (Figura ES-3), a lo largo de la costa norte en el área identificada como UXO 13. Estos campos de tiro permanecieron operativos hasta febrero de 1999, cuando fueron desactivados. Se utilizaron para armas pequeñas, rifles, metralletas, granadas para rifles y de mano, lanzacohetes y cargas de forma (NAVFAC, 2003b).

Este QAPP fue preparado por CH2M HILL, Inc. (CH2M), una subsidiaria de Jacobs, bajo el Contrato N62470-21-D-0007 de Acción Ambiental Integral a Largo Plazo – Marina (CLEAN, por sus siglas en inglés), Orden de Tarea de Contrato N6247021F4140, para su presentación a NAVFAC, a la Agencia de Protección Ambiental de los Estados Unidos (EPA, por sus siglas en inglés), al Departamento de Recursos Naturales y Ambientales de Puerto Rico (PRDNER, por sus siglas en inglés) y USFWS. NAVFAC, EPA, PRDNER y USFWS trabajan conjuntamente para implementar el Programa de Restauración Ambiental de la Ley Integral de Respuesta, Compensación y Responsabilidad Ambiental de Vieques (CERCLA, por sus siglas en inglés).

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_ES-1-Regional_Location_Map.mxd 5/15/2023 mcotterb

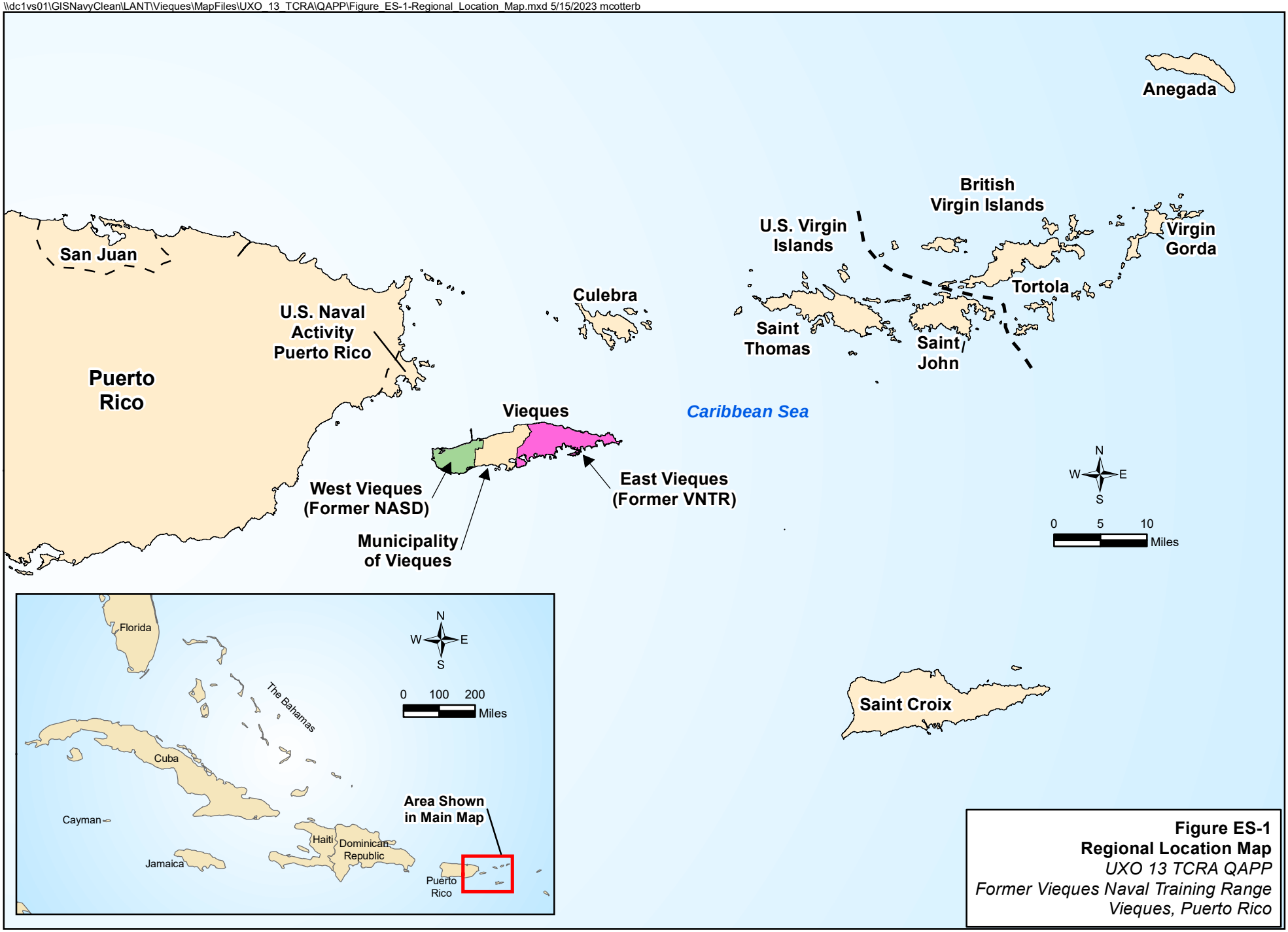


Figure ES-1
Regional Location Map
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

This page intentionally left blank.

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_ES-2-Former_VNTR_Site_Map.mxd 7/3/2023 mcotterb

Former VNTR
(East Vieques)
Department of Interior

EMA
SIA
LIA
ECA

UXO-7
UXO-13
UXO-16
UXO-12
UXO-10
UXO-5
UXO-2
UXO-4
UXO-1
UXO-14
UXO-9
UXO-3
UXO-8
UXO-6
UXO-11
Punta Carrenero
PAOC EE
UXO-18
UXO-15

Legend

- UXO 1 - ECA
- UXO 2 - LIA Beaches
- UXO 3 - LIA Roads
- UXO 4 - LIA Interior
- UXO 5 - SIA Restricted Roads
- UXO 6 - EMA/SIA Planned Public Roads
- UXO 7 - EMA/SIA North Beaches
- UXO 8 - SIA South Beaches
- UXO 9 - SIA Exterior
- UXO 10 - SIA Interior
- UXO 11 - EMA Planned Public Roads
- UXO 12 - EMA Interior
- UXO 13 - EMA West
- UXO 14 - EMA South
- UXO 15 - Puerto Ferro
- UXO 16 - Underwater Areas
- UXO-17 - Public Use Beaches
- UXO 18 - Cayo de la Chiva

N
W E
S

0 2,250 4,500
Feet

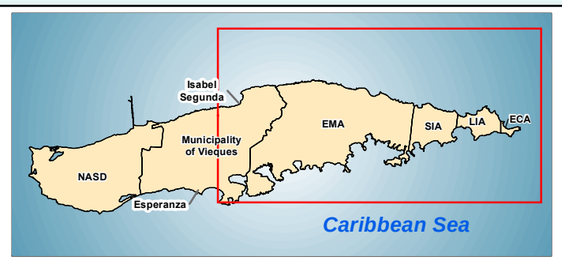


Figure ES-2
Former VNTR Site Map
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_ES-3-UXO_13_Site_Features.mxd9/13/2023mcotterb

Playa Voltios (Beach 26)
Playa Punta Campanilla (Beach 28)
Playa Puntas Cabellos Colorados (Beach 29)
Playa Campanita (Beach 25)
Cove Beach and Cliff Face
Playa Campana/Purple Beach (Beach 24)
Playa Punta Brigadier (Beach 30)
Playa Puerto Negro (Beach 23)
Laguna Algodones
Laguna Monte Largo
UXO-13
UXO-11
G-23
G-27
G-7
G-9
G-8
Parcel C
Range 1
Range 2
Range 3
Range 4
Range 4A
Range 4B
Range 5
Range 6
Range 7
Range 8
Range 9
PAOC AA
PAOC BB
PAOC CC
PAOC DD
Municipality of Vieques

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

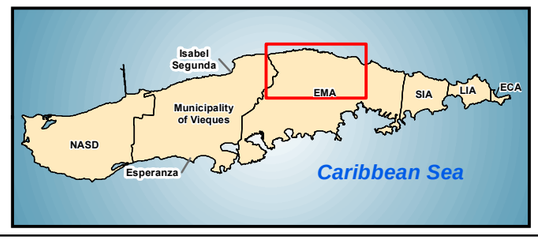
Legend

EMA Munitions Response Sites
- UXO 7 - EMA/SIA North Beaches
- UXO 11 - EMA Public Roads
- UXO 12 - EMA Interior
- UXO 13 - EMA West
- Parcel C
- Photo Identified Area
- Potential Area of Concern

- Gun Positions
- Range
- Lagoon
- Ephemeral Stream
- Topographic Contours (10 Meter)
- Trench Location

Ranges
- 1962 Aerial Photo Analysis
- 1967 Aerial Photo Analysis
- 1983 Aerial Photo Analysis
- 1994 Aerial Photo Analysis

Impact Areas
- 1962 Aerial Photo Analysis
- 1967 Aerial Photo Analysis
- 1983 Aerial Photo Analysis
- 1994 Aerial Photo Analysis

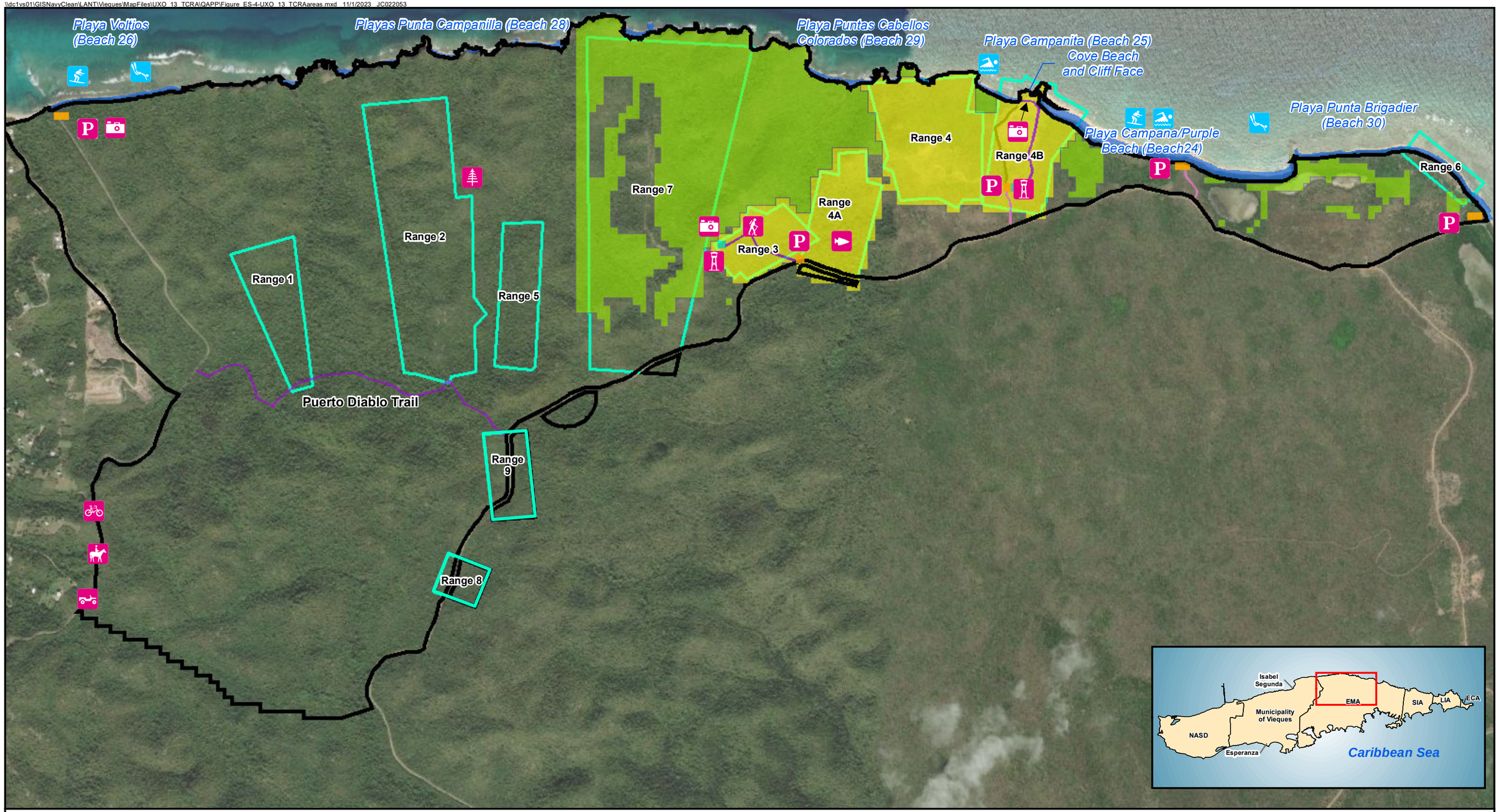


N W E S

0 700 1,400 Feet

Figure ES-3
UXO 13 Site Features
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_ES-4-UXO_13_TCRAareas.mxd 11/1/2023 JC022053



Legend

Proposed Land Use
- Biking Trail
- Cultural Interests
- Hiking Trail
- Horseback Riding
- Observation Tower
- Parking Area
- Reforestation Area
- Scenic View
- Vehicle Access

Proposed Aquatic Use
- Beach Use
- Snorkeling
- Surfing

- UXO 13 Boundary
- Range
- Berm Location

TCRA Areas (Approximate Acres) - Maximum Removal Depth:
- Range Surface and Subsurface Clearance (153) - 12"
- Surface Clearance Only Area (254)
- Trails (4) - 12"
- Multipurpose Road/Trail (0.5) - 24"
- Parking Area (2) - 24"
- Observation Tower (0.5) - 24"
- UXO 13 Adjacent Beach Areas (39) - 48"

N W E S

0 700 1,400 Feet

Figure ES-4
UXO 13 TCRA Areas
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

This page intentionally left blank.

Contents

Figures

Acronyms and Abbreviations

3Rs	(Recognize, Retreat, Report) Munitions Awareness Training
A2LA	American Association for Laboratory Accreditation
ACD	analyst calibration dig
AED	Automated External Defibrillation
AGC	advanced geophysical classification
AM	Activity Manager
ANAB	ANSI National Accreditation Board
ANSI	American National Standards Institute
BDU	Bomb Dummy Unit
bgs	below ground surface
CA	corrective action
CAP	Corrective Action Plan
CAR	Corrective Action Request
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CH2M	CH2M HILL, Inc.
CLEAN	Comprehensive Long-term Environmental Action, Navy
CLU-IN	Contaminated Site Clean-Up Information
cm	centimeter(s)
CONUS	Continental United Status
CPR	cardiopulmonary resuscitation
CSM	Conceptual Site Model
DAGCAP	DoD Advanced Geophysical Classification Accreditation Program
DD	Department of Defense Form
DDESB	Department of Defense Explosives Safety Board
DFW	definable feature of work
DGM	digital geophysical mapping
DoD	Department of Defense
DOI	Department of the Interior
DQO	Data Quality Objective
DUA	Data Usability Assessment
ECA	Eastern Conservation Area
EMA	Eastern Maneuver Area
EMI	electromagnetic induction
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ERA/SI	Expanded Range Assessment/Site Inspection
ESS	Explosives Safety Submission
ESTCP	Environmental Security Technology Certification Program
FCR	Field Change Request
FFA	Federal Facility Agreement
FGDC	Federal Geographic Data Committee
FS	Feasibility Study
FTL	Field Team Leader

GIS	geographic information system
GPS	global positioning system
GSV	geophysical system verification
HAZWOPER	Hazardous Waste Operations and Emergency Response
ID	identifier
in	inch(s)
ISO	industry standard object
ISS	informed source selection
ITS	instrument test strip
IVS	instrument verification strip
LIA	Live Impact Area
m	meter(s)
MD	munitions debris
MDAS	material documented as safe
MEC	munitions and explosives of concern
mm	millimeter(s)
MOV	Municipality of Vieques
MPC	measurement performance criteria
MPPEH	material potentially presenting an explosive hazard
MQO	measurement quality objective
MRP	Munitions Response Program
MR-QAPP	Munitions Response-Quality Assurance Project Plan
mV	millivolt(s)
N/A	not applicable
NAD83	North American Datum of 1983
NAVD	North American Vertical Datum
NAVFAC	Naval Facilities Engineering Systems Command Atlantic
NAVSEA	Naval Sea Systems Command
Navy	Department of the Navy
NMRD	non-munitions related debris
NPL	National Priorities List
NTCRA	Non-Time-Critical Removal Action
O2	oxygen
OP	Ordnance Pamphlet
OSHA	Occupational Safety and Health Administration
PAOC	Potential Area of Concern
PM	Project Manager
POC	point of contact
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PVC	polyvinyl chloride
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control

RAO	Remedial Action Objective
RCA	root cause analysis
RI	Remedial Investigation
RMS	root-mean-square
RPM	Remedial Project Manager
RRD	range-related debris
RTK	Real Time Kinematic
RTS	robotic total station
Rx	receive
SAW	squad automatic weapon
SCUBA	self contained underwater breathing apparatus
SDSFIE	Spatial Data Standards for Facilities, Infrastructure, and Environment
SIA	Surface Impact Area
SLAM	simultaneous localization and mapping
SMAW	shoulder-launched multipurpose assault weapon
SNR	signal to noise ratio
SOP	Standard Operating Procedure
SRA	saturated response area
SUXOS	Senior Unexploded Ordnance Supervisor
TBD	to be determined
TCRA	Time-Critical Removal Action
TOI	target of interest
TP	Technical Paper
Tx	transmit
USACE	United States Army Corps of Engineers
USAE	USA Environmental, Inc.
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer
VNTR	Vieques Naval Training Range

This page intentionally left blank.

Worksheet #1 & 2: Title and Approval Page

1. Project Identifying Information
   a. Regulatory Program/Site Name/Project Name: Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)/UXO 13, Atlantic Fleet Weapons Training Area – Vieques, former Vieques Naval Training Range (VNTR)/UXO 13 Time-Critical Removal Action (TCRA)
   b. Site Location/Number: UXO 13, Former VNTR, Vieques, Puerto Rico
   c. Lead Organization: Department of the Navy (Navy), Naval Facilities Engineering Systems Command Atlantic (NAVFAC)
   d. Munitions Removal and Geophysical Contractor: USA Environmental, Inc. (USAE)

      Quality Assurance (QA) Contractor: CH2M HILL, Inc. (CH2M)
   e. Contract Number:

      N62470-17-D-8003, Contract Task Order 64270-17-F-4023 (USAE)

      N62470-21-D-0007, Contract Task Order N62470-21-F4140 (CH2M)

2. Lead Organization (NAVFAC)
   a. NAVFAC Remedial Project Manager (RPM)
      Daniel Hood _____
      (Signature/Date)
   b. NAVFAC RPM
      Kevin Cloe _____
      (Signature/Date)
   c. NAVFAC Munitions Response QA Officer (QAO)
      Stacin Martin _____
      (Signature/Date)

3. Munitions Removal and Geophysical Contractor (USAE)
   a. USAE Project Manager (PM)
      Bob Hannan _____
      (Signature/Date)
   b. USAE Geophysical Quality Control (QC) Geophysicist
      Al Crandall _____
      (Signature/Date)
   c. USAE QAO
      Michael Price _____
      (Signature/Date)
   d. USAE Health and Safety Manager
      Cheryl Riordan _____
      (Signature/Date)

Worksheet #1 & 2: Title and Approval Page (continued)

4. QA Contractor (CH2M)

   a. CH2M Activity Manager (AM)
   Bill Hannah _____
   (Signature/Date)

   b. CH2M PM
   Dennis Ballam _____
   (Signature/Date)

   c. CH2M Munitions Response Safety and QAO
   Jeff McCauley _____
   (Signature/Date)

   d. CH2M Vieques Program Project Delivery and Quality Manager
   Brett Doerr _____
   (Signature/Date)

   e. CH2M Geophysical QAO
   Jennifer Weller _____
   (Signature/Date)

   f. CH2M Health and Safety Manager
   Stephen Brand _____
   (Signature/Date)

5. Federal Regulatory Agency (United States Environmental Protection Agency [EPA] Region 2)

   EPA RPM
   Jessica Mollin _____
   (Signature/Date)

   EPA QAO
   Lynn Arabia, CHMM _____
   (Signature/Date)

6. Commonwealth Regulatory Agency (Puerto Rico Department of Natural and Environmental Resources [PRDNER])

   PRDNER RPM
   Juan Baba Peebles _____
   (Signature/Date)

7. Vieques National Wildlife Refuge System Supervisor (United States Fish and Wildlife Service [USFWS])

   USFWS RPM
   Silmarie Padron _____
   (Signature/Date)

Worksheet #1 & 2: Title and Approval Page (continued)

8. List of plans and reports from previous investigations relevant to this project

- Environmental Baseline Survey, Vieques Naval Training Range, Vieques Island, Puerto Rico (NAVFAC, 2003a)
- Preliminary Range Assessment Report, Vieques Naval Training Range, Vieques Island, Puerto Rico (NAVFAC, 2003b)
- Munitions and Explosives of Concern (MEC) Master Work Plan, Former Vieques Naval Training Range (VNTR), Vieques, Puerto Rico (CH2M, 2006)
- Expanded Range Assessment/Site Inspection Report, Former Vieques Naval Training Range (VNTR), Vieques, Puerto Rico (CH2M, 2010)
- Non-Time-Critical Removal Action Work Plan Munitions Response Site UXO 13, Former Vieques Atlantic Fleet Weapons Training Area, Vieques, Puerto Rico (CH2M, 2012)
- UXO 13 Non-Time-Critical Removal Action After Action Report, Atlantic Fleet Weapons Training Areas – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M, 2019)
- Public Use Beaches Explosives Safety Submission, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Range, Vieques, Puerto Rico (CH2M, 2020a)
- Draft UXO 13 Remedial Investigation/Feasibility Study Report, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M, 2020b)

9. The undersigned concur that the use of analog technology is justified in area

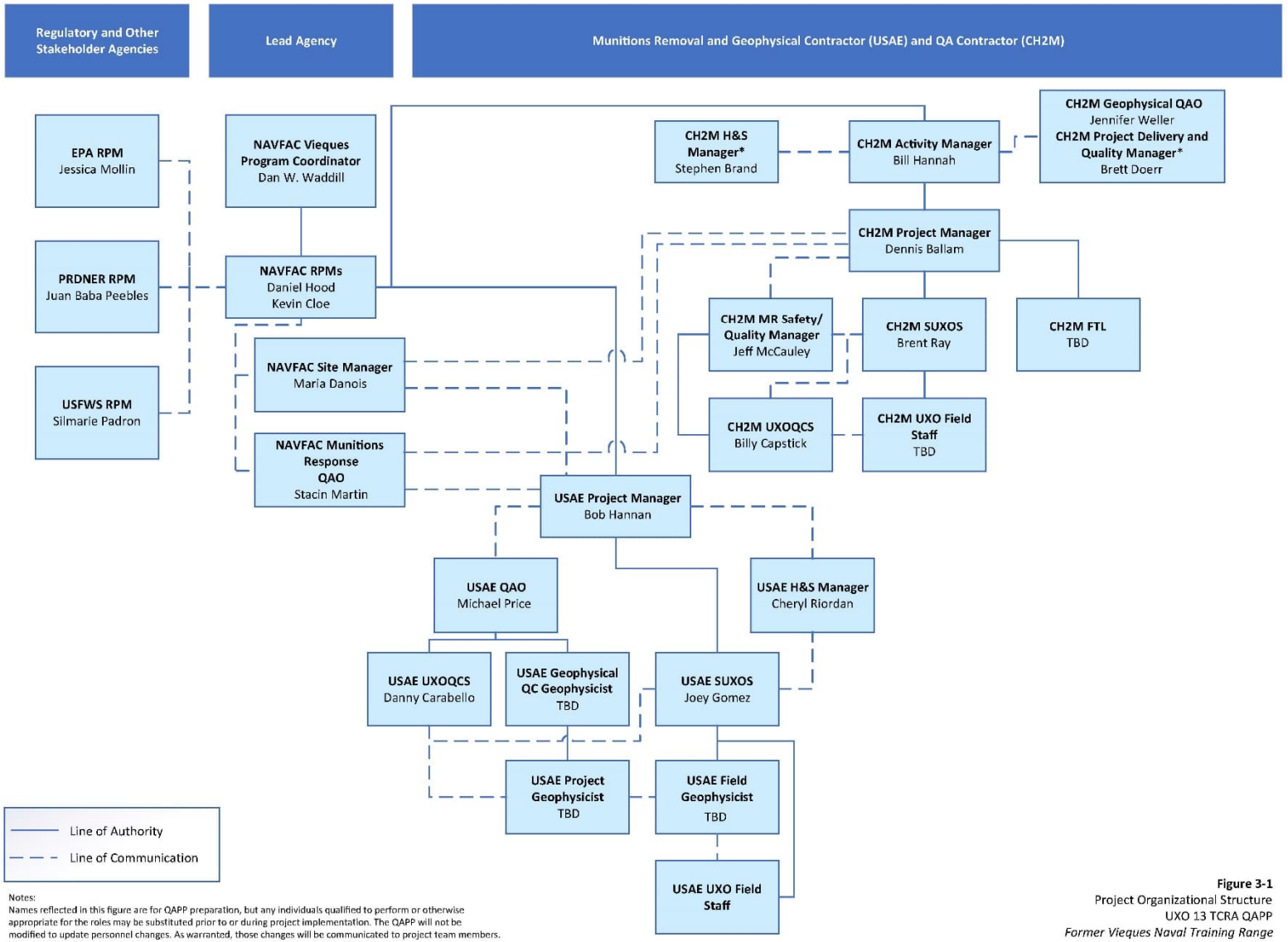
Signature(s) not applicable. Removal action will utilize various technologies and methodologies based on factors such as terrain, accessibility, practicality, feasibility, and differing removal depths across the removal areas. Worksheet #17 presents decision trees that detail the approach for the applicable removal action to be implemented within each removal area, including the associated technology. As shown in Figure 17-2, advanced sensors (i.e., advance geophysical classification [AGC] such as MetalMapper 2x2, APEX, etc.) will be the technology used where practical/feasible, followed by digital geophysical mapping (DGM) (i.e., EM61) if AGC is not practical/feasible but DGM is, and then analog methodology (i.e., all-metals detector) if neither AGC nor DGM is practical/feasible. Analog methodology will also be utilized where only surface clearance is planned.

Notes:

As standard protocol for Vieques documents, the QAPP is loaded to the Vieques document repository once finalized and an email announcing its availability is sent to all RPMs. It is then the RPM's responsibility to communicate the availability within his/her stakeholder agency at his/her discretion. This protocol is consistent with green and sustainable practices by reducing the amount of paper and associated resources consumed for document preparation and distribution. It also reduces the burden on space allocation for document hardcopies. However, hardcopies can be provided to particular individuals at the RPM's request.

This page intentionally left blank.

Worksheet #3 & 5: Project Organization and QAPP Distribution



Notes:
Names reflected in this figure are for QAPP preparation, but any individuals qualified to perform or otherwise appropriate for the roles may be substituted prior to or during project implementation. The QAPP will not be modified to update personnel changes. As warranted, those changes will be communicated to project team members.
* Denotes line of communication throughout project team, as applicable to specific role.

Figure 3-1
Project Organizational Structure
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

This page intentionally left blank.

Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet[1]

Table 4-1. NAVFAC Personnel Qualifications

Name	Project Title	Education/Experience	Specialized Training	Required Licenses/ Certifications/ Authorizations	Signature/Date[a]
Daniel Hood	NAVFAC RPM	• 30 years of environmental remediation and munitions response experience	• Not applicable (N/A)	N/A	
Kevin Cloe	NAVFAC RPM	• 33 years of environmental remediation and munitions response experience	• N/A	N/A	
Stacin Martin	NAVFAC Munitions Response QAO	• 30 years of environmental remediation and munitions response experience	• N/A	N/A	

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

[1] Minor QAPP changes include changes to key CH2M or subcontractor staff assuming the change is to an individual with equivalent experience who meets the minimum requirements for the position set forth in the DoD Quality System Requirements (if applicable) and holds the required Demonstration of Capability (if applicable). They also include minor changes to survey location that do not alter the overall minimum coverage requirement or project objectives. Finally, changes to the AGC sensor used for surveying will also be considered a minor QAPP change assuming the change is to a DAGCAP-approved validated sensor. Changes to measurement quality objectives in Worksheet #22 that are sensor specific will be documented in the appropriate report for that phase of work and will be based on the sensor's manufacturer guidance and/or industry accepted metrics (as applicable).

Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet (continued)

Table 4-2. QA Contractor Personnel Qualifications

Name	Project Title	Education/Experience	Specialized Training	Required Licenses/ Certifications/ Authorizations	Signature/Date[a]
Bill Hannah	CH2M AM	• 25 years of environmental remediation and munitions response experience	• 40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) with current 8-hour refresher • Cardiopulmonary resuscitation (CPR) and First Aid Training	N/A	
Dennis Ballam	CH2M PM	• 22 years of environmental remediation and munitions response experience	• 40-Hour HAZWOPER with current 8-hour refresher • CPR and First Aid Training • Unmanned aircraft systems – Part 107 Pilot's License	N/A	
Jeff McCauley	CH2M Munitions Response Safety and QAO	• 30 years of United States Navy explosive ordnance disposal (EOD) and diving and salvage • 3 years of munitions response experience	• 40-Hour HAZWOPER with current 8-hour refresher • CPR and First Aid Training • Automated external defibrillator (AED) and emergency oxygen (O2) Administrator • Former Navy Diver (Deep Sea/Air/Mixed Gas/Self Contained Underwater Breathing Apparatus [SCUBA]), Naval Diving and Salvage Training Center (1990) • US Navy EOD Technician, Naval School Explosive Ordnance Disposal (1995)	N/A	
Brett Doerr	CH2M Vieques Program Project Delivery and Quality Manager	• 31 years of environmental remediation and munitions response experience	• 40-Hour HAZWOPER with current 8-hour refresher • CPR and First Aid Training • Professional Geologist (Virginia)	N/A	
Jennifer Weller	CH2M Geophysical QAO	• 20 years of environmental remediation and munitions response experience	• Professional Geologist (Colorado) • 40-Hour HAZWOPER with current 8-hour refresher • CPR and First Aid Training • Visual Sample Plan training course completion • American National Standards Institute (ANSI) National Accreditation Board (ANAB) and American Association for Laboratory Accreditation (A2LA) Root Cause Analysis (RCA) training • Oasis Montaj Geophysical Data Processing for unexploded ordnance (UXO) 3-day UX-Analyze instruction by Environmental Security Technology Certification Program (ESTCP) • Military Munitions Support Services – QA Seeding, Contaminated Site Cleanup Information (CLU-IN) Seminar • Internal Quality Auditing Fundamentals, CH2M's Talent Management and Development Program • Strengthening Your Root Cause Analysis, A2LA and ANAB • Munitions Response-Quality Assurance Project Plan (MR-QAPP) Training, Geosoft and Department of Defense (DoD) Advanced Geophysical Classification Accreditation Program (DAGCAP)	N/A	

Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet (continued)

Table 4-2. QA Contractor Personnel Qualifications

Stephen Brand	CH2M Health and Safety Manager	• 31 years of environmental remediation and munitions response experience	• Professional Geologist (Virginia) • Certified Safety Professional • Occupational Health and Safety Technician • 40-Hour HAZWOPER with current 8-hour refresher • 30-Hour Occupational Safety and Health Administration (OSHA) Construction Certification • CPR and First Aid Training	N/A	
Brent Ray	CH2M Senior Unexploded Ordnance Supervisor (SUXOS)	• 33 years of munitions response experience	• 40-Hour HAZWOPER with current 8-hour refresher • CPR and First Aid Training • Qualified SUXOS in accordance with Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP)-18 • Naval Sea Systems Command (NAVSEA) Ordnance Pamphlet (OP) 5 Material Potentially Presenting an Explosive Hazard (MPPEH) Training[b]	N/A	
Billy Capstick	CH2M Unexploded Ordnance Quality Control Specialist (UXOQCS)	• 32 years of munitions response experience	• 40-Hour HAZWOPER with current 8-hour refresher • CPR and First Aid Training • Qualified SUXOS in accordance with DDESB TP-18 • NAVSEA OP5 MPPEH Training[b]	N/A	
Jesse Clements	Geographic Information System (GIS) Lead	• 15 years of munitions response experience	• 40-Hour HAZWOPER with current 8-hour refresher • CPR and First Aid Training	N/A	
To be determined (TBD)	CH2M Field Team Leader (FTL)	• TBD	• 40-Hour HAZWOPER with current 8-hour refresher • CPR and First Aid Training • 3Rs (Recognize Retreat, Report) Munitions Awareness Training	N/A	

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

[b] Personnel who inspect and document the explosive safety status of MPPEH will have the training required per NAVSEA OP5 (NAVSEA, 2023) Appendix D.

Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet (continued)

Table 4-3. Munitions Removal and Geophysical Contractor Personnel Qualifications

Name	Project Title	Education/Experience	Specialized Training	Required Licenses/ Certifications/ Authorizations	Signature/ Date[a]
Robert Hannan	USAE PM	• 38 years of environmental remediation and munitions response experience	• 40-Hour HAZWOPER with current 8-hour refresher • 30-Hour OSHA Construction Training • MPPEH Training in accordance with Attachment D-3p of NAVSEA OP5 • CPR and First Aid Training	N/A	
Michael Price	USAE QAO	• 21 years of environmental remediation and munitions response experience	• 40-Hour HAZWOPER with current 8-hour refresher • CPR and First Aid Training • American Society for Quality Certified Quality Auditor & Certified Manager of Quality/Organizational Excellence • United States Army Corps of Engineers (USACE)-NAVFAC Construction Quality Management	N/A	
Cheryl Riordan	USAE Health and Safety Manager	• 40 years of environmental remediation and munitions response experience	• 40-Hour HAZWOPER with current 8-hour refresher • Certified Safety Professional	N/A	
TBD	USAE Geophysical QC Manager	• TBD	• TBD	N/A	
Danny Carabello	USAE UXOQCS	• 34 years of munitions response experience	• 40-Hour HAZWOPER with current 8-hour refresher • CPR and First Aid Training • Qualified QC in accordance with DDESB TP-18 • NAVSEA OP5 MPPEH Training[b]	N/A	
TBD	USAE Project Geophysicist	• TBD	• TBD	N/A	
Joey Gomez	USAE SUXOS	• 12 years of environmental remediation and munitions response experience	• 40-Hour HAZWOPER with current 8-hour refresher • CPR and First Aid Training • Qualified SUXOS in accordance with DDESB TP-18 • NAVSEA OP5 MPPEH Training[b]	N/A	

Note: The names (including "TBD") in Tables 4-1, 4-2, and 4-3 are current (or not known) at the time of the QAPP development, but any individual or contractor/subcontractor qualified to perform the role may perform them during project implementation. For all personnel/ contractors/subcontractors, the QAPP review/endorsement requirements associated with any role listed as "TBD" or provided by personnel/contractors/subcontractors other than those listed will be required of them once identified.

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

[b] Personnel who inspect and document the explosive safety status of MPPEH will have the training required per NAVSEA OP5 (NAVSEA, 2023) Appendix D.

Worksheet #6: Communication Pathways and Procedures

Communication Driver	Initiator (Name, Project Title)	Recipient (Name, Project Title)	Procedure (Timing, Pathway, Documentation)
Regulatory agency interface	Daniel Hood NAVFAC RPM daniel.r.hood.civ@us.navy.mil Kevin Cloe NAVFAC RPM kevin.r.cloe.civ@us.navy.mil	Jessica Mollin EPA RPM mollin.jessica@epa.gov Juan Baba Peebles PRDNER RPM juanbaba@jca.pr.gov Silmarie Padron USFWS RPM silmarie_padron@fws.gov	Navy RPM(s) provides project updates to regulatory stakeholders via email, telephone, or meetings, as necessary; can delegate communication to other internal or external points of contact (POCs).
Communications to/from Navy from Vieques onsite contractors	Maria Danois NAVFAC Site Manager maria.m.danois.civ@us.navy.mil	Daniel Hood NAVFAC RPM daniel.r.hood.civ@us.navy.mil Kevin Cloe NAVFAC RPM kevin.r.cloe.civ@us.navy.mil	NAVFAC Site Manager provides updates to NAVFAC RPMs via email, telephone, hardcopy, or in-person, as warranted; can delegate communication to other internal and external POCs.
Navy munitions quality/safety inputs	Stacin Martin NAVFAC Munitions Response QAO stacin.r.martin.civ@us.navy.mil	Daniel Hood NAVFAC RPM daniel.r.hood.civ@us.navy.mil Kevin Cloe NAVFAC RPM kevin.r.cloe.civ@us.navy.mil Dennis Ballam CH2M PM dennis.ballam@jacobs.com	Provides review comments to Navy contractor on munitions aspects of the pre-draft QAPP via email through NAVFAC RPM(s). Provides periodic (as necessary) Navy policy or guidance regarding munitions-related aspects via direct communication with Navy contractor, as delegated.
Contractor communication to/from Navy (e.g., submission of QAPP for review; response to comments, updates on project progress, etc.)	Dennis Ballam CH2M PM dennis.ballam@jacobs.com Bob Hannan USAE PM rhannan@usatampa.com	Daniel Hood NAVFAC RPM daniel.r.hood.civ@us.navy.mil Kevin Cloe NAVFAC RPM kevin.r.cloe.civ@us.navy.mil Maria Danois NAVFAC Site Manager maria.m.danois.civ@us.navy.mil	CH2M and USAE PMs provide documents and project updates to the Navy RPMs via hardcopy, email, telephone, or meetings, as necessary.

Worksheet #6: Communication Pathways and Procedures (continued)

Communication Driver	Initiator (Name, Project Title)	Recipient (Name, Project Title)	Procedure (Timing, Pathway, Documentation)
Project administration and logistics	Dennis Ballam CH2M PM dennis.ballam@jacobs.com	Various contractor staff (CH2M and/or USAE)	Direct communication (via email, telephone, hardcopy, or in-person, as needed) to/from Navy and other contractor/subcontractor project staff to ensure appropriate project implementation.
Daily field progress reports; including munitions and explosives of concern (MEC) removal and geophysical documentation	Bob Hannan USAE PM rhannan@usatampa.com Brent Ray CH2M SUXOS brent.ray@jacobs.com	Dennis Ballam CH2M PM dennis.ballam@jacobs.com	At end of each day of fieldwork, USAE PM (or designee) provides daily MEC/geophysical related progress reports to CH2M PM. CH2M SUXOS (or designee) provides daily geophysical progress reports to CH2M PM. CH2M PM will then inform NAVFAC Site Manager and NAVFAC RPMs via email, telephone, hardcopy, or in-person, as applicable.
Stop work due to safety issues	Joey Gomez USAE SUXOS jgomez@usatampa.com Brent Ray CH2M SUXOS brent.ray@jacobs.com Note: Any field personnel are empowered to stop work due to safety concern. In general, field staff will report the situation to the contractor PM and Health and Safety Manager; contractor PM reports situation to NAVFAC Site Manager and RPMs.	Maria Danois NAVFAC Site Manager maria.m.danois.civ@us.navy.mil Daniel Hood NAVFAC RPM daniel.r.hood.civ@us.navy.mil Kevin Cloe NAVFAC RPM kevin.r.cloe.civ@us.navy.mil Bob Hannan USAE PM rhannan@usatampa.com Dennis Ballam CH2M PM dennis.ballam@jacobs.com Note: USAE and CH2M Health and Safety Managers are integral in the stop work communications, including development and implementation of corrective measures.	As soon as possible following discovery, the USAE SUXOS/CH2M SUXOS informs the USAE PM/CH2M PM of critical safety issues and generates a follow-up Stop Work Memorandum. The USAE PM/CH2M PM will then inform the NAVFAC Site Manager and NAVFAC RPMs. USAE PM/CH2M PM will also notify NAVFAC Site Manager and NAVFAC RPMs when safety issue has been addressed (including RCA, if necessary). Of note, CH2M field staff will also observe for potentially unsafe conditions and stop work if conditions/activities deemed to be immediately dangerous to life or health are observed.

Worksheet #6: Communication Pathways and Procedures (continued)

Communication Driver	Initiator (Name, Project Title)	Recipient (Name, Project Title)	Procedure (Timing, Pathway, Documentation)
QC or QA stand-down	Michael Price USAE QAO mprice@usatampa.com Jennifer Weller CH2M Geophysical QAO jennifer.weller@jacobs.com	Bob Hannan USAE PM rhannan@usatampa.com Dennis Ballam CH2M PM dennis.ballam@jacobs.com Maria Danois NAVFAC Site Manager maria.m.danois.civ@us.navy.mil Daniel Hood NAVFAC RPM daniel.r.hood.civ@us.navy.mil Kevin Cloe NAVFAC RPM kevin.r.cloe.civ@us.navy.mil	If an issue is identified that may warrant a QC or QA stand-down, the USAE UXOQCS (for QC issues), CH2M UXOQCS (for QA issues) or QC Geophysicist will communicate and discuss the issue with the USAE QAO or CH2M Munitions Response Safety and QAO, respectively. For QC stand-down, USAE QAO will notify the USAE PM. For a QA stand-down, CH2M Geophysical QAO will notify the CH2M PM. The USAE PM or CH2M PM (as applicable) will then notify the NAVFAC Site Manager and NAVFAC RPMs via email and/or telephone. USAE PM or CH2M PM (as applicable) will also notify the NAVFAC Site Manager and NAVFAC RPMs when QC or QA stand-down issue has been resolved.
Resume work following a stop work or QC or QA stand-down	Daniel Hood NAVFAC RPM daniel.r.hood.civ@us.navy.mil Kevin Cloe NAVFAC RPM kevin.r.cloe.civ@us.navy.mil	Bob Hannan USAE PM rhannan@usatampa.com Dennis Ballam CH2M PM dennis.ballam@jacobs.com	NAVFAC RPMs will provide the USAE PM or CH2M PM (as applicable) written notice of approval to resume work in the event of a stop work or QC or QA stand-down.
Minor QAPP changes during MEC removal, including geophysics[2]	Michael Price USAE QAO mprice@usatampa.com Bob Hannan USAE PM rhannan@usatampa.com	Dennis Ballam CH2M PM dennis.ballam@jacobs.com Maria Danois NAVFAC Site Manager maria.m.danois.civ@us.navy.mil Daniel Hood NAVFAC RPM daniel.r.hood.civ@us.navy.mil	USAE QAO and USAE PM ensure minor QAPP changes are recorded and documented in the associated report with an assessment of any potential impacts on data usability. The CH2M PM provides review and approval in conjunction with the NAVFAC Site Manager and NAVFAC RPMs. The NAVFAC RPMs will notify stakeholders, as necessary.

[2] Minor QAPP changes include changes to key CH2M or subcontractor staff assuming the change is to an individual with equivalent experience who meets the minimum requirements for the position set forth in the DoD Quality System Requirements (if applicable) and holds the required Demonstration of Capability (if applicable). They also include minor changes to survey location that do not alter the overall minimum coverage requirement or project objectives. Finally, changes to the AGC sensor used for surveying will also be considered a minor QAPP change assuming the change is to a DAGCAP-approved validated sensor. Changes to measurement quality objectives in Worksheet #22 that are sensor specific will be documented in the appropriate report for that phase of work and will be based on the sensor's manufacturer guidance and/or industry accepted metrics (as applicable).

Worksheet #6: Communication Pathways and Procedures (continued)

Communication Driver	Initiator (Name, Project Title)	Recipient (Name, Project Title)	Procedure (Timing, Pathway, Documentation)
		Kevin Cloe NAVFAC RPM kevin.r.cloe.civ@us.navy.mil	
Minor QAPP changes (i.e., those that are unlikely to impact meeting the Data Quality Objectives [DQOs]) during project execution[2]	Dennis Ballam CH2M PM dennis.ballam@jacobs.com	Maria Danois NAVFAC Site Manager maria.m.danois.civ@us.navy.mil Kevin Cloe NAVFAC RPM kevin.r.cloe.civ@us.navy.mil Jennifer Weller CH2M Geophysical QAO jennifer.weller@jacobs.com	CH2M PM ensures minor QAPP changes are recorded and documented in the associated report with an assessment of any potential impacts on data usability. NAVFAC Site Manager and NAVFAC RPM provide review and approval. The NAVFAC RPM will notify stakeholders, as necessary.
Substantive QAPP changes (i.e., those that may impact meeting the Remedial Action Objectives [RAOs]) during project execution[3]	Bob Hannan USAE PM rhannan@usatampa.com Dennis Ballam CH2M PM dennis.ballam@jacobs.com	Maria Danois NAVFAC Site Manager maria.m.danois.civ@us.navy.mil Daniel Hood NAVFAC RPM daniel.r.hood.civ@us.navy.mil Kevin Cloe NAVFAC RPM kevin.r.cloe.civ@us.navy.mil	USAE PM/CH2M PM submits a Field Change Request (FCR) and, as applicable, a Corrective Action Request (CAR) and a Corrective Action Plan (CAP) to the NAVFAC Site Manager and NAVFAC RPMs. The NAVFAC Site Manager and NAVFAC RPMs provide review and approval. Following approval, the NAVFAC RPMs will notify stakeholders within 24 hours or as soon as possible via email of any significant changes to the QAPP and/or Corrective Actions (CAs). Navy review, consideration, and incorporation of any resulting regulatory comments will be done to the extent practicable given the constraints commonly associated with a project undergoing implementation, especially in the field (e.g., equipment and other resource availability, staffing, weather, schedule, contract

[2] Minor QAPP changes include changes to key CH2M or subcontractor staff assuming the change is to an individual with equivalent experience who meets the minimum requirements for the position set forth in the DoD Quality System Requirements (if applicable) and holds the required Demonstration of Capability (if applicable). They also include minor changes to survey location that do not alter the overall minimum coverage requirement or project objectives. Finally, changes to the AGC sensor used for surveying will also be considered a minor QAPP change assuming the change is to a DAGCAP-approved validated sensor. Changes to measurement quality objectives in Worksheet #22 that are sensor specific will be documented in the appropriate report for that phase of work and will be based on the sensor's manufacturer guidance and/or industry accepted metrics (as applicable).

[3] Major QAPP changes include changes to any minimum stated requirement including measurement quality objectives (MQOs) and measurement performance criteria (MPC) not related to a change in AGC sensor, or any significant change in technical design approach.

Worksheet #6: Communication Pathways and Procedures (continued)

Communication Driver	Initiator (Name, Project Title)	Recipient (Name, Project Title)	Procedure (Timing, Pathway, Documentation)
			stipulations, etc.). Further, regulatory agencies have the opportunity to review the various elements of data collection, analysis, evaluation, and QC/QA in the associated report(s).
Technical and quality support and reporting	Brett Doerr CH2M Vieques Program Project Delivery and Quality Manager brett.doerr@jacobs.com	Various CH2M staff	Project delivery and quality support, including scope development, guidance, and technical/quality review.
MEC removal activities are complete	Bob Hannan USAE PM rhannan@usatampa.com	Dennis Ballam CH2M PM dennis.ballam@jacobs.com Maria Danois NAVFAC Site Manager maria.m.danois.civ@us.navy.mil Daniel Hood NAVFAC RPM daniel.r.hood.civ@us.navy.mil Kevin Cloe NAVFAC RPM kevin.r.cloe.civ@us.navy.mil	Upon completion of MEC removal activities, the USAE PM will inform the CH2M PM. The CH2M PM will verify all quality assurance aspects were met and then inform the NAVFAC Site Manager and NAVFAC RPMs.
Geophysical daily and weekly QC reports	TBD USAE Geophysical QC Geophysicist	Jennifer Weller CH2M Geophysical QAO jennifer.weller@jacobs.com	At end of each day of geophysical fieldwork, USAE Geophysical QC Manager provides daily QC reports to the CH2M Geophysical QAO via email or electronic field forms (i.e., Data Management Plan).
Weekly QA reports	Jennifer Weller CH2M Geophysical QAO jennifer.weller@jacobs.com	Dennis Ballam CH2M PM dennis.ballam@jacobs.com	At end of each week in which geophysical field work was completed, the CH2M Geophysical QAO will provide QA reports to the CH2M PM. The CH2M PM will inform the NAVFAC Site Manager and NAVFAC RPMs.
Geophysical QC nonconformance	TBD USAE Geophysical QC Geophysicist	Jennifer Weller CH2M Geophysical QAO jennifer.weller@jacobs.com Dennis Ballam CH2M PM dennis.ballam@jacobs.com	USAE Geophysical QC Manager will generate an RCA/CAR form and submit to the CH2M Geophysical QAO, who will notify the CH2M PM via email. After notification, the process will follow, as applicable, the

Worksheet #6: Communication Pathways and Procedures (continued)

Communication Driver	Initiator (Name, Project Title)	Recipient (Name, Project Title)	Procedure (Timing, Pathway, Documentation)
			procedures in the change-related drivers discussed above.

Note: The names (including "TBD") in this table are current (or not known) at the time of the QAPP development, but any individual or contractor/subcontractor qualified to perform the role may perform them during project implementation. For all personnel/ contractors/subcontractors, the QAPP review/endorsement requirements associated with any role listed as "TBD" or provided by personnel/contractors/subcontractors other than those listed will be required of them once identified.

Worksheet #9: Project Planning Session Summary

Project Name: UXO 13 Munitions Response TCRA

Site Name: UXO 13

Projected Date(s) of Field Activities: Summer 2023

Site Location: Vieques, Puerto Rico

Project Manager: Dennis Ballam

Date of Session: December 6, 2022

Scoping Session Purpose: Discuss and concur upon key elements of UXO 13 Public Use Beaches TCRA to be included in QAPP

Name	Title	Affiliation	Email Address	Project Role
Angela Carpenter	EPA Branch Chief	EPA	carpenter.angela@epa.gov	EPA Leadership
Doug Pocze	EPA Section Chief	EPA	pocze.doug@epa.gov	EPA Leadership
Jessica Mollin	EPA RPM	EPA	mollin.jesseica@epa.gov	EPA RPM
Karyn Treinen	EPA RPM	EPA	treinen.karyn@epa.gov	EPA RPM
Zolymar Luna	EPA RPM	EPA	luna.zolymar@epa.gov	EPA Representative
Juan Baba Peebles	PRDNER RPM	PRDNER	juanbaba@jca.pr.gov	Federal Facilities Coordinator
Silmarie Padron	USFWS RPM	USFWS	silmarie_padron@fsw.gov	USFWS RPM/Caribbean Islands Refuges Supervisor
Mike Barandiaran	Refuge Manager	USFWS	mike_barandiaran@fws.gov	No project-specific role
Felix Lopez	Technical Support	USFWS	felix_lopez@fws.gov	No project-specific role
Dan Waddill	Vieques Program Coordinator	Navy	dan.w.waddill.civ@us.navy.mil	Navy Vieques Program Coordinator
Kevin Cloe	NAVFAC RPM	Navy	kevin.r.cloe.civ@us.navy.mil	NAVFAC RPM
Daniel Hood	NAVFAC RPM	Navy	daniel.r.hood.civ@us.navy.mil	NAVFAC RPM
Maria Danois	NAVFAC Site Manager	Navy	maria.m.danois.civ@us.navy.mil	NAVFAC Site Manager
Brett Doerr	QA Contractor Vieques Program Project Delivery and Quality Manager	QA Contractor/ Navy CLEAN contractor	brett.doerr@jacobs.com	Project Delivery and Quality Management; including, scope development and technical review
Bill Hannah	QA Contractor PM	QA Contractor/ Navy CLEAN contractor	bill.hannah@jacobs.com	QA Contractor PM

Worksheet #9: Project Planning Session Summary (continued)

Project Name: UXO 13 Munitions Response TCRA

Site Name: UXO 13

Projected Date(s) of Field Activities: Summer 2023

Site Location: Vieques, Puerto Rico

Project Manager: Dennis Ballam

Date of Session: December 6, 2022

Scoping Session Purpose: Discuss and concur upon key elements of UXO 13 Public Use Beaches TCRA to be included in QAPP

Name	Title	Affiliation	Email Address	Project Role
Dennis Ballam	QA Contractor PM	QA Contractor/ Navy CLEAN contractor	dennis.ballam@jacobs.com	QA Contractor PM
Jesse Clements	QA Contractor Geographic Information System (GIS) Lead	QA Contractor/ Navy CLEAN contractor	jesse.clements@jacobs.com	QA Contractor GIS Lead
Tom Bourque	Technical Support	UXOPro (technical support contractor to PRDNER)	tbourque@uxopro.com	PRDNER technical support contractor
Janice Derby	Technical Support	TRC (technical support contractor to PRDNER)	jderby@trccompanies.com	PRDNER technical support contractor
Jeff Hansen	Technical Support	TRC (technical support contractor to PRDNER)	jhansen@trccompanies.com	PRDNER technical support contractor

Key Discussion Points

The Navy's plan for a UXO 13 TCRA was presented by Daniel Hood (NAVFAC) who summarized past removal actions, planned land use, planned TCRA rationale, and planned TCRA approach. Mike Barandiaran (USFWS) agreed that the proposed removal areas in UXO 13 warrant a TCRA and agreed with the approach to include an embedded biologist when needed. No action items were identified during discussion or recorded in the meeting minutes.

Worksheet #10: Conceptual Site Model

Facility Profile – Former Vieques Naval Training Range

Location, Size, Facility History, and Ownership

The former VNTR is located in Vieques, Puerto Rico, in the Caribbean Sea, approximately 7 miles southeast across the Vieques Passage from the eastern tip of the main island of Puerto Rico (Figure 10-1). The former VNTR consists of approximately 14,600 acres and is divided into four separate operational areas that from west to east comprise: the 11,000-acre Eastern Maneuver Area (EMA), the 2,500-acre Surface Impact Area (SIA), the 900-acre Live Impact Area (LIA), and the 200-acre Eastern Conservation Area (ECA) (Figure 10-2). The former VNTR is bounded by the Caribbean Sea to the north, east, and south, and the Municipality of Vieques (MOV) to the west.

Military operations at the former VNTR included ground warfare and amphibious training for Marines, naval gunfire support training, and air-to-ground training. Following cessation of military operations on the former VNTR, the Navy subdivided the former operational areas into smaller parcels based on considerations such as historic use, geographic features, and land use. The parcels, referred to as UXO sites, were delineated to make them more manageable for the purposes of prioritization, munitions removal, site characterization, and decision making.

On April 30, 2003, the former VNTR was transferred to the Department of the Interior (DOI) to be operated and managed by the USFWS as a National Wildlife Refuge and, in some places, a Wilderness Area, pursuant to Section 1049 of the National Defense Authorization Act for Fiscal Year 2002 (Public Law 107-107). Although the DOI is directed to protect and conserve the transferred land as a wildlife refuge, the Navy retains the responsibility for conducting the environmental investigations and cleanup of the property, as warranted.

In 2005, the former VNTR was placed on the National Priorities List (NPL). The NPL required all subsequent environmental restoration activities for Navy Installation Restoration sites on Vieques to be conducted under CERCLA unless and until removed from CERCLA authority.

The Navy, EPA, the Commonwealth of Puerto Rico, and DOI entered into a Federal Facility Agreement (FFA) for the former VNTR in 2007 due to the NPL listing and pursuant to CERCLA. The FFA established the procedural framework and schedule for implementing the CERCLA response actions for Vieques environmental and munitions sites.

Site Profile – UXO 13

Location

UXO 13 is located in the northwest portion of the EMA including a small portion along the eastern border within the MOV (Figure 10-3).

Site History

UXO 13 encompasses approximately 1,800 acres within the former EMA (Figure 10-2). The former EMA was established in 1947 to provide maneuvering areas and ranges for the training of Marine amphibious units and battalion landing teams in exercises including amphibious landings, small-arms fire, artillery and tank fire, shore fire control, and combat engineering tasks. Artillery exercises completed in the EMA included using live marine artillery including 76 millimeter (mm), 81 mm, 90 mm, 105 mm, 106 mm, and 107 mm rounds, fired toward targets located within the SIA and LIA. During 1966, six ranges (Ranges 1 through 6, including 4A and 4B, in Figure 10-3) were established along the north coast in the area identified as UXO 13. These ranges remained operational through February 1999 when they were deactivated. These ranges were used for small arms, rifles, submachine guns, rifle and hand grenades, rocket launchers, and shape charges (NAVFAC, 2003b).

Worksheet #10: Conceptual Site Model (continued)

Aerial photography analysis identified three additional ranges (Ranges 7, 8, and 9) which are also located within UXO 13, as shown in Figure 10-3. Range 7 was used for longer-range, probably crew-served weapons, and had numerous impact/target areas and Ranges 8 and 9 appeared to be small arms ranges and are visible in 1994 aerial photographs. These ranges were deactivated by 1999.

Former ranges in UXO 13 are shown in Figure 10-3 and their description is provided below. While not all ranges are included in this TCRA, all are included in the CSM because the library of munitions developed for the UXO 13 TCRA is based on munitions historically found throughout UXO 13, the rationale for which is discussed in Worksheet #11.

Ranges

- Range 1: Small Arms Range. Used for service rifles, pistols, and machine guns. The impact/target area (as identified in the 1962 aerial photograph) is located in the northwestern portion of the range.
- Range 2: Combat Rifle Range, also known as Potential Area of Concern (PAOC) AA. This range is a former squad fire and maneuver range with different target areas (identified in each year of aerial photography) where firing occurred in a generally south-to-north direction. M-16 service rifles, pistols, M-249 squad automatic weapon (SAW), M-60 and M-240G submachine guns, practice grenades, and pyrotechnics were authorized for use at this range. The range is approximately 500 feet wide and 1,100 feet long. An earthen berm was observed within the general impact areas identified in the northern portion of the range boundaries identified in the 1983 and 1994 aerial photographs; the earthen berm was investigated during the Remedial Investigation (RI) berm trenching (CH2M, 2020b).
- Range 3: Hand Grenade Range. Fragmentation hand grenades were thrown from a control pit seaward toward the target area. The target area was a trench like opening in the ground with some empty steel drums embedded into the sides of the trench at a lower elevation than the firing point. An earthen berm was observed within the general impact area identified in the 1967 aerial photograph; the earthen berm was investigated during the RI berm trenching activities (CH2M, 2020b).
- Range 4: M-79 Grenade Launcher/Rifle Grenade Range that includes PAOC CC. Range 4 is an area where multiple range orientations and target areas were identified in the aerial photography from various years. PAOC CC, located within Range 4, was a roughly 800-foot-wide by 650-foot-long range (as identified in the 1983 aerial photograph), reportedly bounded on all four sides by a 6- to 8-foot-high earthen berm, where 40 mm projected grenades were fired in a seaward direction into an area adjacent to the beach; the earthen berm was investigated during the RI berm trenching activities (CH2M, 2020b).
- Range 4A: Flame Range. Flame thrower equipment was authorized for use but was apparently seldom used at this range. The range orientations were in a general south-to-north direction, as identified in the 1962 and 1967 aerial photographs.
- Range 4B: 3.5 inch (in) Rocket Launcher Range. This range, also known as PAOC DD, is an approximately 1,000-foot-wide and 2,600-foot-long range of various configurations in a general south-to-north orientation where 3.5 in rockets were fired in a seaward direction into a dune area adjacent to the beach. Pieces of aircraft and one 75 mm gun were set up as targets at distances ranging from 300 to 350 meters from firing points. Earthen berm(s) were observed on the west side of the range; the earthen berm was investigated during the RI berm trenching and will be addressed as part of this TCRA. Field of fire was reportedly from the berm at the firing line to a 10-meter high cliff that forms the center of the target area.

Worksheet #10: Conceptual Site Model (continued)

- Range 5: Pistol Range. This range was reportedly used for firing pistols at targets located 15 and 25 yards from the firing point to the north; however, target areas identified in 1962 and 1967 aerial photographs identify impact areas further from the firing point and some randomly located targets were observed at the range. Allowable weapons were reportedly M-16 service rifles, pistols, M-249 SAW, M-60 and M-240G submachine guns, practice grenades, and pyrotechnics.
- Range 6: Shape Charges. Shape charges were reportedly exploded adjacent to Punta Brigadier Beach (Beach 30) and Playa Puerto Negro (Beach 23). The size of the charges did not exceed 40 pounds.
- Range 7: M-60 Caliber Machine Gun Range. This range, also known as PAOC BB, is a former range used for longer-range weapons. The range was roughly 1,000 feet wide and 2,300 feet long in a south-to-north orientation. Machine guns and Browning automatic rifles were reportedly fired at numerous fixed targets/ impact areas to the north of firing positions of various range configurations; the targets/impact areas reportedly consisted of old military vehicles and rock outcroppings. Allowable weapons on this range were recorded as M-16 service rifles, pistols, M-249 SAW, M-60 and M-240G submachine guns, practice grenades, and pyrotechnics.
- Range 8: Aerial photography identified the area as a possible range with an associated target/impact area; likely a small arms range.
- Range 9: Aerial photography identified the area as a possible range with an associated target/impact area; likely a small arms range.

Table 10-1 summarizes the purpose, scope, and pertinent results of previous investigations and munitions removal activities performed at or relevant to UXO 13. The nature and extent of MEC and other MPPEH considered as part of this TCRA was determined though consideration of all previous investigations and removal actions. Via these activities, 558 surface and 31 subsurface MEC, 38,407 surface and 609 subsurface munitions debris (MD) items, and 60,249 surface and 1,470 range-related debris (RRD) items were identified and removed from UXO 13. The locations of the surface and subsurface MEC items are presented in Figure 10-4 and Figure 10-5, respectively, and summarized in Table 10-2.

Physical, Biological, and Cultural Characteristics

The topography of eastern Vieques is characterized by a series of rolling hills, peaks, and small valleys that are intersected by a series of ephemeral streams (known locally as quebradas), and narrow, low lying coastal areas. The most elevated areas occur along a west to east axis near the center of the former VNTR. In general, the former VNTR slopes gradually downward from the center of the island to the coastal areas. There is a topographic divide that separates the northern and southern portions of the site. A topographic high also occurs along the western boundary between UXO 13 and the MOV.

The topography of UXO 13 ranges from 0 feet along the northern boundary (i.e., ocean boundary) to above 90 feet inland (Figure 10-3). UXO 13 is characterized as a vegetated area (including forests) and its bedrock comprises primarily sandstone, siltstone, conglomerate, lava, tuff, and tuffaceous breccias largely deposited in a marine environment and subject to extensive deep weathering. Except in the lowlands close to the coast, the soil overburden is relatively thin (non-existent where the bedrock outcrops), fine-grained and has a high clay content from the weathering of the bedrock.

The primary terrestrial habitat types in UXO 13 are thorn scrub and grassland with thorn scrub being the dominant habitat type across UXO 13. Thorn scrub is composed of low-growing thorny shrub species that are generally less than 10 feet in height, such as acacia, mesquite, and white leadtree. Grassland habitat, dominated by guinea grass, occurs in many isolated areas that are slowly reverting to thorn scrub.

Worksheet #10: Conceptual Site Model (continued)

A number of ephemeral streams occur within UXO 13 the vast majority of which drain northward to the ocean or to Laguna Algodones at the eastern end of UXO 13. The ephemeral streams generally contain water only during precipitation events that produce runoff. Laguna Algodones, consisting of two discontinuous lobes, is a shallow, inland marine lagoon system that is not tidally influenced and supports a fringe of mangrove habitat. Common species include red mangrove, black mangrove, white mangrove, and buttonwood. The presence of standing water in this lagoon is ephemeral, and the hydrology is likely to be solely the result of precipitation; the lagoon was approximately 3 feet deep at the time of RI sampling but has been observed to contain no water during dry periods. The lagoon substrate is predominantly silt/clay (fines) with lesser amounts of fine and medium sand.

Two federally listed plant species have the potential to occur in habitats associated with UXO 13, though none has been reported in the EMA where UXO 13 is located. Mangrove habitat (such as found at Laguna Algodones) is potentially supportive of Cóbana negra (*Stahlia monosperma*), a federally threatened tree species. Cóbana negra inhabits brackish, seasonally flooded wetlands with a mangrove component, the edge of salt flats or shallow lagoons, and remnants of mangrove forests and salt flats. Beautiful goetzea (*Goetzea elegans*) is a federally endangered shrub or small shrubby tree that can grow to about 30 feet in height and is characterized by trumpet-shaped orange-yellow flowers. Suitable habitat for this species may exist in the ephemeral streams (quebradas) of UXO 13.

Information from an archaeological survey conducted previously (Goodwin, 1998) was used to identify any potential cultural and/or historical sites located in the UXO 13 TCRA areas. Additionally, on April 30, 2013, an archaeological site named La Campana, identified as Vi076, was discovered. The site was a former sugarcane processing site and was determined to be eligible for listing in 1980 (nomination form was submitted); however, to date, the archaeological site has not been listed by the Puerto Rico State Historical Preservation Office. Several archaeological sites are located within the TCRA area; however, as a conservative measure to protect the integrity of these archaeological sites their locations are not shown in figures contained in this QAPP. Worksheet #17 provides information regarding the protective measures for archaeological sites that will be implemented during the TCRA.

Summary of Key Conceptual Site Model Characteristics Supporting the TCRA Rationale and Approach

A summary of key Conceptual Site Model (CSM) characteristics supporting the TCRA rationale and approach for UXO 13 is provided herein. Details associated with the approach and objectives are provided in the applicable worksheets (specifically Worksheet #11 and Worksheet #17) in this QAPP.

Sources of Explosive Hazards (MEC)

The sources of explosive hazards (i.e., MEC) are the former military training activities conducted within the former VNTR and, more specifically, UXO 13. Numerous ranges were used for small arm, rifle, submachine gun, rifle and hand grenade, rocket launcher, and shape charge training activities. Additionally, artillery exercises were conducted using live rounds (e.g., 76 mm, 81 mm, 90 mm, 105 mm, and 106 mm) fired toward targets located within the SIA and LIA. Historical removal actions and investigations have eliminated some MEC within UXO 13; however, MEC remains at the site, warranting the TCRA. Table 10-2 provides a list of the types of munitions items (including MEC and MD) recovered from UXO 13 from previous removals and investigations. Figures 10-4 and 10-5 show the geospatial location of site features and MEC findings from previous removals and investigations. Based on the types of munitions items previously removed, it is inferred that remaining munitions of these types may be present and public receptors (both current and future) could come in contact with them.

Worksheet #10: Conceptual Site Model (continued)

Receptors and Exposure Scenarios

Potential Receptors within UXO 13 comprise:

- Current and Future Trespassers
- Future Public Recreational Users (e.g., hikers, picnickers, etc.)
- USFWS Workers

An explosive hazard exposure scenario associated with direct contact with MEC on or beneath the surface (which may become exposed from site erosion) by trespassers, future public recreational users, USFWS workers, or other unanticipated entities exists at the site. Explosive hazard exposure scenarios are presented in Table 10-3 and are based on the intended site activities associated with reasonably anticipated receptor site use.

With the exception of construction activities associated with establishment of the future recreational use areas (i.e., parking areas and observation tower) and future recreational use associated with beaches[4] adjacent to UXO 13, explosive hazard exposure scenarios are anticipated to be limited to the surface or shallow subsurface (i.e., conservatively anticipated to be a maximum depth of 12 inches below ground surface [bgs]), as the intended site activities associated with reasonably anticipated receptor site use involves little to no subsurface exposure (i.e., hiking along trails, picnicking, stopping at scenic view area). In other words, reasonably anticipated refuge maintenance and repair activities, recreational use, and trespassing activities within UXO 13 generally would not consist of any ground disturbance, or at worst minimal ground disturbance within the top 6 inches.

Explosive hazard exposure depths for future recreational users associated with the beaches adjacent to UXO 13 (i.e., UXO 7) are anticipated to be limited to the surface down to a maximum depth of 48 inches bgs, as has been assumed for past beach clearance work performed under a Non-Time-Critical Removal Action (NTCRA; CH2M, 2008). The anticipated exposure depth for construction activities for the parking areas is anticipated to be 24 inches bgs, which is the same as the removal depths for parking areas associated with similar uses (i.e., SWMU 4, UXOs 12 and 14). The anticipated exposure depth for construction activities for the observation tower is to the depth of the construction required to secure the structural foots (anticipated to be approximately 48 inches bgs).

Additionally, there is a berm that stretches along much of the western length of Range 4B. The berm is suspected to have been created by consolidating debris from military training as part of range maintenance. There is no planned use along this berm (other than the southern tip that intersects a planned parking area). However, the berm has a higher potential for erosion than the surroundings because of its unconsolidated nature and steep slopes. Further, munitions have been observed within the berm during past investigations. These characteristics result in an explosive hazard to trespassers should erosion along the berm expose munitions in the future. Additionally, there is a cliff face within Range 4B and an adjacent sandy beach area associated with the small cove located between Beach 25 and Beach 24 (hereafter referred to as Cove Beach). While there is no anticipated exposure scenario for the cliff face, munitions and/or munitions debris that may be present along the cliff face, which were derived from range maintenance activities, may be subjected to erosional processes and washed down onto the beach.

[4] Although the beaches adjacent to UXO 13 are technically part of UXO 7, because of the interrelationship between UXO 7 and UXO 13, especially with respect to likely recreational use, these beaches will be included in UXO 13 TCRA. Reporting and decision-making for these beaches will be done under UXO 7.

Worksheet #10: Conceptual Site Model (continued)

Table 10-1. UXO 13 Summary of Previous Investigations

Previous Investigation	Dates	Summary
Preliminary Range Assessment	2002-2003	A Preliminary Range Assessment (NAVFAC, 2003b) was conducted in 2002 and consisted of personnel interviews, archive records searches, and inspections to provide information about the types, quantities, and other factors related to military munitions used, and to identify the types and locations of any targets that may have been used at the former VNTR. The information was used to help identify areas for further consideration.
Expanded Range Assessment/ Site Inspection (ERA/SI)	2005-2008	An ERA/SI (CH2M, 2010) was conducted between 2005 and 2008 that included transect surveys across approximately 116 acres of UXO 13. Over 40 MEC were identified with the majority of the items located at or adjacent to Ranges 2 and 4. Based on the results of the ERA/SI, a remedial investigation was recommended to delineate the nature and extent of MEC and potential environmental impacts within site media.
NTCRAs	2011-2015	An NTCRA was conducted from 2011 through 2015 to perform surface MEC clearance comprising approximately 326 acres. A total of 590 MEC items were identified and removed during the NTCRA. Surface MEC clearance activities consisted of instrumented-aided visual sweeps along search lanes approximately 3- to 5-feet wide.
RI/ Feasibility Study (FS) (Draft)	2016-2018	RI activities (CH2M, 2020b) were conducted to assess the nature and extent of MEC and potential environmental media contamination, to assess potential risks to human health and the environment at UXO 13. RI activities consisted of instrument-aided MEC transect surveys in areas west of Range 7, digital geophysical surveys and subsequent intrusive investigation to 24-inches bgs within approximately 1-acre sample units conservatively placed (i.e., firing positions, impact areas, etc.), and trenching activities within multiple berms associated with Ranges 2, 3, 4, and 4B. The draft UXO 13 RI/FS Report was submitted for regulatory review in 2020; the report will be finalized with the information gathered during the TCRA and additional rounds of groundwater data requested by EPA.

Worksheet #10: Conceptual Site Model (continued)

TABLE 10-2. MEC/MD/RRD/NMRD Identified within UXO 13

Item Group	ERA/SI (2007-2008)			NTCRA (2011-2015)			RI Western Transect Investigation (2017)			Surface Totals	Subsurface Totals
	Number of Surface Items	Number of Subsurface Items	General Types of Items Identified	Number of Surface Items	Number of Subsurface Items	General Types of Items Identified	Number of Surface Items	Number of Subsurface Items	General Types of Items Identified		
MEC	49	0	3.5 in rockets, 40 mm and 105 mm projectiles, 60 mm mortar, rifle grenade, illumination flare, M72 66 mm (unfuzed)	497	30	3.5 in rockets, 40 mm projectiles, 40 mm projected grenades, 105 mm projectiles, 60 mm and 81 mm mortars, 5 in rockets, 3 in projectiles, Mk 33 BDUs	12	1	3.5 in rockets, SMAW Rocket (83 mm), 60 mm mortar, and illumination flares	558	31
MD	474	1	3.5 in rockets, 40 mm white star casings, empty illumination flares, 81 mm mortars, 106 mm projectile recoilless rifle cartridges, a smoke hand grenade, and scrap	37,760	534	Mostly scrap with a few parts and fragments of types of MEC in above column, 20 mm projectile	173	75	Scrap, 3.5 in rockets, 40 mm grenade fragments, 81 mm mortars, 25 mm projectile, hand grenade spoons, bullet fragments, ammunition boxes, expended illumination flares, and an empty land mine	38,407	610
RRD	1,087	0	Scrap, consisting of 55-gal drums, 5 ton tires, communication wire, barbed wire, ammunition cans, targets, runway matting, scrap metal, PVC pipe	58,996	1,429	Mostly scrap, consisting of fence posts, barbed wire, concrete with rebar in it, and a small amount of 7.62 mm blanks and empty 5.56 mm cartridges	166	41	Scrap, consisting of fence posts, fence wire, steel bar, barb wire, scrap metal, target pieces, wire, metal spool, and a few 7.62 mm bullets, and a box of 5.52 mm blank ammo	60,249	1,470
NMRD	0	0	-	1	0	General trash	19	52	Non-munitions related piece of metal and scrap, rebar, angle iron, nails, and fence posts	20	52
TOTALS	1,610	1	-	97,254	1,993	-	370	169	-	99,234	2,163

BDU = Bomb Dummy Unit
NMRD = non-munitions related debris
PVC = polyvinyl chloride
SMAW = shoulder-launched multipurpose assault weapon

Worksheet #10: Conceptual Site Model (continued)

Table 10-3. UXO 13 Conceptual Site Model

<table>
<tr><th colspan="4">UXO 13 Conceptual Site Model - Description and Munition Items Summary</th></tr>
<tr><td>Description and Historical Site Use</td><td colspan="3">UXO 13 is approximately 1,800 acres and comprises the northwest portion of the former EMA. Artillery exercises were conducted in the EMA using live Marine artillery, including 76 mm, 81 mm, 90 mm, 105 mm, 106 mm, and 107 mm rounds fired toward targets located within the SIA and LIA. During 1966, six ranges (Ranges 1 through 6, including 4A and 4B, in Figure 10-3) were established along the north coast in the area identified as UXO 13. These ranges were used for small arms, rifles, submachine guns, rifle and hand grenades, rocket launchers, and shape charges.
Aerial photo analysis identified three additional ranges (Ranges 7 through 9 in Figure 10-3). Range 7 was used for longer-range, probably crew-served weapons, and had numerous impact/target areas and Ranges 8 and 9 appeared to be small arms ranges visible in 1994 aerial photographs.</td></tr>
<tr><td rowspan="2">Munitions Items Summary</td><td>Encountered and Known MEC Items</td><td colspan="2">Potential Additional MEC Items
(Based on previous MD Encounters)</td></tr>
<tr><td>Bombs (BDU-33)
Flares (illumination)
Grenades (40 mm projected grenade, smoke)
Mortars (60 mm, 81 mm)
Projectiles (40 mm, 105 mm, 106 mm, 3 in, and 5 in, M72 66 mm)
Rocket (3.5 in, 5 in, 83 mm SMAW)</td><td colspan="2">Projectiles (20 mm, 25 mm, 40 mm white star casing)
Small Arms Ammunition</td></tr>
<tr><td rowspan="4">Receptors and Exposure Pathways</td><td>Current and Future Anticipated Receptors</td><td>Anticipated Exposure Pathways</td><td>Anticipated Exposure Medium (Soil)</td></tr>
<tr><td>USFWS Workers (including subcontractors)</td><td>Refuge maintenance and repairs, construction activities</td><td>Surface and, in some areas, subsurface (to maximum of bedrock depth or final construction depth [whichever is shallower])</td></tr>
<tr><td>Public Recreational Users (hikers, picnickers, etc.)</td><td rowspan="2">Potential MEC encounter during recreational or trespassing activities</td><td rowspan="2">Surface and shallow subsurface (maximum subsurface depth of 12 inches)</td></tr>
<tr><td>Trespassers</td></tr>
</table>

\\dc1vs01\GISNAVYCLEAN\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_10-1-Regional_Location_Map.mxd 3/3/2023 JC022053

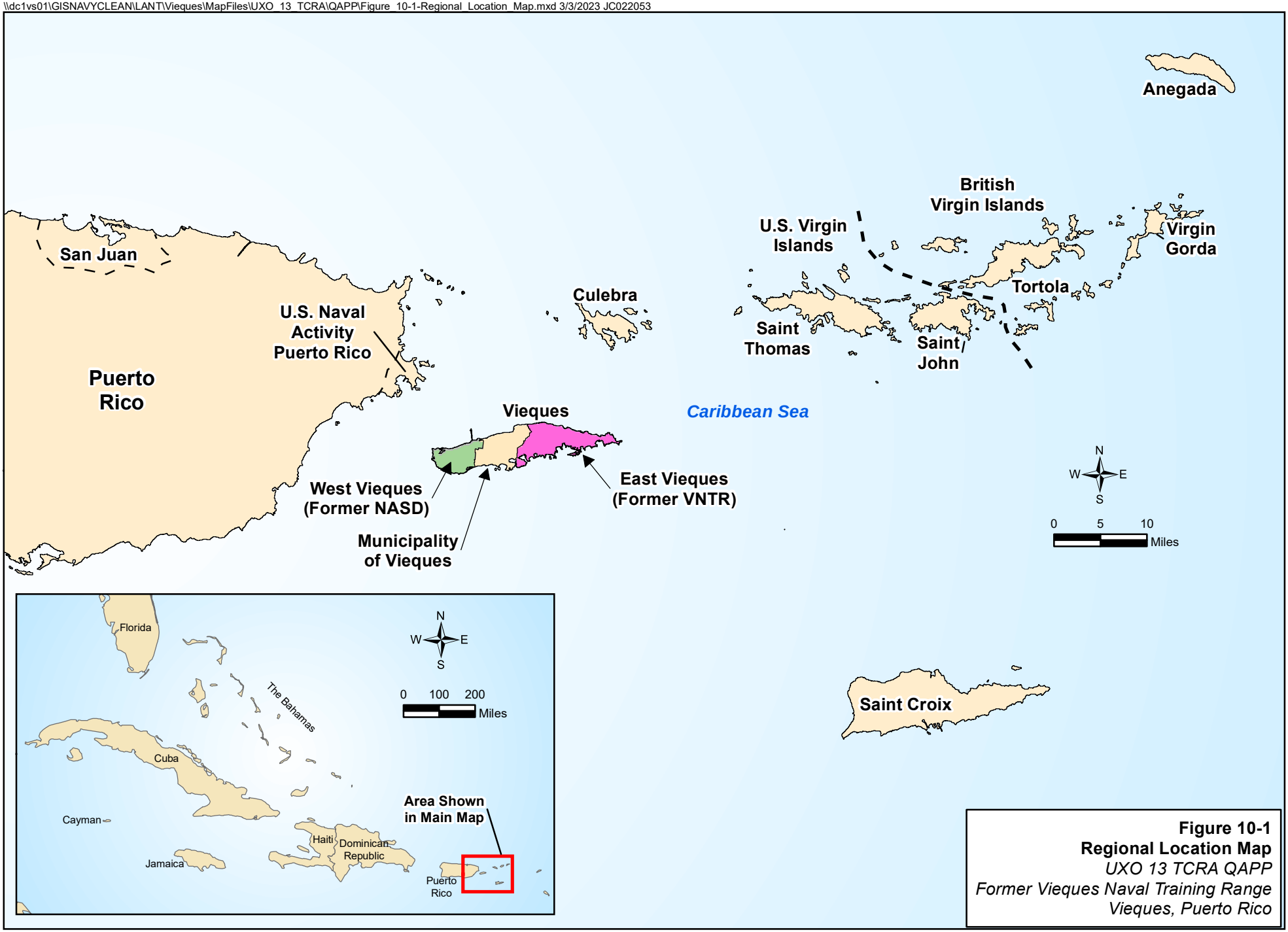
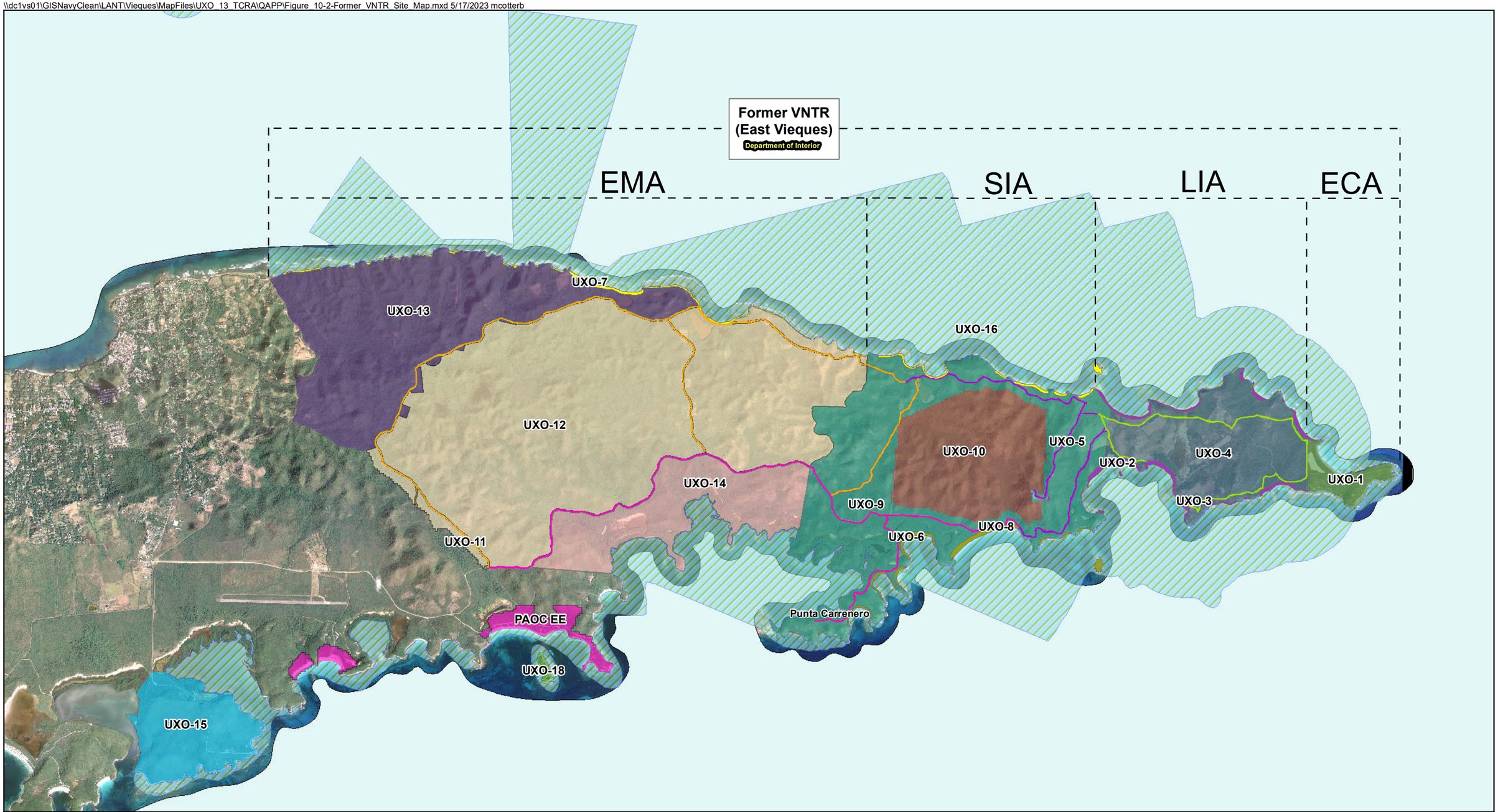


Figure 10-1
Regional Location Map
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

This page intentionally left blank.

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_10-2-Former_VNTR_Site_Map.mxd 5/17/2023 mcotterb



Legend

- UXO 1 - ECA
- UXO 2 - LIA Beaches
- UXO 3 - LIA Roads
- UXO 4 - LIA Interior
- UXO 5 - SIA Restricted Roads
- UXO 6 - EMA/SIA Planned Public Roads
- UXO 7 - EMA/SIA North Beaches
- UXO 8 - SIA South Beaches
- UXO 9 - SIA Exterior
- UXO 10 - SIA Interior
- UXO 11 - EMA Planned Public Roads
- UXO 12 - EMA Interior
- UXO 13 - EMA West
- UXO 14 - EMA South
- UXO 15 - Puerto Ferro
- UXO 16 - Underwater Areas
- UXO-17 - Public Use Beaches
- UXO 18 - Cayo de la Chiva

N
W E
S

0 2,250 4,500
Feet

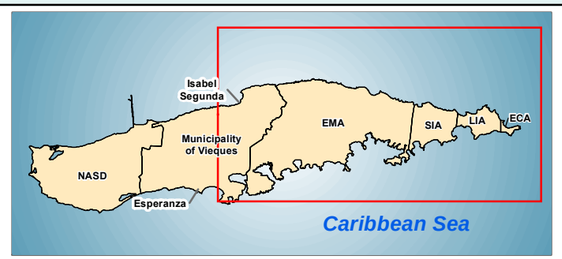


Figure 10-2
Former VNTR Site Map
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_10-3-UXO_13_Site_Features.mxd7/31/2023mcotterb

Playa Voltios (Beach 26)
Playa Punta Campanilla (Beach 28)
Playa Puntas Cabellos Colorados (Beach 29)
Playa Campanita (Beach 25)
Cove Beach
Playa Punta Brigadier (Beach 30)
Playa Campana/Purple Beach (Beach 24)
Playa Puerto Negro (Beach 23)
Laguna Algodones
Laguna Monte Largo
UXO-11
UXO-13
Parcel C
Municipality of Vieques
G-23
G-27
G-7
G-9
G-8
Range 1
Range 2
Range 3
Range 4
Range 4A
Range 4B
Range 5
Range 6
Range 7
Range 8
Range 9
PAOC AA
PAOC BB
PAOC CC
PAOC DD

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

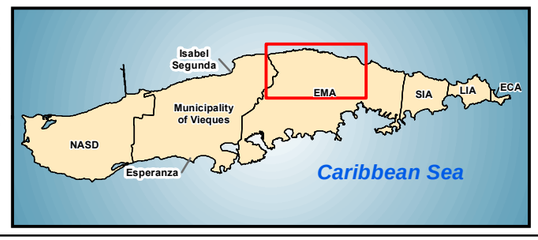
Legend

EMA Munitions Response Sites
- UXO 7 - EMA/SIA North Beaches
- UXO 11 - EMA Public Roads
- UXO 12 - EMA Interior
- UXO 13 - EMA West
- Parcel C
- Photo Identified Area
- Potential Area of Concern

- Gun Positions
- Range
- Lagoon
- Ephemeral Stream
- Topographic Contours (10 Meter)
- Trench Location

Ranges
- 1962 Aerial Photo Analysis
- 1967 Aerial Photo Analysis
- 1983 Aerial Photo Analysis
- 1994 Aerial Photo Analysis

Impact Areas
- 1962 Aerial Photo Analysis
- 1967 Aerial Photo Analysis
- 1983 Aerial Photo Analysis
- 1994 Aerial Photo Analysis

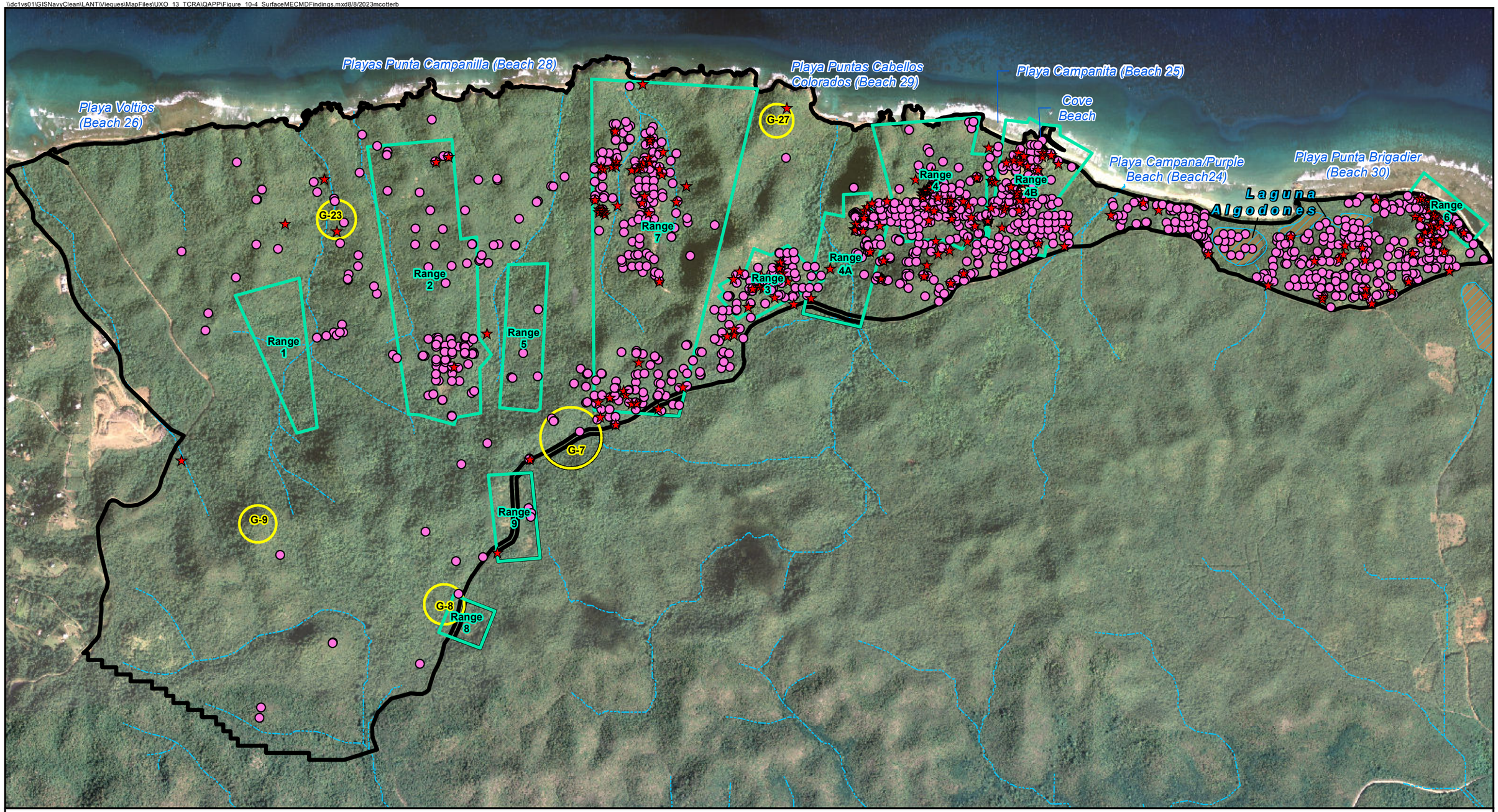


N W E S

0 700 1,400 Feet

Figure 10-3
UXO 13 Site Features
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_10-4_SurfaceMECMDFindings.mxd8/8/2023mcotterb

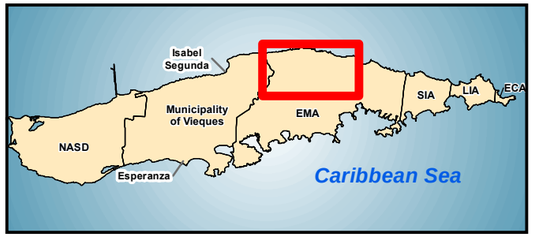


Legend

- UXO 13 Boundary
- Range
- Gun Positions
- Lagoon
- Ephemeral Stream

Items Found

- MEC
- MD



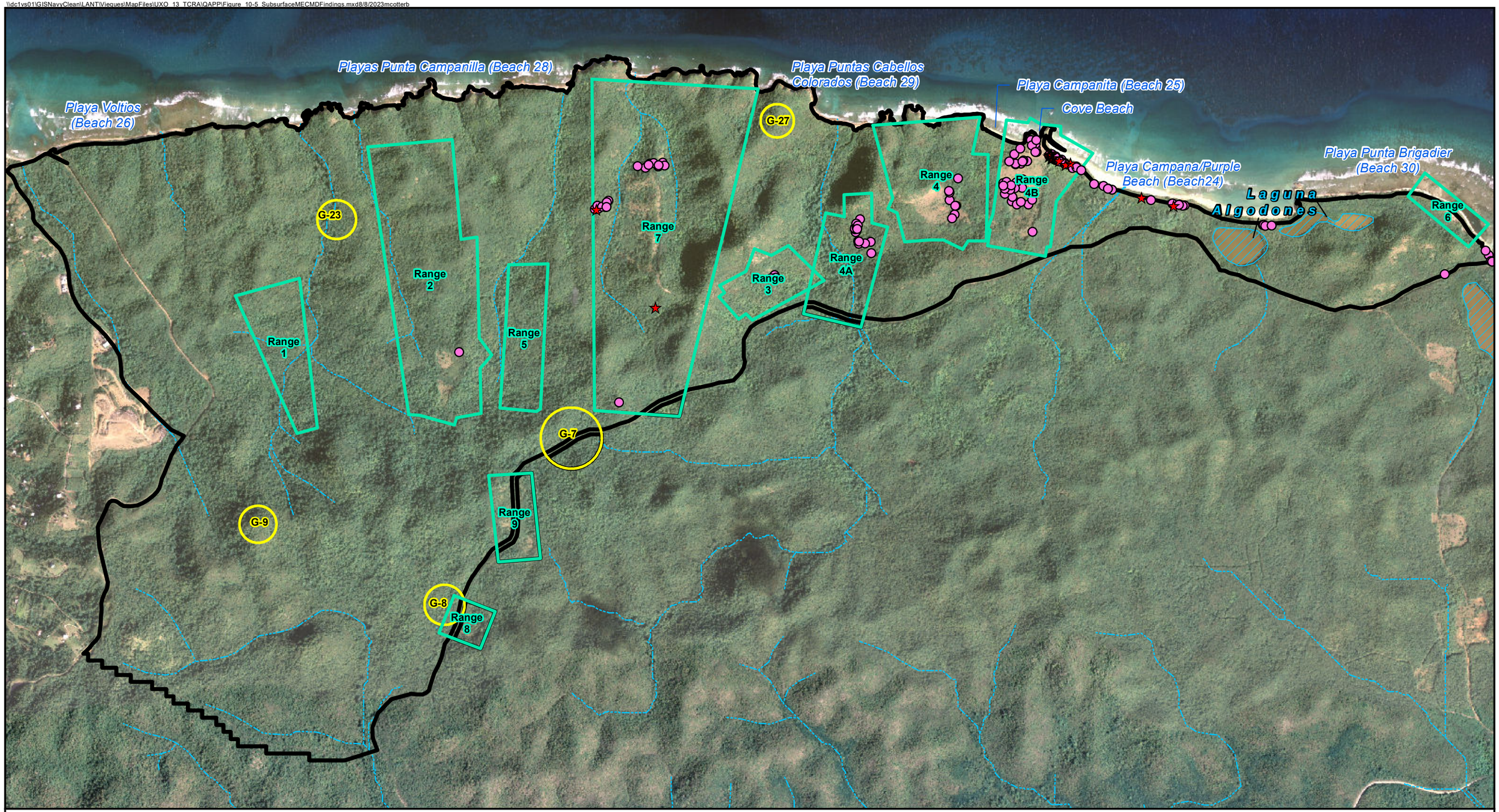
N
W E
S

0 650 1,300
Feet

2007 Aerial Imagery

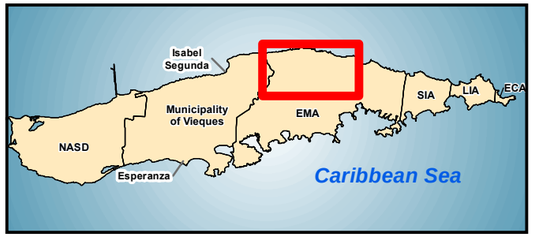
Figure 10-4
UXO 13 Surface MEC and MD Findings
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_10-5_SubsurfaceMECMDFindings.mxd8/8/2023mcotterb



Legend
- UXO 13 Boundary
- Range
- Gun Positions
- Lagoon
- Ephemeral Stream

Items Found
- MEC
- MD



N W E S

0 650 1,300 Feet

2007 Aerial Imagery

Figure 10-5
UXO 13 Subsurface MEC and MD Findings
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

Worksheet #11: Data Quality Objectives

This worksheet documents the DQOs following the EPA seven step Data Quality Objective Process (EPA, 2006). Because the RI is still ongoing, a TCRA is warranted within UXO 13 to address the imminent threat based on the relatively close proximity of the site to the MOV, observations of trespassing, and the presence of certain munitions types (e.g., grenades and rockets).

The primary objective of this TCRA is to reduce the explosive hazards to current and anticipated future receptors. The areas to be addressed are presented in Figures 11-1 through 11-9 and Table 11-1 summarizes, by TCRA area, the approximate size of the area, the geophysical technology or technologies planned to be utilized to support the TCRA, and the maximum removal depth based on the conceptual exposure scenario discussed in Worksheet #10. The various geophysical technologies that are planned to support the TCRA are AGC, DGM (both inclusive and exclusive of advanced sensors), and analog (i.e., all-metals detector).

As shown in Table 11-1, the removal action in any particular TCRA area will utilize one or more geophysical technologies based on site characteristics (i.e., terrain, accessibility, practicality, feasibility) and assumed exposure depths. Therefore, the DQOs provided in this worksheet are based on the technologies assumed for each TCRA area. It is noted the actual technology or technologies utilized at any particular TCRA area may need to be adjusted based on site conditions observed at the time of TCRA implementation. If the planned technology or technologies are modified, the impact on achieving the DQOs associated with the particular TCRA area will be discussed in the UXO 13 TCRA Completion Report.

DQO Step	Description
Step 1 State the Problem	Previous investigations and removal actions identified the presence of MEC within portions of UXO 13 (see Table 11-1). The presence of MEC poses an imminent threat because of the relatively close proximity of the site to the MOV, observations of trespassing, and the presence of certain munitions types (e.g., grenades and rockets). Therefore, a TCRA is warranted to reduce the explosive hazard associated with current and anticipated use within UXO 13.
Step 2 Identify the Goal	Goal: The goal of the TCRA is to reduce the explosive hazard associated with MEC by identifying and removing MEC/MPPEH on the surface and/or in the subsurface within the UXO 13 TCRA areas (see Table 11-1 and Figures 11-1 through 11-9). Principle Study Question: Have MEC/MPPEH on the surface and/or in the subsurface been detected and removed? Alternative Outcomes: Based on the Principal Study Question, the potential outcomes are: • MEC is not found on the ground surface. • MEC is found on the ground surface and removed. • Geophysical anomalies with metallic characteristics are not detected/targeted in a TCRA area and no intrusive investigation of that area is warranted. • Geophysical anomalies with metallic characteristics are detected/targeted in a TCRA area: – Identified anomalies that are intrusively investigated, documented, and removed are determined to be MEC. – Identified anomalies that are intrusively investigated, documented, and removed are determined not to be MEC. – Identified anomalies are intrusively investigated, documented, and left in place because they are below the maximum removal depth identified for the TCRA area (see Table 11-1).

Worksheet #11: Data Quality Objectives (continued)

DQO Step	Description
	How Data will be Used in Solving the Problem: For the Surface Clearance Only Areas (Figure 11-3), MEC/MPPEH will be removed from the surface via a surface clearance. A surface sweep will be conducted to identify surface MEC (as well as any other metallic items) in the TCRA areas where geophysical surveys will be conducted. Following the surface sweep AGC, DGM, analog (i.e., all-metals detector), or a combination of these technologies will be used to identify anomalies in the subsurface of each survey area. The type of technology used in each area will be based on the specific characteristics of the area being investigated. Items on the final dig list (or flagged during analog activities) will be intrusively investigated until the source is recovered, refusal, or the area's maximum removal depth is reached. With the exception of the Surface Clearance Only Areas (and the cliff face within Range 4B [to the extent practical and safe] where analog will be the primary technology used), the following priority will generally be used to establish the type of geophysical technology employed during the TCRA: • AGC – Advanced sensors (inclusive of those that require a detection followed by a separate cued phase and one-pass sensors) will be the preferred geophysical technology for execution of the TCRA. However, factors such as terrain, anomaly density, and site access may limit AGC's use in some areas. • DGM – DGM is inclusive of both advanced sensor use (detection survey with no follow-on cued survey) and the EM61-MK2 (EM61) sensor. DGM may be used when AGC is not practical or feasible for the area being investigated as part of the TCRA and this is the preferred approach when AGC is not able to be utilized. • Analog – This approach will only be utilized when AGC and/or DGM cannot be used in all or part of a specific survey area. All areas where analog technology is used but was not the primary planned technology will be recorded, the rationale for its use provided, and the potential impact on the TCRA objectives discussed in the UXO 13 TCRA Completion Report.
Step 3 Identify Information Inputs	The information inputs for the UXO 13 TCRA are: • Current CSM (Worksheet #10), which includes historical information gathered during previous investigations/removals. • Types of munitions previously removed at UXO 13 based on the CSM (Table 10-2). • Biological and archaeological survey information. • The horizontal and vertical boundaries for each TCRA area. • Observed site conditions during TCRA activities. • Anticipated depth of reliable detection and/or classification for munitions present based on electromagnetic induction (EMI) sensor used. • Defensible data collected by instrument-aided visual survey (e.g., all-metals detector in which detection is defined as an audible signal) including: (1) surface sweep in advance of digital geophysical surveys, and (2) surface removal (including areas not accessible by geophysical sensors). – Note: If analog equipment is used to perform subsurface clearance in areas inaccessible to the DGM equipment and/or in saturated response areas (SRAs), anomaly locations associated with audible signals produced by the analog instruments will also be information inputs (see Step 5).

Worksheet #11: Data Quality Objectives (continued)

DQO Step	Description
	• QC and QA seed locations recorded with real-time kinematic (RTK) global positioning system (GPS) or equivalent positioning system. • Digital geophysical survey results, including: – Coverage – Identification and delineation of data gaps (inaccessible areas, SRAs, etc.) – Required instrument verification strip (IVS) and QC test results – Raw and processed data packages, processed data packages to include databases that can be imported into UX-Analyze if AGC is used – QA/QC seed performance results – Performance against measurement quality objectives (MQOs) and measurement performance criteria (MPCs) – Mapped anomaly locations – Target lists including a ranked, prioritized target list for AGC surveys – Classification of sources with library-match coefficient metric (for AGC surveys) – Data Usability Assessments (DUAs) – Applicable reports (see Worksheet #14 & 16) • Intrusive investigation results, including: – Excavation results (entered into database) – Photographs – Disposal records – Stop-dig threshold verification for AGC – Applicable reports (see Worksheet #14 & 16)
Step 4 Define Spatial and Temporal Boundaries	Target Population: The target population includes the type of ordnance used or found at UXO 13 based on historical military training activities and past findings at UXO 13 (Table 10-2). While it is recognized the type of munitions used or intended for use at the various ranges differed, munitions other than anticipated were found at various ranges during past removal actions at UXO 13 (e.g., projectiles found at rocket range). Therefore, as a conservative measure, the target population throughout the UXO 13 TCRA area comprises the munition types associated with all MEC and MD previously identified within UXO 13. While conservative, the approach should not unnecessarily burden the TCRA because the target population size is small (i.e., less than 20 ordnance types, as shown in Table 10-3). Spatial Boundaries: Spatial boundaries include both the horizontal (lateral) area and vertical depths established for each TCRA area. Establishing the spatial boundary for the survey areas of UXO 13 considers: 1. The horizontal extents of each planned survey area and vertical distribution of MEC present 2. The predicted depth of current and future subsurface disturbances based on anticipated land use 3. Detection and classification limitations (that is, the maximum depth at which the EMI sensor can collect meaningful data for specific munitions in the survey area)

Worksheet #11: Data Quality Objectives (continued)

DQO Step	Description
	4. Areas that are inaccessible to TCRA activities, including the presence of structures, steep or rugged terrain, standing water, sensitive habitats, cultural resources, constraints on vegetation removal, etc. Horizontal Boundaries: The conceptualized horizontal boundaries of the UXO 13 TCRA areas are shown on Figures 11-1 through 11-9; however, all boundaries are approximate and final boundaries will be established based on field conditions at the time of the survey and will be documented in the UXO 13 TCRA Completion Report. Vertical Boundaries: With respect to the vertical boundary, the TCRA approach is designed to detect and classify targets of interest (TOIs) exceeding the target selection threshold and meeting measurement criteria within the established spatial boundary. The vertical boundary for detection/classification is based on a 37 mm projectile in its worst-case orientation (i.e., horizontal). Based on previous removal findings (Table 10-3), there is a potential for smaller or thin-walled TOIs (i.e., 20 mm, 25 mm, and illumination flares) to exist within the UXO 13 TCRA boundaries. Although the TCRA will include the attempt to detect, classify, and remove these TOIs, currently there are limitations on the ability of AGC sensors to confidently detect or classify them. Therefore, not correctly classifying the previously mentioned smaller TOIs will not be a QC failure for this TCRA. Using the 37 mm projectile to establish the vertical boundary for detection/classification is: (1) consistent with the approach used during previous and similar removal actions (e.g., UXO 17 TCRA), and (2) accounts for the limitations of the applicable geophysical sensor in terms of detection/ classification limits (i.e., the maximum depth at which the sensor can collect meaningful data for specific munitions, which is modeled to be 12 inches bgs for a 37 mm projectile in its worst-case orientation). It is important to note that the vertical boundary for classification is not synonymous with the maximum depth of removal for certain TCRA areas (i.e., roads/parking areas and beaches/observation towers, for which the maximum depth of removal is 24 inches and 48 inches, respectively). The impact on the TCRA objectives of having a maximum removal depth that is deeper than the vertical boundary for classification will be discussed in the TCRA Completion Report. Forward modeling will be used to establish an initial target selection threshold for each EMI sensor used to complete site surveying and the results of the forward modeling and initial threshold will be presented in the IVS Technical Memorandum. The initial threshold should be at least five times root-mean-square (RMS) noise as established during the initial IVS survey(s). The initial threshold for any EMI sensor used may be adjusted by survey area based on analysis of site noise conditions, as applicable. The threshold used should be at a minimum five times the average RMS noise levels of the survey area. Broad areas where decreased signal to noise results in data usability limitations will be identified and defined. Final target selection thresholds and areas with data usability limitations will be reported in the appropriate final geophysical report[5]. While it is recognized that any geophysical technology has limitations associated with maximum reliable vertical detection/classification depth, any limitations identified and their potential impacts to the TCRA goal will be documented in the DUA Report which will be appended to the UXO 13 TCRA Completion Report.

[5] Dependent on EMI sensor(s) used.

Worksheet #11: Data Quality Objectives (continued)

DQO Step	Description
	Inaccessible areas or SRAs (localized areas where individual targets cannot reliably be selected/classified) will be identified and their extents defined in the survey area boundaries. At the discretion of the project team, analog surveys may be performed over areas inaccessible to digital geophysical equipment. SRAs not associated with a known non-MD feature will be investigated using analog detection methods to the extent that they can be characterized. SRAs may be resurveyed using an EMI sensor following analog removal at the discretion of the project team. Any data gaps or data usability implications related to inaccessible areas and/or SRAs will be discussed in the DUA Report. Note: If informed source selection (ISS) is performed, the size and decay parameters will be established based on the size and decay for a 37 mm projectile. A 20 percent buffer will be added to the smallest size and the smallest decay to ensure TOI are not eliminated during the ISS process. The intrusive vertical boundary for MEC removal within each discrete TCRA area was established based on current and reasonably anticipated future land use (i.e., exposure depths for known, potential, and planned site receptors) and comparison to previous NTCRA removal depths (CH2M, 2008). The maximum depth of intrusive investigation for each TCRA area is shown on Figures 11-1 through 11-9 and detailed in Table 11-1. If bedrock is encountered during any intrusive investigation of a subsurface anomaly prior to maximum removal depth, the removal objective at this location will be satisfied as MEC is unlikely to have penetrated bedrock nor will foreseeable construction activities associated with planned use extend into the bedrock. If the water table is encountered during the investigation of a subsurface anomaly prior to maximum removal depth (i.e., a "water hole"), removal activities will cease for safety reasons as water intrusion into the hole reduces visibility of the item. In the event of a water hole, additional evaluation including, but not limited to, location-specific consideration of exposure potential will occur and a determination will be made whether removal at the location can/should be performed using remote-controlled excavation techniques or whether the depth of intrusive investigation reached before encountering water effectively satisfies the removal objective. As indicated previously, for areas where the maximum removal depth is deeper than the maximum depth of reliable detection, the potential for MEC to remain within and below that interval will exist. However, the TCRA approach represents the best currently available technology coupled with an industry standard approach. Lastly, any limitations associated with the technology and removal activities will be documented in the DUA Report which will be attached to the UXO 13 TCRA Completion Report. <u>Temporal Boundaries</u>: There are no substantial temporal boundaries that could impact the TCRA.
Step 5 Develop the Project Data Collection and Analysis Approach	The general technical approach for the TCRA is summarized below[6] and consists of four potential phases of work (depending on the particular TCRA area): 1. A surface MEC clearance or a surface sweep in advance of digital geophysical surveys to remove MEC and metal items measuring 2 inches by 2 inches or larger. 2. An EMI sensor based digital geophysical survey over the survey area. This is inclusive of AGC sensors (detection and cued or one-pass) and non-AGC sensors such as the EM61 and includes data collection, data processing, and data QC. 3. If required, analog subsurface survey.

[6] A detailed description of each phase of work is provided in Worksheet #17.

Worksheet #11: Data Quality Objectives (continued)

DQO Step	Description
	4. Intrusive investigation of items on the final dig list or final ranked prioritized dig list. This phase includes re-acquisition of anomalies for investigation. **1.** Surface Sweep (in advance of DGM or AGC) A surface sweep will be performed to locate and remove surface MEC and other metal present on the ground surface in advance of the geophysical survey. The surface sweep will be performed via an instrument-aided visual survey using an all-metals detector. Worksheet #17 describes the specific tasks to be performed associated with the surface sweep. No surface seeding will be performed in the surface sweep area because the analog instrument survey is not intended to be the final remedy or the sole geophysical survey method on which decisions about the applicable TCRA area will be made; however, surface seeding will be performed as part of the surface clearance activities for the Surface Clearance Only Areas (see 3. Analog-Based Clearance) Parameters of Interest: MEC and other MPPEH identified on the ground surface or partially buried but protruding from and visible above the ground surface. For the surface sweep, metallic items on the ground surface having a dimension of at least 1 inch (2.5 centimeters [cm]) in any two dimensions not related to structures within the established horizontal boundaries of the TCRA survey area. Assumptions: MEC and other MPPEH may be: (1) located at or adjacent to known targets within ranges, (2) located at or adjacent to firing lines associated with ranges, and (3) randomly distributed across the TCRA areas. Type of inference: For the surface sweep, items on the ground surface meeting the criteria of having a dimension of at least 1 inch (2.5 centimeter [cm]) in any two dimensions will be identified and removed from the survey area. MEC/MD identified and recovered during the surface sweep will be appropriately documented, removed from the survey area, and dispositioned in accordance with the Explosives Safety Submission (ESS). Decision Rules for Surface Sweep: a. IF metallic items (which might include MEC/MD) are detected on the ground surface, THEN they will be removed from the ground surface and their location and description/type recorded. b. IF metallic items are not detected on the ground surface, THEN this condition will be documented. **2.** Digital Geophysical Survey The project team will perform a digital geophysical survey[7] to identify TOI in the subsurface for intrusive investigation. A general summary for the anticipated geophysical methods/technologies to be employed during the TCRA (AGC and DGM[8] surveys) are provided below. AGC Survey An advanced sensor (i.e., MetalMapper 2x2, APEX, or other) will be used to discriminate among subsurface geophysical anomalies between TOI (i.e., potential munitions) and clutter (scrap metal

[7] For AGC technology any DAGCAP validated sensor/method may be used including one-pass classification. For non-AGC digital surveys the EM61 sensor may be used.

[8] Detection survey, regardless of sensor used, without classification.

Worksheet #11: Data Quality Objectives (continued)

DQO Step	Description
	that does not pose an explosive hazard). Where AGC is used at UXO 13, anomalies will be classified as follows: • Category 1: TOI (item has intrinsic properties similar to a munitions item in the library, to be intrusively investigated). • Category 2: If used (depending on the sensor/software and Standard Operating Procedures (SOPs) specific to the sensor/software) Category 2 targets will be considered TOI and intrusively investigated. • Category 3: Non-TOI (high likelihood clutter, not to be intrusively investigated). • Category 0: Inconclusive (not enough information is present to determine whether the item is a TOI or non-TOI, to be intrusively investigated). • Category -1 (or other as long as clearly specified): Other TOI. These may consist of analyst calibration digs (ACDs), cluster analyses or feature space analyses, or items exhibiting some feature similar to a TOI but located below the TOI/non-TOI threshold. These may or may not be intrusively investigated depending on the specific circumstance, as discussed below. The final product will be a "ranked target list" that classifies each anomaly, justifies the classification, and identifies whether a detected object will be considered a TOI. Anomalies on the list (excluding inconclusive items and Category -1) will be ranked in the order of greatest likelihood to be TOI to greatest likelihood to be non-TOI, based on their library-match metric. Analysis of the data may result in selection of additional anomalies (Category -1) for intrusive investigation. At a minimum, the data will be analyzed to identify: • ACDs: Sources selected to inform the classification process. These digs are intended to validate the completeness of the library, test/calibrate the analyst threshold, and provide initial validation results. If selected, ACDs may be intrusively investigated prior to sources classified as TOI. • Sources associated with a cluster (that is, numerous similar signatures consistent with a potential TOI not contained in the library). This may be performed against the full DoD Library. • Sources with predicted properties consistent with those of a munition item based on a feature space analysis. • Those identified by the analyst, QC Geophysicist, or QA Geophysicist (i.e., QA Contractor Geophysical QAO), following visual inspection of the final classification decision of a source, as an alternate source that should be investigated but is below the TOI/non-TOI threshold. Anomalies classified as TOI (including Category -1) or inconclusive will be intrusively investigated. Notwithstanding validation or verification processes and/or QA activities, anomalies classified as non-TOI will be left in place. In the event that the total anomaly count for an individual survey area is small, it may be practical to intrusively investigate all items on the ranked target list which would likely result in non-TOIs being investigated. If the decision is made to dig all items, regardless of classification status on the ranked target list, the list will be reviewed, and duplicate items will be removed. An analysis will also be performed (either through ISS or other means) to remove anomalies that are clearly the result of noise spikes in the data. Parameters of Interest: Measurements with an amplitude at or exceeding project-specific target selection threshold and not associated with known cultural features or noise. If ISS is used, anomalies that are as large/thick or larger/thicker walled than smallest size/decay parameters for

Worksheet #11: Data Quality Objectives (continued)

DQO Step	Description
	the TOI in the CSM (including QC seeds). The spatial extent of the anomaly, measurement signal to noise ratio (SNR), inversion fit coherence, and inversion outputs of β1, β2, β3, x, y, and z. Assumptions: The anomaly density is such that discrete anomalies may be selected from the detection data, otherwise the area or portion of the area will be identified as an SRA. It is assumed that RTK-GPS can be used to provide reliable positioning during the detection survey. If RTK-GPS cannot provide reliable positioning, then other suitable positioning technology may be used such as simultaneous localization and mapping (SLAM). The results of classification allow a determination to be made for each selected anomaly indicating whether or not the source is a high confidence TOI potentially related to past munitions-related activity. Type of Inference: If any of the following criteria are met, the anomaly will be intrusively investigated: a. The polarizability matches that of an item in the project-specific TOI library with a match metric above the TOI/non-TOI threshold (within specifications established in Worksheet #22 or sensor specific SOP, as applicable[9]). b. Estimates of the size, shape, symmetry, and wall thickness calculated from the polarizability, indicates the item is long, cylindrical, and thick-walled. c. There is a group (cluster) of anomalies having similar polarizabilities. d. Sources identified by the analyst, QC Geophysicist, or QA Geophysicist identified below the TOI/non-TOI as requiring investigation. e. The source is Category 0 (inconclusive). Decision Rules: a. IF all or a portion of a TCRA survey area is identified as an SRA, THEN an analog-based intrusive investigation will be performed over this defined area until the anomaly density supports individual target selection from the detection data, at which time a detection survey will be re-performed over this area and targets selected (if applicable) (factors for evaluating anomaly density are discussed in Worksheet #17). Targets selected from the detection data may be dug without performing classification (all selected targets that do not exhibit characteristics of noise) or classification may be performed. b. IF the source is classified as TOI (including Category -1), THEN the object will be on the final ranked dig list and intrusively investigated. c. IF the object is classified as non-TOI, THEN the object will not be intrusively investigated. d. IF the object is classified as inconclusive (cannot analyze), THEN it will be on the final dig list and intrusively investigated. e. IF newly acquired data are inconsistent with the CSM or suggest the CSM is incomplete (for example, unexpected MEC is found), THEN the sampling design will be reviewed and revised, as necessary. f. IF all or a portion of a survey area is determined to be inaccessible to AGC, THEN DGM techniques will be used to identify anomalies in the subsurface such that the MPC identified in Worksheet #12 are met and the overall subsurface MEC removal objectives are achieved.

[9] Specific to one-pass sensors.

Worksheet #11: Data Quality Objectives (continued)

DQO Step	Description
	DGM DGM may be performed with either an advanced sensor or the EM61. In this application it is considered a detection survey with no classification of anomalies performed[10]. If DGM is selected as the approach for all or part of a survey area, a 100 percent detection survey will be conducted over the horizontal extents of the area to identify subsurface anomalies that potentially represent MEC. A list of targets will be generated from these data. Sensor-specific forward modeling will be performed to establish a presumed target selection threshold based on the 37 mm projectile identified in this QAPP. Additionally, an assessment of noise will be performed by survey area, and the presumed threshold should be adjusted to be at least five times the average RMS background noise. Anomalies are identified from the geophysical data and targets are selected based on the established target selection threshold. Items at or above the threshold (as gridded) are selected from the data and added to a target list. Anomalies related to known cultural features or associated with noise spikes will not be included on the final dig list. ISS (if an advanced sensor is used to perform the DGM survey) may be used to eliminate targets that do not have the characteristics associated with TOI expected based on the CSM. ISS size and decay parameters will be established based on the smallest values for each associated with the TOI established with a 20 percent buffer applied. Areas where discrete targets cannot be reliably selected at the established target selection threshold due to broad elevated response or significantly increased noise conditions (that is, SRAs) will be identified and defined. Individual targets within SRA boundaries will not be selected. In addition, areas that are inaccessible to the survey team will be identified and documented. SRAs and areas inaccessible to DGM will be defined and an analog-based clearance will be performed over these areas. Parameters of Interest: Measurements with an amplitude exceeding the target selection threshold established for the survey area that are not associated with known cultural features, within an SRA, or have characteristics of noise. SRAs and inaccessible areas. If ISS is used, anomalies that are as large/thick or larger/thicker walled than smallest size/decay parameters for the TOI identified in the CSM, or a 37 mm projectile. Assumptions: The anomaly density is such that discrete anomalies may be selected from the detection data, otherwise the area or portion of the area will be identified as an SRA. It is assumed that RTK-GPS can be used to provide reliable positioning during the detection survey. If RTK-GPS cannot provide reliable positioning, then other suitable positioning technology may be used such as SLAM. Decision Rules: a. IF an anomaly is at or above the target selection threshold, is not related to noise, and is not associated with a known cultural feature, or is not eliminated through the use of ISS (as applicable for sensor used), THEN the anomaly will be selected as a target and placed on the dig list for intrusive investigation.

[10] The exception is use of ISS to eliminate sources that are too small or thin walled to be TOI if an advanced sensor is used. ISS cannot be performed with an EM61.

Worksheet #11: Data Quality Objectives (continued)

DQO Step	Description
	b. IF an anomaly is below the established detection threshold, THEN the anomaly will not be placed on the dig list. c. IF all or a portion of a TCRA survey area is identified as an SRA, THEN an analog-based intrusive investigation will be performed over this defined area until the anomaly density supports individual target selection from the detection data, at which time a detection survey will be re-performed over this area and targets selected (if applicable). d. IF all or a portion of a survey area is determined to be inaccessible to DGM, THEN analog clearance techniques will be used to identify anomalies in the subsurface such that the MPC identified in Worksheet #12 are met and the overall subsurface MEC removal objectives are achieved. e. IF no anomalies are identified in the DGM data, THEN no intrusive investigation will be performed in the associated area. 3. Analog-Based Clearance (as applicable) Worksheet #17 describes in detail the specific tasks to be performed associated with the surface MEC clearance and subsurface analog-based clearance. A solely analog-based clearance (except as noted below) is planned in the following circumstances: • A surface MEC clearance will be performed over the Surface Clearance Only Areas (Figure 11-3) as part of this TCRA. • Over the extents of SRAs identified from AGC or DGM surveys. This will not be the sole technology utilized for clearance in these areas because it is assumed a resurvey of the areas will be performed using AGC or DGM methods to identify any remaining anomalies following the analog-based clearance. • In areas inaccessible to AGC or DGM. • Along the surface of the cliff face (to the extent practical/safe). Analog geophysical tools produce an audible output, meter deflection, and/or numeric output, which is interpreted in real time by the instrument operator. The operator holding the sensor serves as the survey platform, positioning system, and data-processing system. When an anomaly is detected, the location is marked immediately by placing a small flag in the ground. Except for the surface sweep as described previously, analog surveys in support of the subsurface removal will only be conducted in areas not accessible to digital geophysical sensors or in areas identified as SRA(s). If the SRA is associated with a cultural feature that will be left in place, the source of the SRA will be documented. Parameters of Interest: Locations that produce an audible output, metal deflection, and/or numeric output indicating the presence of a metallic object. Assumptions: For MEC clearance within the Surface Clearance Only Areas and along the cliff face, the analog sensor will be able to detect the smallest TOI on the ground surface. For areas inaccessible to AGC or DGM, the analog sensor will be able to detect a 37 mm in its worst-case orientation to a depth of 12 inches. Type of Inference: An audible response from the analog sensor will indicate the presence of a surface and/or subsurface anomaly. For the MEC surface clearance, any MEC/MD identified on or protruding from the ground surface will be appropriately documented, removed from the survey area, and dispositioned in accordance with the ESS.

Worksheet #11: Data Quality Objectives (continued)

DQO Step	Description
	Decision Rules: a. IF MEC or other MPPEH are encountered, THEN it will be documented (including location, item description, and munition type) and removed to reduce the explosive hazard. b. IF a portion of the subsurface removal area is determined to be an SRA not associated with a cultural feature, THEN analog clearance will be conducted across the horizontal boundaries of the SRA until the anomaly density is low enough to support use of DGM as described in DQO Step 5, Item 4. c. IF an area is identified as inaccessible to DGM or AGC, THEN analog clearance will be performed across the horizontal and vertical boundaries of the defined area. 1) IF anomalies are detected in this area, THEN the anomalies will be intrusively investigated and removed to the applicable maximum removal depth. 2) IF anomalies are not detected in this area, THEN no intrusive investigation will be performed d. IF the analog-based clearance MQOs and MPCs have been achieved and: (1) MEC are not encountered, or (2) MEC are encountered but removed in accordance with this QAPP, THEN it may be concluded that MEC is not likely present on the ground surface or to the maximum reliable detection depth in the particular TCRA area and the TCRA objective in that area has been achieved with the limitations previously discussed. **4.** Intrusive Investigation of Anomalies Targets identified for intrusive investigation will be re-acquired using an RTK-GPS or conventional survey methods (total station) and flags will be placed at the location derived target locations. After re-acquisition of targets, each flagged location will be intrusively investigated and documented in accordance with the intrusive investigation SOPs (Attachment A). Items on the final dig lists will undergo intrusive investigation to the depth of recovery, the depth of refusal, or the maximum depth specified for that survey area, whichever comes first. Intrusive investigation will also be conducted for subsurface anomalies identified via any analog surveys where analog equipment is the planned survey equipment to support clearance (i.e., Surface Clearance Only Areas) and for both SRAs and areas inaccessible to digital geophysical equipment, as described in the section pertaining to the analog-based clearance. Parameters of Interest: Targets on the final dig list (if classification is not performed) or on the final ranked dig list (if classification is conducted). Assumptions: Target locations are flagged to the accuracy and precision required at all locations on the survey areas dig list. Decision Rules: a. IF all items on the final dig list are investigated and no MEC/MD are identified, THEN it may be concluded that MEC are not likely present in the subsurface to the reliable depth of detection of the geophysical instrument or instruments used. If technology and/or assumption limitations/uncertainty (including areas/depths where MEC may not be reliably detected) is such that there is the potential for MEC to remain at the particular TCRA area, this will be discussed in the DUA Report and UXO 13 TCRA Completion Report.

Worksheet #11: Data Quality Objectives (continued)

DQO Step	Description
	b. IF an item on the final dig list is identified as MEC/MD, THEN the item will be removed and dispositioned and it may be concluded that no additional MEC are likely present in the subsurface to the reliable depth of detection of the geophysical instrument or instruments used. If technology and/or assumption limitations/uncertainty (including areas/depths where MEC may not be reliably detected) is such that there is the potential for MEC to remain at the particular TCRA area, this will be discussed in the DUA Report and UXO 13 TCRA Completion Report.
Step 6 Specify Project-specific Measurement Performance Criteria	Worksheet #12 presents the project-specific MPC for the UXO 13 TCRA. Project-specific MPC are the criteria that collected data must meet to satisfy the DQOs. Failure to achieve the MPC may have an impact on end uses of the data, which will be discussed in the DUA, as discussed in Worksheet #37.
Step 7 Survey Design and Project Workflow	The MPC established during Step 6 of the DQO process (documented in Worksheet #12) were used to develop the TCRA approach, which is described in Worksheet #17. The TCRA approach is broken down into a series of specific processes and data collection steps, termed definable feature of work (DFW). Figure 17-1 provides the decision tree that will be used in the execution of the TCRA to evaluate the conformance of the specific DFWs to established MPCs. Figure 17-2 provides the decision tree that will be used in the selection of the removal methodology for each TCRA removal area.

Worksheet #11: Data Quality Objectives (continued)

Table 11-1. UXO 13 TCRA Summary Table

TCRA Area		Approximate Site Feature Area (Acres)[g]	Anticipated Geophysical Technology[a]	Maximum Removal Depth (inches bgs)
UXO 13 Adjacent Beach Areas (Figure 11-2)		39	AGC/DGM/Analog	48
Surface Clearance Only Areas (Figure 11-3)		255	Analog	Surface
Range Clearance - Range 3 (Figure 11-4)		19	AGC/DGM/Analog (as necessary)	12
Range Clearance - Range 4 (Figure 11-5)		50	DGM and Analog	12
Range Clearance - Range 4A (Figure 11-6)		31	DGM and Analog	12
Range Clearance - Range 4B - Including berm[e] and cliff face[f] (Figures 11-7 and 11-8)[a]		31	AGC/DGM/Analog/Remote Robotics	12
USFWS Planned Land Use Areas within UXO 13 (Figure 11-1)	Hiking Trails[b]	1	DGM/Analog (as necessary)	12
	Puerto Diablo Trail (Figure 11-9)	0.2	AGC/DGM/Analog	12
	Observation Tower (two locations)[c]	0.5	AGC/DGM/Analog (as necessary)	Removed if detected within the depth of observation tower footings (assumed to be approximately 48-inches)
	Parking Lots (five locations)[d]	2	AGC/DGM/Analog (as necessary)	24

[a] The rationale for the geophysical technology or technologies anticipated to be used for each TCRA area is presented in Worksheets #11 and #17.

[b] Roads and trails will include an approximate 3- to 5 -foot buffer on each side of the established road or trail; area calculated includes this buffer and may vary depending on site conditions. While no vegetation cutting will be conducted to address this area, if feasible, the selected geophysical survey will be completed in the buffer. If not feasible, an analog clearance will be conducted in the buffer.

[c] Each observation tower area shown is 0.25 acre (approximately one grid); actual area may vary depending on USFWS input and site conditions.

Worksheet #11: Data Quality Objectives (continued)

Table 11-1. UXO 13 TCRA Summary Table

TCRA Area	Approximate Site Feature Area (Acres)[g]	Anticipated Geophysical Technology[a]	Maximum Removal Depth (inches bgs)

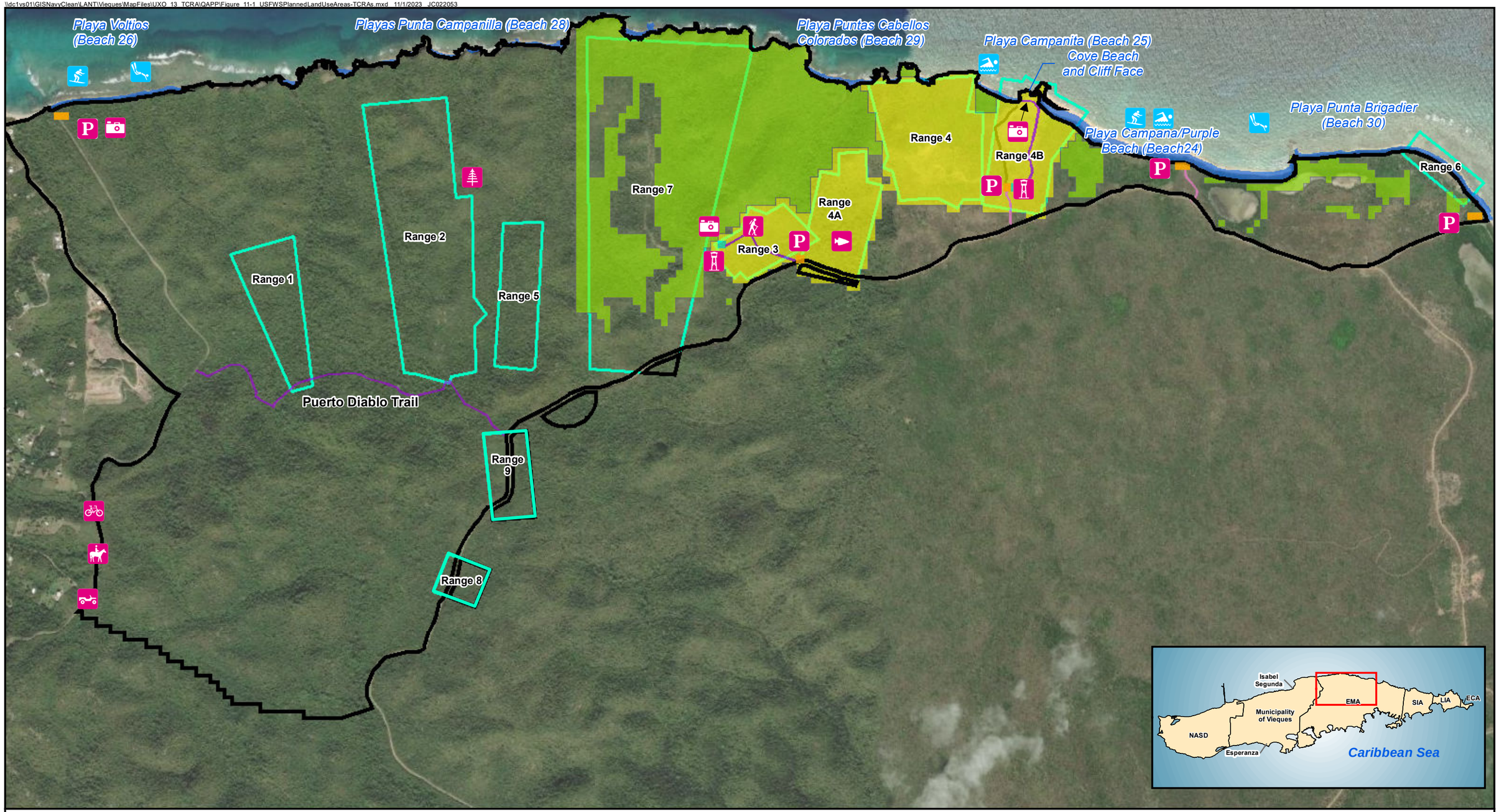
[d] Three parking areas shown as 0.50 acre (approximately two grids) and two parking areas shown as 0.25 acre (approximately one grid); actual area may vary depending on USFWS input and site conditions.

[e] MEC clearance will be applied to berm once dismantled (spread on ground surface).

[f] To the extent practical and safe, analog technology will be used to aid in MEC removal from the cliff face in Range 4B.

[g] The acreages shown in this table are based on the boundary polygons of the associated features; the acreages shown in Figures 11-1 through 11-10 are based on the areas for which the TCRA will be conducted, which may be larger based on grid-based clearance.

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_11-1_USFWSPlannedLandUseAreas-TCRAs.mxd 11/1/2023 JC022053



Legend

Proposed Land Use
- Biking Trail
- Cultural Interests
- Hiking Trail
- Horseback Riding
- Observation Tower
- Parking Area
- Reforestation Area
- Scenic View
- Vehicle Access

Proposed Aquatic Use
- Beach Use
- Snorkeling
- Surfing

- UXO 13 Boundary
- Range
- Berm Location

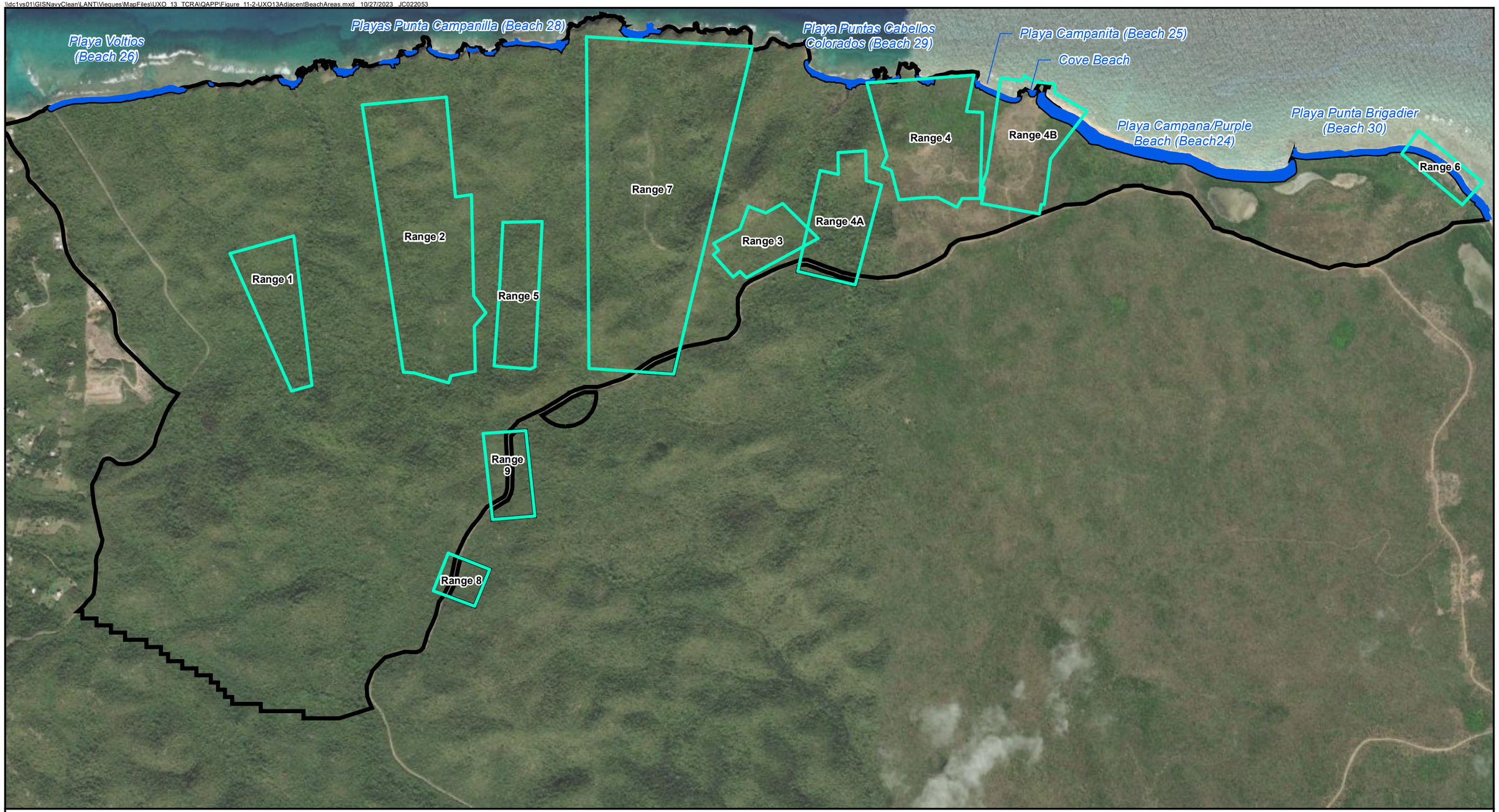
TCRA Areas (Approximate Acres) - Maximum Removal Depth:
- Range Surface and Subsurface Clearance (153) - 12"
- Surface Clearance Only Area (254)
- Trails (4) - 12"
- Multipurpose Road/Trail (0.5) - 24"
- Parking Area (2) - 24"
- Observation Tower (0.5) - 24"
- UXO 13 Adjacent Beach Areas (39) - 48"

N
W E
S

0 700 1,400
Feet

Figure 11-1
UXO 13 TCRA Areas
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_11-2-UXO13AdjacentBeachAreas.mxd 10/27/2023 JC022053

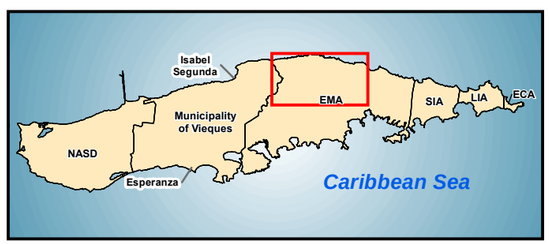


Legend

- UXO 13 Boundary
- Range

TCRA Area (Approximate Acres) - Maximum Removal Depth:

- UXO 13 Adjacent Beach Areas (39 acres) - 48"

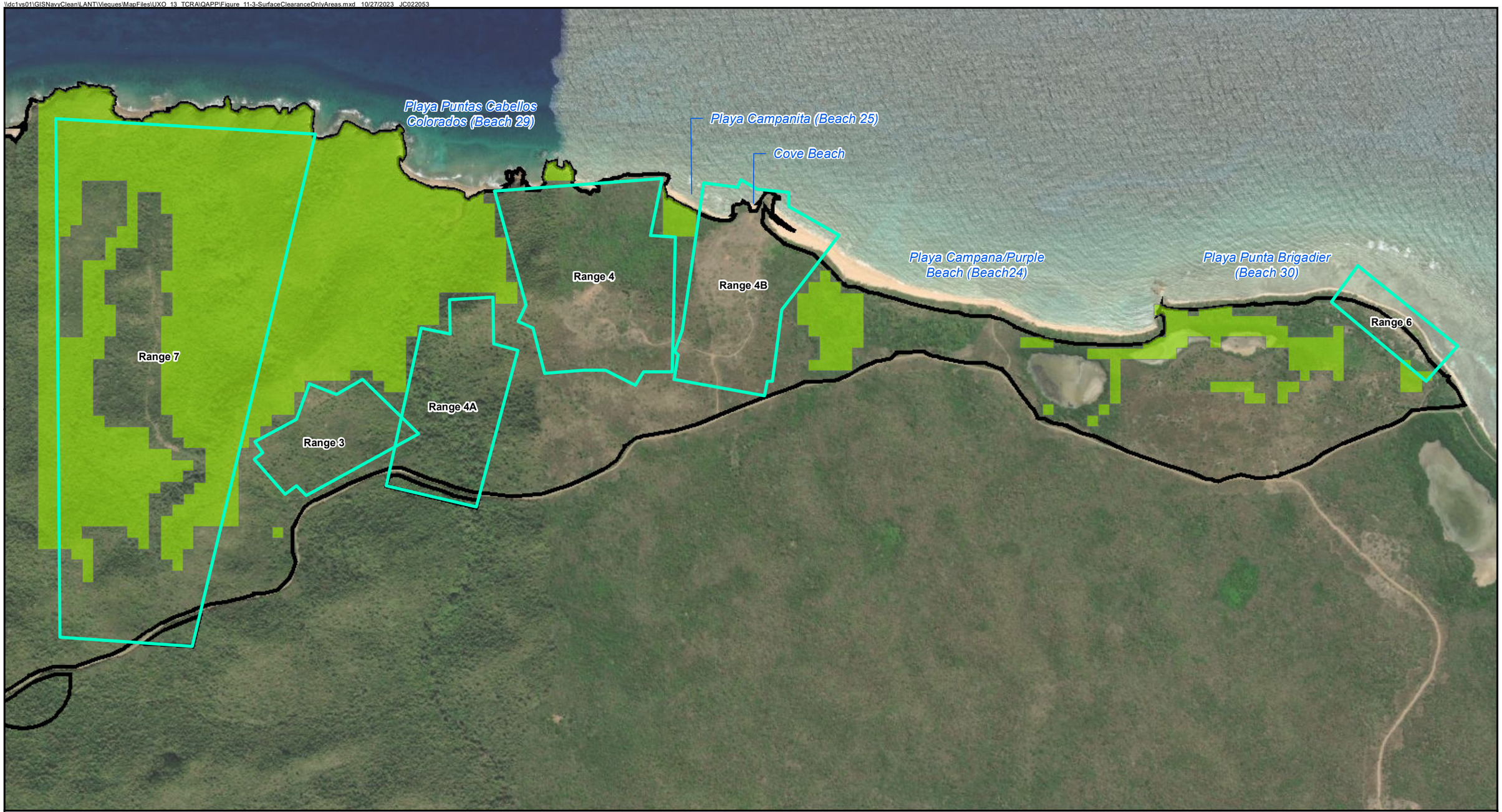


N
W E
S

0 700 1,400
Feet

Figure 11-2
UXO 13 Adjacent Beach Areas
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_11-3-SurfaceClearanceOnlyAreas.mxd 10/27/2023 JC022053

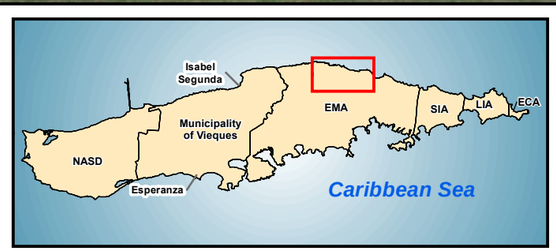


Legend

- UXO 13 Boundary
- Range

TCRA Area (Approximate Acres) - Maximum Removal Depth:

- Surface Clearance Only Area (254)



N
W E
S

0 400 800
Feet

Figure 11-3
Surface Clearance Only Area
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_11-4-Range3.mxd11/1/2023

Legend

Proposed Land Use

- Cultural Interests
- Hiking Trail
- Observation Tower
- Parking Area

- UXO 13 Boundary
- Range

TCRA Areas (Approximate Acres) - Maximum Removal Depth:

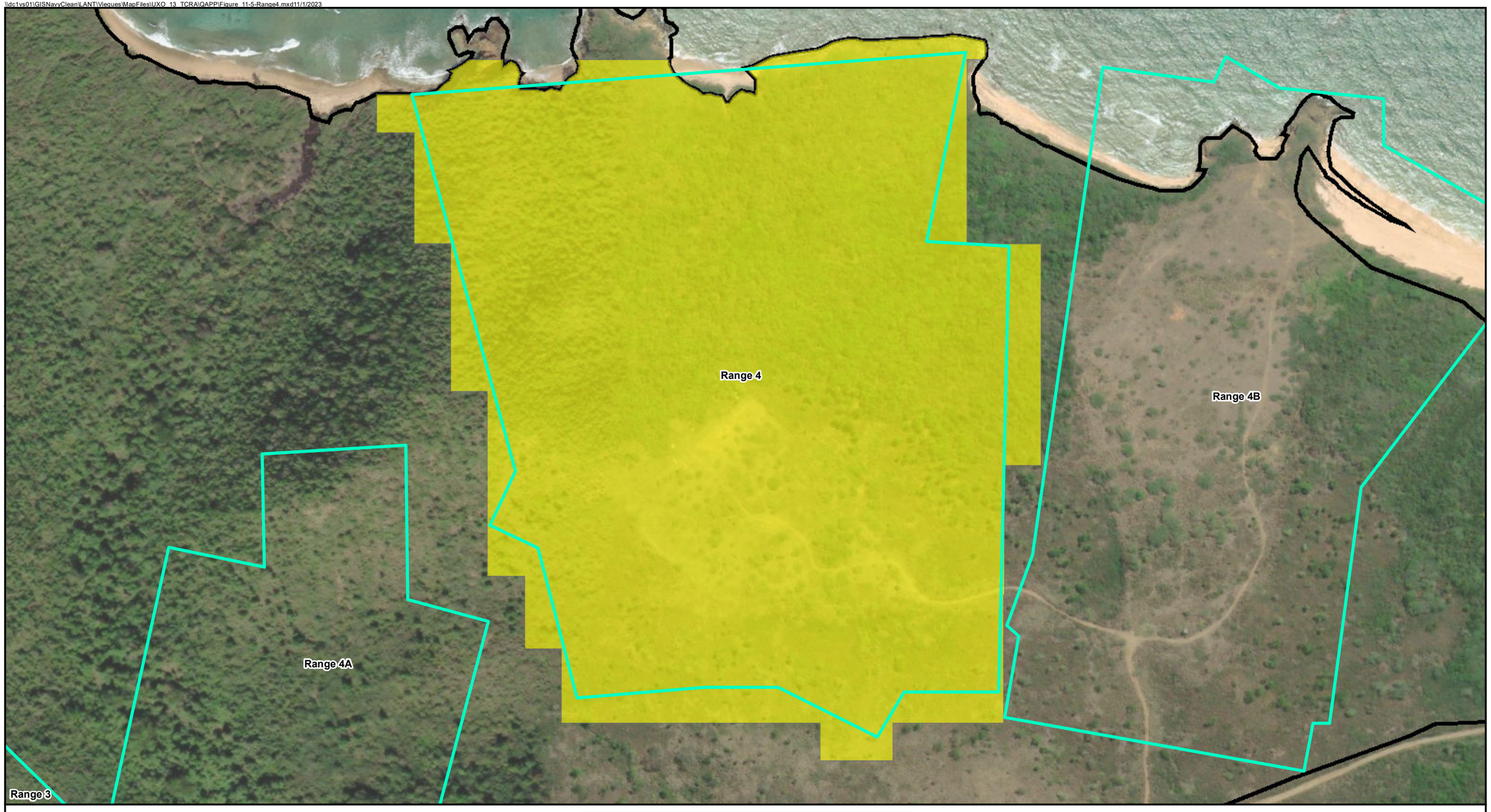
- Range Clearance (25) - 12"
- Observation Tower (0.25) - 48"
- Trails (0.5) - 12"
- Parking Area (0.25) - 24"

N
W E
S

0 75 150
Feet

Figure 11-4
Range 3 and Proposed Land Use
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_11-5-Range4.mxd11/1/2023

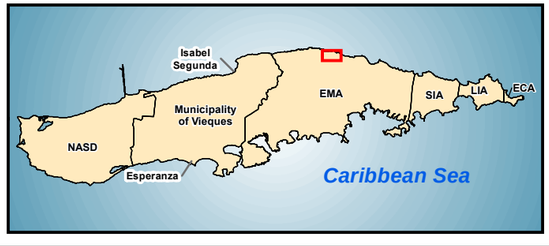


Legend

- UXO 13 Boundary
- Range

TCRA Area (Approximate Acres) - Maximum Removal Depth:

- Range Clearance (58) - 12"

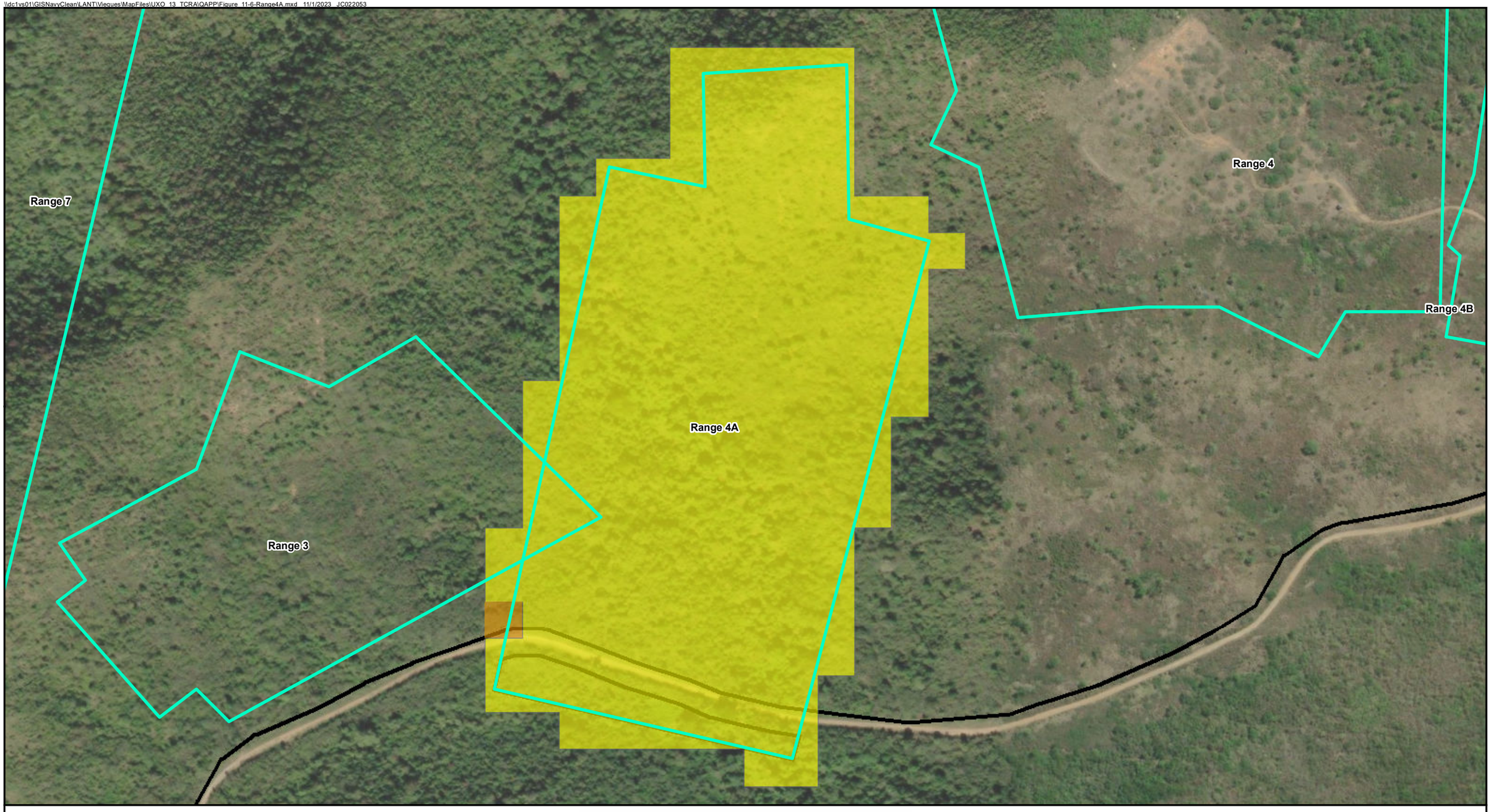


N
W E
S

0 125 250
Feet

Figure 11-5
Range 4
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_11-6-Range4A.mxd 11/1/2023 JC022053

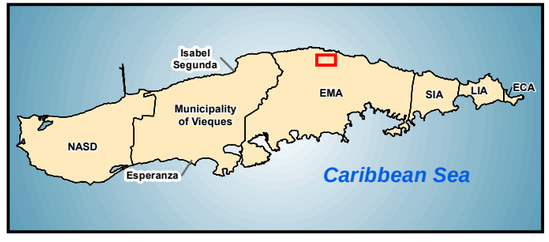


Legend

- UXO 13 Boundary
- Range

TCRA Area (Approximate Acres) - Maximum Removal Depth, inches:

- Range Clearance (38) - 12"
- Parking Area (0.25) - 24"

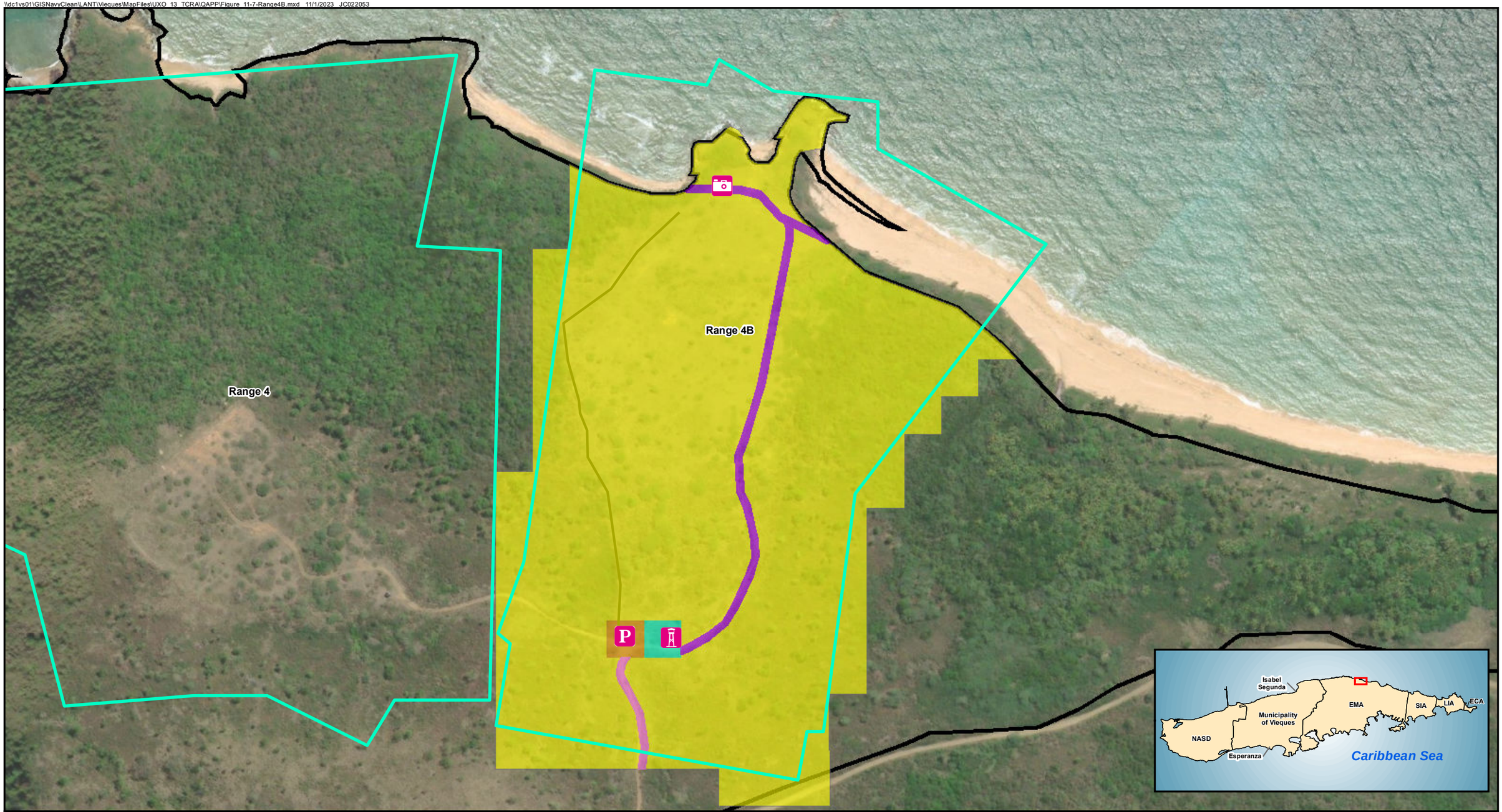


N
W E
S

0 125 250
Feet

Figure 11-6
Range 4A and Proposed Land Use
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_11-7-Range4B.mxd 11/1/2023 JC022053



Legend

Proposed Land Use
- Scenic View
- Parking Area
- Observation Tower

- UXO 13 Boundary
- Range

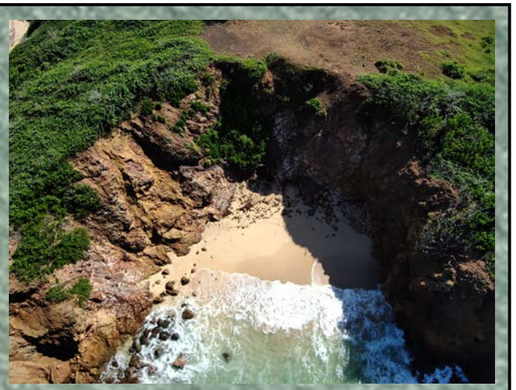
TCRA Area (Approximate Acres):
- Range Clearance (35) - 12"
- Trails (0.75) - 12"
- Multipurpose Road/Trail (0.1) - 24"
- Parking Area (0.25 acres) - Maximum Removal Depth - 24"
- Observation Tower (0.25 acres) - Maximum Removal Depth - 48"

N
W E
S

0 125 250
Feet

Figure 11-7
Range 4B, Berm, and Proposed Land Use
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_11-8-Range4B-BeachDetail.mxd 11/1/2023 JC022053



Playa Campanita (Beach 25)

Cove Beach

Range 4B

Range 4

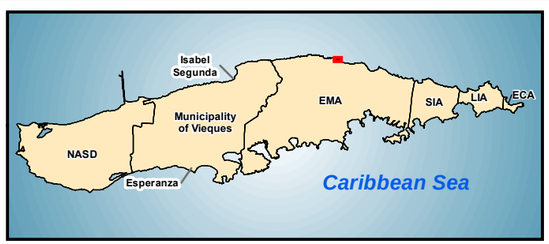
Playa Campana/Purple Beach (Beach24)

Legend

- Scenic View
- UXO 13 Boundary
- Range
- Trails

TCRA Area (Approximate Acres) - Maximum Removal Depth:

- Cove Beach and Cliff (0.1) - 48" for Cove Beach and Surface Only for Cliff



N
W E
S

0 125 250
Feet

Figure 11-8
Cove Beach and Cliff Adjacent to Historic Target
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_11-9-TrespasserRoad.mxd 11/1/2023 JC022053

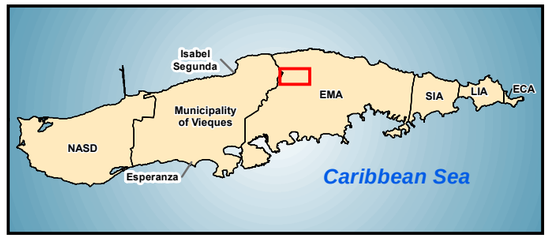
Legend

UXO 13 Boundary

Range

Puerto Diablo Trail TCRA Area (Estimated Acres) - Maximum Removal Depth:

Trail (2.5) - 12"



N
W E
S

0 200 400

Feet

Figure 11-9
Puerto Diablo Trail
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

\\dc1vs01\GISNavyClean\LANT\Vieques\MapFiles\UXO_13_TCRA\QAPP\Figure_11-10-USFWSPlannedLandUseAreas.mxd 11/1/2023 JC022053

Playa Voltios (Beach 26)

Playas Punta Campanilla (Beach 28)

Playa Puntas Cabellos Colorados (Beach 29)

Playa Campanita (Beach 25)

Cove Beach

Playa Campana/Purple Beach (Beach24)

Playa Punta Brigadier (Beach 30)

Range 1

Range 2

Range 3

Range 4

Range 4A

Range 4B

Range 5

Range 6

Range 7

Range 8

Range 9

Puerto Diablo Trail

Legend

Proposed Land Use
- Biking Trail
- Cultural Interests
- Hiking Trail
- Horseback Riding
- Observation Tower
- Parking Area
- Reforestation Area
- Scenic View
- Vehicle Access

Proposed Aquatic Use
- Beach Use
- Snorkeling
- Surfing

- UXO 13 Boundary
- Range

TCRA Areas (Approximate Acres) - Maximum Removal Depth:
- Range Clearance (153) - 12"
- Surface Clearance Only Area (254)
- Trails (4) - 12"
- Multipurpose Road/Trail (0.5) - 24"
- Parking Area (2) - 24"
- Observation Tower (0.5) - 24"
- UXO 13 Adjacent Beach Areas (39) - 48"

N
W E
S

0 700 1,400
Feet

Figure 11-10
USFWS Planned Land Use Areas
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

Worksheet #12: Measurement Performance Criteria

This worksheet documents the project-specific MPC in terms of data quality indicators (that is, accuracy, sensitivity, representativeness, completeness, and comparability) for the UXO 13 TCRA. Accuracy, sensitivity, and completeness can be measured quantitatively. Representativeness and comparability can be evaluated only qualitatively. These MPC establish the minimum performance specifications that the TCRA must meet to ensure collected data will satisfy the DQOs documented in Steps 1-5 on Worksheet #11. They are the criteria against which the DUA will be conducted as documented on Worksheet #37. The DUA must evaluate and document the data quality and decision-making impacts of any failures to meet these criteria (Worksheet #37). The MPCs for the surface sweep and subsurface removal utilizing digital geophysical technologies are established in Table 12-1. The MPCs for the analog-based surface and subsurface removal are established in Table 12-2. These MPCs were developed from the guidance provided in Uniform Federal Policy for Quality Assurance Project Plan Munitions Response QAPP Toolkit Module 2: Remedial Action (IDQTF, 2023) and tailored to be specific to the TCRA being performed at UXO 13.

Table 12-1. MPC – Surface Sweep and Subsurface Removal Using AGC or DGM for UXO 13 TCRA

Measurement Performance Activity	Data Quality Indicator	Specification	Activity Used to Assess Performance
Site Preparation			
1. Accessibility	Completeness	All areas inaccessible to use of digital geophysical systems within the established TCRA boundaries, or other site features that may impact removal activities, are mapped in GIS.	Visually inspect the TCRA areas and review the GIS
2. Site Survey	Completeness/ Accuracy/Precision	Existing benchmarks and control points will be verified that they are within or near the work area for navigation of the geophysical survey equipment. Additional control points will be established, as necessary. Survey boundaries (e.g., grid corners) tied to the Universal Transverse Mercator (UTM) Zone 20 north, projection North American Datum of 1983 (NAD83) horizontal datum project coordinate system, units in meters. Survey areas staked so that the area is clearly defined.	1) Survey Report 2) Munitions Removal and Geophysical Contractor UXOQCS and Project Geophysicist verify site survey/control are completed/ repeated within tolerances 3) QA Contractor GIS Lead completes GIS maps indicating areas of AGC

Worksheet #12: Measurement Performance Criteria (continued)

Table 12-1. MPC – Surface Sweep and Subsurface Removal Using AGC or DGM for UXO 13 TCRA

Measurement Performance Activity	Data Quality Indicator	Specification	Activity Used to Assess Performance
3. Surface Sweep Coverage	Representativeness/ Completeness	Surface sweep completed across the entire TCRA area.	1) Munitions Removal and Geophysical Contractor UXOQCS confirms completion of surface sweep and documents results. 2) CSM updated if unexpected TOI recovered.
Instrument Verification Strip			
4. IVS Construction	Accuracy/ Completeness	Seeds placed so that each sensor passes at least two seed items during IVS surveys. Seed type, depth, and location accuracy recorded during placement.	IVS Technical Memorandum
5. IVS Testing	Sensitivity/ Completeness	Sensors assembled correctly and functioning as designed. Detection threshold confirmed or the effects of site-specific conditions on detection capabilities are documented.	IVS Technical Memorandum
Quality Control and Validation Seeding			
6. QC Seeding	a) Representativeness b) Completeness c) Sensitivity d) Accuracy e) Comparability	e) QC seeding personnel will place QC seeds for the geophysical survey at each survey area. b, c) QC seeds must be detectable and located throughout the horizontal and vertical survey boundaries as defined in the DQOs. b, d) The QC Seeding Plan will be under separate cover for firewall purposes and will describe the details of the QC seeding program, including number and types of QC seeds. Information regarding the location of QC seeds will be firewalled from production personnel. e) QC seeds will be distributed so that each field team can be expected to encounter, on average, at least one QC seed per day.	1) Munitions Removal and Geophysical Contractor QC Geophysicist to review seed emplacement data and ensure seeds are placed in accordance with the QC Seeding Plan. 2) QC Seeding Report

Worksheet #12: Measurement Performance Criteria (continued)

Table 12-1. MPC – Surface Sweep and Subsurface Removal Using AGC or DGM for UXO 13 TCRA

Measurement Performance Activity	Data Quality Indicator	Specification	Activity Used to Assess Performance
7. Validation Seeding	a) Representativeness b) Completeness c) Sensitivity d) Accuracy e) Comparability	e) Validation seeds will be placed throughout each geophysical survey area. b, c) Validation seeds must be detectable as defined in the DQOs and located at depths that do not challenge the detection capabilities of the sensor. b, d) The Validation Seed Plan will be under separate cover for firewall purposes and will describe the details of the validation seeding program, including number and types of validation seeds. Information regarding the location of validation seeds will be firewalled. e) Validation seeds will be distributed so that each field team can be expected to encounter, on average, at least one validation seed per day.	1) QA Contractor QA Geophysicist to review seed emplacement data and ensure seeds area placed in accordance with the Validation Seed Plan 2) Validation Seeding Report
Data Acquisition Detection Survey			
8. Detection Threshold (all digital sensors)	Sensitivity	Digital sensors (AGC and DGM): the final target selection threshold for each sensor used during the TCRA will be established as at least five times RMS noise.	1) Review of sampling design 2) Initial and ongoing IVS surveys 3) Blind QC and validation seed detection 4) RMS background statistics showing average background of area is less than or equal to 20 percent of the threshold
9. Detection Survey (all digital sensors)	Accuracy/ Completeness	100 percent of QC seeds must be detected.	1) QC Seed Database or Spreadsheet 2) RCA/CA (if applicable) review and acceptance

Worksheet #12: Measurement Performance Criteria (continued)

Table 12-1. MPC – Surface Sweep and Subsurface Removal Using AGC or DGM for UXO 13 TCRA

Measurement Performance Activity	Data Quality Indicator	Specification	Activity Used to Assess Performance
10. Detection Survey (all digital sensors)	Accuracy/ Completeness	100 percent of validation seeds must be detected.	1) Validation Seed Database or Spreadsheet 2) RCA/CA (if applicable) review and acceptance
11. Detection Survey Coverage (all digital sensors)	Representativeness/ Completeness	100 percent of each survey area is sampled at required lane spacing and point-to-point sampling specifications.	1) Coverage maps 2) Detection Survey Database
12. ISS Thresholds	Sensitivity	ISS size and decay parameters will be established based on the smallest TOI identified in Step 4 of Worksheet #11 under "Vertical Boundaries" with a 20 percent buffer applied.	1) Review of sampling design 2) Initial and ongoing IVS surveys 3) QC and validation seed detection
13. Anomaly Selection (all digital sensors)	Completeness	Complete project-specific databases and anomaly lists delivered.	Detection Survey and Target Databases
14. Background (applicable only to follow-on cued survey)	Representativeness/ Sensitivity	Background areas where detection threshold does not exceed five times the RMS background identified.	1) GIS Database 2) Detection Survey Database
15. AGC Cued Survey Background Locations (applicable only to follow-on cued survey)	Representativeness/ Comparability	Representative areas determined to be background are selected and bounded in the detection survey.	1) GIS Database 2) Cued Background Database

Worksheet #12: Measurement Performance Criteria (continued)

Table 12-1. MPC – Surface Sweep and Subsurface Removal Using AGC or DGM for UXO 13 TCRA

Measurement Performance Activity	Data Quality Indicator	Specification	Activity Used to Assess Performance
16. Variability for Cued Background Locations (applicable only to follow-on cued survey)	Representativeness/ Sensitivity	Representative backgrounds are selected in all noise regimes. Background areas where detection threshold is less than five times background are identified. Background measurements used to level cued measurements must be in the same noise regime as the cued measurements.	1) GIS Database 2) Cued Background Database
17. SRAs (all digital sensors)	Completeness	No SRAs in final detection survey data (unless related to a known, non-removal cultural feature). All SRAs digitally remapped.	1) Detection Survey Database 2) GIS Database
Data Acquisition – Classification (Cued Survey and One-Pass)			
18. Background Data Collection (cued survey)	Representativeness/ Accuracy	Each cued analysis is performed with a representative background and verified during quality control.	1) Background Validation Database 2) Cued Survey Database 3) QC verification
19. Background Frequency (cued survey)	Completeness	Background data are collected at a minimum of the interval specified by the manufacturer.	Background Validation Database
20. Anomaly Classification (cued and one-pass)	Completeness/ Comparability	Site-specific library must include representative signatures for all items considered by the project team to be TOI as listed in the CSM.	Site-specific TOI Library
21. Anomaly Classification (cued and one-pass)	Completeness	Classification of all anomalies meeting the target selection criteria as: • TOI • Non-TOI • Inconclusive	1) Source Database 2) Final Intrusive Database

Worksheet #12: Measurement Performance Criteria (continued)

Table 12-1. MPC – Surface Sweep and Subsurface Removal Using AGC or DGM for UXO 13 TCRA

Measurement Performance Activity	Data Quality Indicator	Specification	Activity Used to Assess Performance
22. Anomaly Classification – QC Seeds (cued and one-pass)	Accuracy/ Completeness	100 percent of QC seeds are correctly classified as TOI for excavation. QC seeds classified as inconclusive are discussed in DUA.	1) QC Seed Database 2) RCA/CA (if applicable) review and acceptance
23. Anomaly Classification - Validation Seeds (cued and one-pass)	Accuracy/ Completeness	100 percent of validation seeds are correctly classified as TOI for excavation.	1) Validation Seed Database 2) RCA/CA (if applicable) review and acceptance
Anomaly Resolution and Excavation			
24. Anomaly Resolution – QC Seeds	Accuracy/ Completeness	100 percent of QC seeds are recovered.	1) Intrusive Results Database 2) RCA/CA (if applicable) review and acceptance
25. Anomaly Resolution – Validation Seeds	Accuracy/ Completeness	100 percent of validation seeds are recovered.	1) Intrusive Results Database 2) RCA/CA (if applicable) review and acceptance
26. Anomaly Resolution	Accuracy/ Completeness	100 percent of predicted non-TOI that are intrusively investigated are confirmed to be non-TOI. This includes final threshold verification digs and validation digs.	1) Intrusive Results Database 2) RCA/CA (if applicable) review and acceptance
27. Intrusive Investigation	Accuracy	Inversion results correctly predict one or more physical properties (e.g., size, symmetry, or wall thickness) of all recovered items.	Intrusive Results Database

Worksheet #12: Measurement Performance Criteria (continued)

Table 12-1. MPC – Surface Sweep and Subsurface Removal Using AGC or DGM for UXO 13 TCRA

Measurement Performance Activity	Data Quality Indicator	Specification	Activity Used to Assess Performance
28. Intrusive Investigation	Completeness/ Comparability	A complete project-specific database including records reconciling inversion results to the physical properties of the recovered items. 100 percent of anomalies on the dig list are intrusively investigated.	Intrusive Results Database

Worksheet #12: Measurement Performance Criteria (continued)

Table 12-2. MPC – Analog-Based Surface and Subsurface Removal for UXO 13 TCRA

Measurement Performance Activity	Data Quality Indicator	Specification	Activity Used to Assess Performance
1. Accessibility	Completeness	All areas inaccessible to analog equipment are identified and mapped in GIS.	Visual Inspection QA Report and/or GIS Database
2. Completeness	Representativeness/ Completeness (recoverability)	All recoveries (MEC and MD) were reviewed and CSM confirmed or updated.	Updated CSM
3. Survey Control	Completeness	All survey control points placed and survey control report submitted (as applicable).	Surveyor and/or QC Report
Instrument Test Strip, QC Seeding, and QA Seeding			
4. Instrument Test Strip (ITS) Construction	Accuracy/ Completeness	Seeds placed so that each sensor passes at least one seed item during ITS. Seed type, depth, and location accuracy recorded during placement.	Daily Report
5. ITS Testing	Sensitivity/ Completeness	Analog equipment assembled correctly and functioning as designed. Detection threshold confirmed and tested daily with ITS seeds at depth of detection.	Daily Report
6. QC Seeding	a) Representativeness b) Completeness c) Sensitivity d) Accuracy	a) QC seeding personnel will place QC seeds at each analog area. b, c) QC seeds must be detectable and located throughout the horizontal and vertical boundaries defined in the DQOs. b, d) The QC Seeding Report will be under separate cover for firewall purposes and will describe the details of the QC seeding program, including the number and types of QC seeds. Information regarding the location of the QC seeds will be firewalled from production personnel. QC seeds will be distributed so that each field team can be expected to encounter, on average, at least 10 QC seeds per day.	1) Munitions Removal and Geophysical Contractor UXOQCS to ensure seeds are placed in accordance with the QC Seeding Plan 2) QC Seeding Plan

Worksheet #12: Measurement Performance Criteria (continued)

Table 12-2. MPC – Analog-Based Surface and Subsurface Removal for UXO 13 TCRA

Measurement Performance Activity	Data Quality Indicator	Specification	Activity Used to Assess Performance
7. Validation Seeding	a) Representativeness b) Completeness c) Sensitivity d) Accuracy	a) Validation seeds will be placed at each analog area. b, c) Validation seeds must be detectable and located throughout the horizontal and vertical boundaries defined in the DQOs. b, d) The Validation Seed Plan will be under separate cover for firewall purposes and will describe the details of the validation seeding program, including number and types of validation seeds. Information regarding the location of validation seeds will be firewalled.	1) QA Contractor UXOQCS to ensure seeds are placed in accordance with the Validation Seed Plan 2) Validation Seeding Report
Conduct Analog Surface and Subsurface Removal			
8. Planned Survey Coverage	Completeness	Survey lanes are planned at a spacing of 3-foot, with a maximum allowable separation of 5-foot, and cover the entire survey area.	GPS or photographic documentation
9. Detection Threshold (all analog sensors)	Sensitivity	Detection of a small industry standard object (ISO) at the surface (and when applicable at 12 inches bgs) must be demonstrated in the ITS.	1) Initial and ongoing ITS surveys 2) Blind QC and validation seed detection 3) Periodic verification by Munitions Removal and Geophysical Contractor UXOQCS (or designee)
10. Detection Survey	Accuracy/ Completeness	100 percent of QC seeds must be detected (see Worksheet #22).	1) QC Seed Database or Spreadsheet 2) RCA/CA (if applicable) review and acceptance
11. Detection Survey	Accuracy/ Completeness	100 percent of validation seeds must be detected (see Worksheet #22).	1) Validation Seed Database or Spreadsheet 2) RCA/CA (if applicable) review and acceptance
12. Detection Survey Coverage	Representativeness/ Completeness	100 percent of each survey area at required lane spacing.	1) Seed recovery 2) Operator GPS records

Worksheet #12: Measurement Performance Criteria (continued)

Table 12-2. MPC – Analog-Based Surface and Subsurface Removal for UXO 13 TCRA

Measurement Performance Activity	Data Quality Indicator	Specification	Activity Used to Assess Performance
Anomaly Resolution and Excavation			
13. Anomaly Resolution (QC Seeds)	Accuracy/ Completeness	100 percent of QC seeds recovered.	QC Seed Database
14. Anomaly Resolution (QA Seeds)	Accuracy/ Completeness	100 percent of validation seeds recovered.	Validation Seed Database
15. Intrusive Investigation	Accuracy	QC re-check of 10 percent of the excavated locations result in zero additional intrusive investigations.	QC Report
16. Intrusive Investigation	Completeness	Complete project-specific database with all intrusive records.	Project Database

Worksheet #13: 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
Topographic Data	United States Geological Survey (USGS)	Pre-planning for removal method selection and approach	None identified.
Aerial Photography	United States Navy Archives	Pre-planning for geophysical method selection and removal area delineation	Changes in land condition (e.g., shape and size of sandy beach areas due to storm events or erosion/deposition, increases/decreases in vegetation) between the time the aerial photograph was taken and when the TCRA begins. Actual boundaries will be determined during TCRA mobilization.
Geophysical Data and Munition Types	Expanded Range Assessment/Site Inspection Report (CH2M, 2010) Preliminary Range Assessment Report (NAVFAC, 2003b) Non-Time-Critical Removal Action Work Plan Munitions Response Site UXO-13, (CH2M, 2012) UXO 13 Non-Time-Critical Removal Action After Action Report (CH2M, 2019) UXO 13 Remedial investigation/ Feasibility Study Report (CH2M, 2020b)	Provides previous geophysical anomaly data Provide previous MEC and other MPPEH encountered	There are no known reliability issues or limitations on the use of the data as presented in the historical data; however, historic data will be evaluated to determine any data limitations associated with their planned use prior to that use.

This page intentionally left blank.

Worksheet #14 & 16: Project Tasks & Schedule

DFW	Activity	Responsible Party	Planned Start Date	Planned Completion Date[a]	Deliverable(s)[b]	Deliverable Due Date
1	Pre-mobilization Activities	QA Contractor/ Munitions Removal and Geophysical Contractor	Estimated Fall 2023	TBD	1) ESS 2) QAPP (interagency decision point) – includes USAE SOPs, CH2M SOPs, Draft Verification and Validation Plan 3) Notification to interagency team denoting anticipated start date 4) QC Seeding Firewall Plan 5) QC Seed Plan 6) Validation Seeding Firewall Plan 7) Validation Seed Plan	Documents accepted/approved prior to field mobilization
2	Mobilization	QA Contractor/ Munitions Removal and Geophysical Contractor	Estimated Winter 2024	TBD	Daily Report	Daily
3	Site Preparation	QA Contractor/ Munitions Removal and Geophysical Contractor	Estimated Winter 2024	TBD	1) Daily Report 2) USFWS approved land use area boundaries	1) Daily 2) Prior to starting DFW 5
4	ITS Construction	Munitions Removal and Geophysical Contractor	Estimated Winter 2024	TBD	Daily Report	24 hours following completion
5	QC Seeding	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report 2) QC Seeding Report	1) Daily 2) 15 days following completion

Worksheet #14 & 16: Project Tasks & Schedule (continued)

DFW	Activity	Responsible Party	Planned Start Date	Planned Completion Date[a]	Deliverable(s)[b]	Deliverable Due Date
6	Validation Seeding	QA Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) Validation Seeding Report	1) Daily 2) Within 15 days following completion
7	IVS Construction	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) (including as-built records) 2) IVS Technical Memorandum	1) Daily/upon completion of IVS construction 2) Within 14 days following construction
8	Assemble and Test EMI Sensors	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) Completed Sensor Assembly Checklist(s) 3) IVS Technical Memorandum (Detection and/or Cued as applicable)	1) Daily 2) Within 24 hours following assembly 3) Within 14 days following testing
9	Surface Sweep	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) MRP Database Entries (for all MEC items) 3) QC Report(s) 4) Disposal Records (as applicable)	1) Daily 2) Within 15 days following completion 3) Daily 4) Within 30 days following disposal

Worksheet #14 & 16: Project Tasks & Schedule (continued)

DFW	Activity	Responsible Party	Planned Start Date	Planned Completion Date[a]	Deliverable(s)[b]	Deliverable Due Date
10	Analog-based Clearance (Surface and Subsurface)	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) MRP Database Entries (for all MEC items) 3) QC Report(s) 4) Surface and Subsurface Technical Memorandum 5) Disposal Records (as applicable)	1) Daily 2) Within 15 days following completion 3) Daily 4) Within 30 days following completion of surface and subsurface clearance activities 5) Within 30 days following disposal
11	Detection Survey	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) MRP Database Entries (for all MEC items) 3) QC Report(s)	1) Daily 2) Within 15 days following completion 3) Daily
12	Detection Data Processing and Data Usability Assessment	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) Target Selection Technical Memorandum (as applicable, if one-pass used may be included in Classification Report) 3) MRP Database Entries (for all MEC items) 4) QC Report(s) 5) Detection DUA Report	1) Daily 2) Within 30 days of completion of data unit 3) Within 15 days following completion 4) Daily 5) Within 20 days following completion

Worksheet #14 & 16: Project Tasks & Schedule (continued)

DFW	Activity	Responsible Party	Planned Start Date	Planned Completion Date[a]	Deliverable(s)[b]	Deliverable Due Date
13	Collect Classification Data (for one-pass surveys data collected as part of detection survey)	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) MRP Database Entries 3) QC Reports(s)	1) Daily 2) Within 15 days following completion 3) Daily
14	Data Processing, Classification, Ranked Anomaly List, and Classification DUA (as applicable for technology used)	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) Classification Report 3) MRP Database Entries (for all MEC items) 4) QC Report(s) 5) Dig list	1) Daily 2) Within 20 days of completion of classification 3) Within 15 days following completion 4) Daily 5) Within 14 days of completion of survey area
15	Excavate Buried Objects (intrusive investigation)	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) MRP Database Entries (for all MEC items) 3) QC Report(s) 4) Disposal Records (as applicable)	1) Daily 2) Within 15 days following completion 3) Daily 4) Within 30 days following disposal
16	Verify Dig/No-Dig Threshold and Update Verification/ Validation Plan	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) Final Verification/Validation Plan	1) Daily 2) Within 20 days following completion of verification and validation digs

Worksheet #14 & 16: Project Tasks & Schedule (continued)

DFW	Activity	Responsible Party	Planned Start Date	Planned Completion Date[a]	Deliverable(s)[b]	Deliverable Due Date
17	Excavate and Evaluate Classification Validation Targets	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) Final Verification/Validation Plan	1) Daily 2) Within 20 days following completion of verification and validation digs
18	Conduct MEC/MPPEH Handling and Disposal	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) Disposal Records (as applicable)	1) Daily 2) Within 30 days following disposal
19	Removal at Berm(s), Cliff Face(s), and Beach Cove	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	1) Daily Report(s) 2) MRP Database Entries (for all MEC items) 3) Disposal Records (as applicable)	1) Daily 2) Within 15 days following completion 3) Within 30 days following disposal
20	Conduct Final DUA	Munitions Removal and Geophysical Contractor, QA Contractor, NAVFAC	Estimated 2024	TBD	Final DUA Report	Within 30 days of completing all TCRA activities
21	Demobilization	Munitions Removal and Geophysical Contractor	Estimated 2024	TBD	Daily Report(s)	Daily
22	UXO 13 TCRA Completion Report[b] Preparation	QA Contractor	Estimated 2024	TBD	UXO 13 TCRA Completion Report (interagency decision point)	Draft UXO 13 TCRA Completion Report delivered to Navy within 90 days of project completion

Worksheet #14 & 16: Project Tasks & Schedule (continued)

DFW	Activity	Responsible Party	Planned Start Date	Planned Completion Date[a]	Deliverable(s)[b]	Deliverable Due Date

[a] All TBD dates will be communicated once the actual dates are determined.

[b] The QAPP and the UXO 13 TCRA Completion Report will be provided for regulatory review and represent decision points for the TCRA (i.e., mobilization and completion). All other various deliverables, such as technical memoranda, data usability assessment reports, data packages, etc., generated during the TCRA are interim and will not be provided separately for formal review and comment, but instead the information from them will be included in the UXO 13 TCRA Completion Report, as appropriate. The implementation of continual quality control and quality assurance protocol defined in the QAPP, including the interim documents, is sufficient to ensure the TCRA is implemented in a manner that achieves its objectives. Nonetheless, the Navy can provide various interim documentation to regulatory agencies for informational purposes during TCRA implementation and any feedback provided will be considered and incorporated to the extent practicable.

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal)

This worksheet provides descriptions for each DFW associated with the UXO 13 TCRA. It highlights the MEC removal activities (including the geophysical components), QC/QA components, decision points, and key deliverables, as identified in Worksheet #14 & 16. Figure 17-1 provides the decision tree associated with these tasks. Figure 17-2 provides the decision tree associated with the selection of the removal method.

DFW 1: Pre-mobilization Activities

Pre-mobilization activities include preparation of various plans (including this QAPP) and establishing data collection protocol in advance of mobilization.

Planning Documents

In addition to and/or as part of this QAPP, the following relevant planning documents for implementation of the TCRA will be completed prior to mobilization:

- ESS – An ESS will be prepared under separate cover.
- QC and QA Documents (geophysical components) – As part of this QAPP, the following QC and QA documents will be prepared under separate cover:
  - QC Seeding Firewall Plan
  - QC Seed Plan
  - Validation Seeding Firewall Plan
  - Validation Seed Plan

Note: The QC Seed Plan and Validation Seed Plan will contain the seeding details for all types of removal methodologies anticipated to be utilized (i.e., AGC, DGM, analog).

Standard Operating Procedures

Geophysical work will be performed under the Munitions Removal and Geophysical Contractor's accreditation, and hence their quality system. QA activities will be performed per the QA contractors SOPs. In the event there is a conflict between a particular element(s) of contractor-specific SOPs and this QAPP, the applicable element(s) of this QAPP take precedence.

- Attachment A includes the Munitions Removal and Geophysical Contractor SOPs.
- Attachment B includes the QA Contractor SOPs. Note: CH2M is a wholly-owned subsidiary of Jacobs. As such, SOPs displaying the "Jacobs" designation are equally applicable to CH2M.

Geographic Information System

A sitewide GIS database has been previously established for the former VNTR, and relevant geospatial-related data will be managed in the GIS database. The database can use and export Environmental Systems Research Institute, Inc. compliant formats (shape files, coverages, or geodatabases) to present GIS data during the project, with supporting tabular data provided in Microsoft Excel and/or Microsoft Access. In addition, each GIS dataset is accompanied by metadata conforming to the Federal Geographic Data Committee's (FGDC's) Content Standard for Digital Geospatial Metadata and will be provided in a geodatabase compliant with the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) (Version 4.0).

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

Surveying and Mapping Standards

The FGDC's Geospatial Positioning Accuracy Standards, Part 4: Standards for Architecture, Engineering, and Construction and Facility Management, and the FGDC's Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy will be used for any point positioning such as GPS. Unless otherwise noted, horizontal control work for land surveyor work will meet or exceed the Third Order, Class I specification or better, as outlined in the FGDC Geospatial Positioning Accuracy Standards, Part 4: Standards for Architecture, Engineering, and Construction and Facility Management. If RTK-GPS (e.g., Trimble R12) is used, horizontal measurements will be repeatable to ±5-cm accuracy for control work. If needed, a registered Professional Land Surveyor will document compliance with accuracy specifications. Survey data will be correlated with navigational data based upon a local "third-order" (1:5,000) monument or survey marker. Survey data will be provided in UTM, Zone 20 North, and units of meters.

Unless otherwise noted, all horizontal control work for land surveyor work will be tied to the historic control at Observation Post 1, which is referenced to the 1997 NAD83 horizontal datum and North American Vertical Datum (NAVD) 1929.

A land surveyor will be utilized only if required survey data are not possible to obtain via GPS within the accuracy specifications provided in this QAPP. Because this circumstance will not be known until the survey work is being performed, survey-specific information will not be available, and potentially not applicable, to include in this QAPP. Should a surveyor be utilized, details regarding the surveyor and associated survey, including compliance with the accuracy standards in this QAPP, will be provided in the UXO 13 TCRA Completion Report.

Control Points

The location, identification, coordinates, and elevations of control points that are recovered and/or established at the site will be plotted on one or more site maps. Each control point will be identified on the map by its name and number and the final adjusted coordinates. Control points include reference benchmarks as well as QC check points to verify and back-check GPS accuracy.

Digital Data

Geospatial data will conform to SDSFIE and will be provided in metric units. Location information will be collected for survey work, including the geophysical surveys, so the position of each anomaly can be managed and presented within the GIS environment.

Data Management Systems

Survey123 (Geophysical Data Management Collector): Survey123 is a field data gathering solution that is part of the ArcGIS platform. Survey123 will be utilized for geophysical data management. Within Survey123, forms (or surveys) are completed by the field team using an application on a tablet or computer in pre-authored forms that utilize various drop-down menus. Once completed, forms are submitted directly to ArcGIS online, where they can be viewed and analyzed. The uploaded information will be verified by QA personnel.

It is assumed that each removal area or closely spaced removal areas will be defined as its own gridblock where a gridblock is defined as a survey unit that will be managed as a single entity for data management and tracking purposes. Gridblocks representing a defined survey unit will be assigned a series of forms representing each phase of work in Survey123. The gridblocks will define the geophysical collection boundaries. The use of these gridblocks will allow field teams to readily manage data collection, production progress, and ensure that the survey areas are clearly defined and identifiable. Additionally, the use of defined gridblocks will allow for easy transition between

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

each phase of work including fieldwork, data processing, QC review, and QA review, and will facilitate acceptance and approval for all aspects of the MEC removal. Note that a gridblock will be defined by the lateral extents of an individual removal area, entire individual grids or portions of grids may make up a gridblock.

Munitions Response Program Enterprise (MEC Database): The Navy Comprehensive Long-term Environmental Action, Navy (CLEAN) Vieques Munitions Response Program (MRP) Enterprise system for recording field notes and other pertinent information collected/noted during intrusive field operations will be utilized for this TCRA.

Information is entered in a forms-based operating system by field personnel and uploaded by QC personnel. The uploaded information will be verified by QA personnel.

Documentation

QAPP, ESS, QC Seed Plan, QC Seeding Firewall Plan, Validation Seeding Firewall Plan, Validation Seed Plan

Decision Points

The key decision point in the pre-mobilization process are interagency team decisions made through the scoping and document review process that will culminate in the final approved version of the QAPP. Upon approval, a start date will be determined and communicated to the interagency team.

DFW 2: Mobilization

Prior to the commencement of the fieldwork, the key project staff will meet to ensure all necessary equipment, tools, and safety items have been collected and are ready for shipment. Additionally, key project staff will meet to ensure full understanding of the objectives and scope for the TCRA and all necessary training to complete the field work in accordance with this QAPP. The following general activities will be performed as part of mobilization:

1. Identify/procure, package, ship, and inventory project field equipment
2. Verify emergency communication protocols and procedures
3. Determine field operations schedule and coordinate any logistical support (e.g., USFWS)
4. Test and inspect equipment (see Worksheet #22 for details)
5. Assemble and transport the work force
6. Verify that forms and project documentation are in order, and that field project personnel understand their responsibilities regarding data collection and documentation requirements

As part of the mobilization efforts, a kickoff and site safety meeting will be conducted. This meeting will include a review of the field-related elements of this QAPP. Additionally, it will include a review and acknowledgement of Health and Safety Plans by site personnel. Additional project and safety meetings will occur as needed, and as new personnel or visitors arrive at the site.

Documentation

Daily Report(s)

Decision Points

Key decision points during mobilization activities include: ((1) Has all equipment required to support the TCRA (including geophysical surveys) arrived onsite? (2) Is the equipment free of damage and working as expected?

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

DFW 3: Site Preparation

Site Control

After mobilization but prior to the start of TCRA activities, a review of the established benchmarks and site control points will be performed. GPS data and coordinates will be referenced to UTM Zone 20N, NAD83 Continental United States (CONUS) (i.e., no local datum transform applied). GPS function tests (i.e., daily position tests) on established benchmark(s) or control point(s) will be performed at the start of each day of utilization to ensure GPS accuracy and adherence to the MQOs (see Worksheet #22) for data usability. As needed, work crews will stake the site boundaries for operational purposes based on the established sitewide VNTR grid network.

Coordination with USFWS Services for Planned Land Use Areas

Prior to TCRA activities for the planned land use areas, it is assumed that USFWS will provide formal concurrence/documentation of the boundaries to be established for the planned land use areas.

Archaeological Demarcation

Previously identified archaeological sites are present in UXO 13 TCRA areas. Therefore, when applicable, an archaeologist will be present to provide guidance and field-determinations when TCRA activities occur within archaeological sites as warranted. Should TCRA activities occur within an archaeological site with no archaeologist onsite, TCRA activities may continue but the ground will not be disturbed in any way and a zero-disturbance approach will be practiced. Should an item or an anomaly be encountered for which removal would disturb the soil, the item will be marked, documented, and left in place until an archaeologist can be consulted. The item may be removed once it is determined that removal will not impact the archaeological site or if the removal of the item when first encountered does not disturb the soil. The presence of a potentially dangerous item will supersede this zero-disturbance protocol and be addressed as needed in order to remove any explosive hazard. Should the presence of artifacts impact the ability to complete TCRA activities within the associated area, the coordinates of the area will be recorded and a discussion on the potential impact on meeting the TCRA objectives will be included in the TCRA Completion Report.

Vegetation Clearance

Vegetation clearance activities will be performed as necessary to facilitate TCRA activities at UXO 13 as discussed/described in Worksheet #11 (Table 11-1 and Figures 11-1 through 11-9) and defined by the actual boundaries established.

Vegetation clearance activities will be performed by the Munitions Removal and Geophysical Contractor. The objective of the vegetation clearance is to cut and/or remove site vegetation in order to facilitate the TCRA and may involve the utilization of mechanized equipment (e.g., backhoe) as well as hand-tools. If threatened or endangered species are present within certain TCRA areas requiring vegetation clearance, a biologist will advise or be embedded with the clearance team to ensure vegetation clearance activities will be conducted in a manner consistent with appropriate ecological protectiveness measures to the extent practical. Should the presence of threatened or endangered species impact the ability to complete TCRA activities within the associated area, the coordinates of the area will be recorded and a discussion on the potential impact on meeting the TCRA objectives will be included in the TCRA Completion Report.

Documentation

Daily Report(s), USFWS approved land use area boundaries

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

Decision Points

Formal concurrence/documentation of planned land use boundaries as noted under 'Coordination with USFWS for Planned Land Use Areas' is the initial decision point upon which subsequent points associated with site preparations are established. GPS function tests will be performed at the beginning of each day as needed. Measurements will be taken from an established benchmark(s) or control point(s). If the measured point does not meet the required accuracy see (Worksheet #22), then the instrument will be adjusted (e.g., to provide better satellite coverage) and the point will be remeasured. Any malfunctioning equipment will be repaired or replaced.

DFW 4: Instrument Test Strip Construction

Instrument Test Strip Construction

Work crews will establish an ITS in proximity to UXO 13. The ITS will consist of one medium ISO (e.g., 2-inch diameter, 8-inch long pipe), and two small ISOs (e.g., 1-inch diameter, 4-inch long pipe) buried at various depths and orientations in a line approximately 10 feet apart in an anomaly free area. The medium ISO, and two of the small ISOs will be buried horizontally at depths of 24-, 12-, and 6-inches bgs, respectively. The planned seed item depth(s) may be adjusted such that the reliable maximum detection depth for the all-metals detector can be established. Multiple ITSs may be established in close proximity to the work areas for convenience.

Table 17-1. Planned ITS Seed Emplacement Summary

Seed Type	Depth of Burial	Orientation
Medium ISO	24 inches	Horizontal
Small ISO	12 inches	Horizontal
Small ISO	6 inches	Horizontal

Note that the ITS is intended to support two different activities that are part of the TCRA. The first is associated with the surface sweep in advance of geophysical surveys and requires that analog instruments identify surface MEC and metallic debris. Testing the analog sensor at the ITS effectively verifies functionality. Additionally, the ITS will be used to verify functionality of the analog sensors for the surface and subsurface removal including the Surface Clearance Only Areas and any areas inaccessible to geophysical surveys.

All analog instrument(s) will be tested at the beginning of each day, the end of each day, and anytime the battery is changed for a positive response to each ISO. The analog instrument will be an all-metals detector and will function by providing a positive response upon exposure to a metallic object. The positive response will be in the form of a change in frequency from the unit's speaker that corresponds to the intensity of the object's induced field registered by the instrument's sensor(s). If an instrument fails to detect an ISO during ITS testing, then the instrument will be repaired or removed from service and replaced.

Documentation

Daily Report(s)

Decision Point

If an instrument fails to detect the ISOs during ITS testing, the instrument will be repaired or removed from service and replaced.

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

DFW 5: Quality Control Seeding

The geophysical system verification (GSV) approach will be used to monitor and verify the functionality of the geophysical sensor(s) during geophysical surveys. As part of the GSV program, QC seeds (surface and subsurface) will be placed in accordance with this QAPP and the QC Seed Plan. QC seeding provides ongoing verification and feedback on the geophysical process as well as objective evidence that TOI can be detected throughout the vertical profile to the extent possible based on the technology limitations previously described.

QC seeds will include small ISOs and medium ISOs. The quantity, depth, orientation, and intended location (if applicable) of surface and subsurface QC seeds will be described in detail in the QC Seed Plan, provided under separate cover for firewall purposes. For areas where digital geophysical surveys are performed, the total quantity of QC seeds placed will ensure that, on average, each geophysical sensor and each geophysical field team will encounter one seed per field day. For analog-based clearance areas, the total quantity of QC seeds placed will result in, on average, each removal team encountering at least 10 seeds per field day. Subsurface QC seeds will be placed throughout the vertical detection boundary as defined by the maximum reliable depth of detection for the seed item used in the planned orientation. QC seeds will not be placed deeper than the maximum reliable depth

for a given orientation or deeper than the specified removal depth for the removal area (see Table 11-1). Final as-built information on the seeds will be documented daily and summarized in the Quality Control Seeding Report upon completion of QC seeding activities.

Documentation

Daily Report(s), QC Seeding Report

Decision Points

Were QC seeds placed in accordance with the QC Seed Plan? If there were deviations from the QC Seed Plan were these documented and approved by the QC Geophysicist? Was the accurate position and depth of each QC seed placed in the survey area recorded?

DFW 6: Validation Seeding

Validation (or QA) seeding will be performed by the QA Contractor and is intended to supplement the Munitions Removal and Geophysical Contractor's QC seeding program. The purpose of validation seeding is to provide an ongoing quality measure and validation of the geophysical systems, data collection, data analysis, and data QC processes used during the TCRA. Additionally, QA seed results provide the project delivery team defensible data at each phase of the project to aid in decision making and ensure project DQOs are being met.

For firewall purposes, details of validation seeding are not discussed in this QAPP. The QA seeding program will be documented in the Validation Seed Plan, provided under separate cover. Validation seeds will be placed by the QA Contractor' SUXOS in accordance with the Validation Seed Plan, this QAPP, and applicable SOPs. Validation seeding activities will be documented in the Validation Seeding Report.

Documentation

Daily Report(s), Validation Seeding Report

Decision Points

Were validation seeds placed in accordance with the Validation Seed Plan? If there were deviations from the Validation Seed Plan were these documented and approved by the QA Geophysicist? Was the accurate position and depth of each validation seed placed in the survey area recorded?

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

DFW 7: Instrument Verification Strip Construction

As part of the GSV process, an IVS (or IVSs) will be established within or proximal to UXO 13 for initial and ongoing testing and verification of the geophysical sensors to be used during the TCRA. The IVS will be constructed in an area that is representative of the terrain, vegetation, and underlying rock and/or soils that naturally exist within the survey areas. A background survey will be conducted at each proposed IVS site to determine and avoid the location of potential native anomalies that may interfere with the response of the IVS seed items.

Seed items to be used in IVS construction will consist of two small ISOs, Schedule 80. ISOs are used because they are inert, manufactured to precise specifications, and their responses are well documented. ISOs will be placed in the IVS such that each ISO is sufficiently separated to ensure no response overlap. Table 17-1 presents the intended as-built specifications for the IVS. The depths specified are intended to ensure an SNR of at least five.

Table 17-2. Planned IVS Seed Emplacement Summary

Seed Identifier (ID)	Seed Type	Depth (to center of mass)	Orientation
IVS-01	Small ISO	12 inches	Horizontal, cross-track
IVS-02	Small ISO	8 inches	Vertical

The IVS Technical Memorandum will include IVS construction activities including the results of the background survey and the final as-built IVS details. For each additional IVS location established following submission and approval of the IVS Technical Memorandum, an addendum detailing the new IVS construction will be drafted to document these subsequent activities and will be provided to the QA Contractor for review and concurrence.

Documentation

Daily Report (including as-built records), IVS Technical Memorandum

Decision Points

Was the IVS constructed as specified in the QAPP and any applicable SOPs? If an instrument fails to meet the initial IVS MQOs established in Worksheet #22-1 the nonconformance/RCA process will be implemented to determine the root cause and appropriate CA(s).

DFW 8: Assemble and Test EMI Sensors

The digital geophysical sensor(s) will be assembled and tested in accordance with manufacturer specifications and sensor-specific SOP(s), as applicable. During sensor assembly, a visual inspection will be performed to identify obvious defects or missing components. No data collection will be performed until all required components are onsite and the sensor is determined to be free of damage and the initial sensor function test has been confirmed as passing the acceptance criterion in Worksheet #22. The sensor-specific SOP checklist (if applicable) will be completed once the sensor has been successfully assembled and tested.

Following completion of IVS construction, an initial IVS survey will be performed for each geophysical sensor being used for TCRA activities in the configuration planned for production surveying (i.e., wheel or litter mode, GPS positioning or SLAM positioning). The initial IVS survey is part of the GSV process and is intended to verify sensor functionality prior to commencement of production area surveys.

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

The IVS Technical Memorandum will document sensor assembly, the initial IVS survey activities, and initial survey results compared against the initial IVS MQOs in Worksheet #22 for each sensor tested. The IVS Technical Memorandum will be provided to the QA Contractor for review and concurrence. For each new sensor introduced following submission and approval of the IVS Technical Memorandum, an addendum detailing the initial survey results will be drafted to document these subsequent activities and will be provided to the QA Contractor for review and concurrence.

Documentation

Daily Report(s), Sensor Assembly Checklist(s), IVS Technical Memorandum

Decision Points

Following assembly, did the sensor pass all initial QC tests (including the initial IVS) as specified in Worksheet #22 and/or manufacturer specifications?

DFW 9: Surface Sweep

An instrument-aided visual surface sweep will be conducted within the TCRA removal areas in advance of digital geophysical surveys. It is planned that each surface sweep and removal area(s) will be defined as its own gridblock where gridblock is defined as a survey unit that will be managed as a single entity for data management and tracking purposes as discussed in DFW 1. The gridblocks defined during the surface sweep will be the same gridblocks used during the follow-on geophysical survey and subsequent removal. The use of these gridblocks will allow field teams to readily manage data collection, production progress, and ensure that the survey areas are clearly defined and identifiable. Prior to MEC removal activities, these established gridblocks will be uploaded into the data management system (see DFW 1) field device/tablets for tracking purposes in the field. Note that no QC/validation seeding will be performed as part of surface sweep activities.

Applicable areas within UXO 13 will be sub-sectored in a manner to provide safe and efficient clearance/removal of all surface MEC and metallic debris (to aid in the follow-on geophysical surveys) that are visible/detected on the ground surface. It is assumed that sub-sectoring will be achieved by the placement of ropes or other suitable visual aids (flags, marking paint, etc.) at 3-feet (with a maximum allowable spacing of 5-feet) (the estimated coverage of a UXO Technician swinging an analog instrument) to create search lanes. The search lane widths may be optimized and adjusted as needed based on encountered site conditions; however, search lanes will be established to ensure coverage of the established gridblock(s).

Once search lanes are established, field personnel will transverse the search lanes while visually looking for MEC/metallic items and listening for an audible change in tone from the analog instrument (which indicates a metallic object is present) while slowly swinging the analog instrument back and forth in such a manner to provide coverage of the defined search lane(s). Should a MPPEH item be identified (either visually or audibly via the analog instrument), field personnel will flag the object for further inspection and classification as either MEC or Material Documented as Safe (MDAS) from the SUXOS and UXO Safety Officer (UXOSO) or in accordance with the Munitions Removal and Geophysical Contractor's SOPs (Attachment A). MEC items will be documented on daily digital field forms (see DFW 1), will be photographed, and GPS coordinates collected and documented. Surface metallic debris (i.e., non-munitions related debris [NMRD]) will be removed (to the extent practical) from the gridblock to aid in the follow-on geophysical survey(s).

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

Field activities will be recorded on applicable daily digital field forms as described in DFW 1. In general, the following data will be recorded in the digital field forms:

1. Date and time of ITS testing and the outcome of the test for each instrument
2. GPS coordinates for survey grid corners or grid location (as needed)
3. GPS coordinates for all MEC items found and description of the item (as applicable)
4. Visual observations and condition of MEC items found
5. Photographs of MEC items found
6. Amounts of metal debris found (as pounds per gridblock(s) for each day)
7. When and where QC checks were performed and their outcomes
8. When and where QA checks were performed and their outcomes
9. Date, time, location, and method of disposal for MEC items (if performed)
10. Explosives used to perform demolition (if performed)

See DFW 18 for discussion of munitions handling and disposal.

Documentation

Daily Report(s), MRP database entries (excavation results, including photographs, descriptions, and locations), QC Report(s), disposal records (as applicable).

Decision Point

Proper documentation in the daily report of any MEC or metallic items encountered.

DFW 10: Analog-based Clearance (Surface and Subsurface)

An instrument-aided visual surface MEC clearance will be conducted by the Munitions Removal and Geophysical Contractor within the Surface Clearance Only Areas (Table 11-1 and Figure 11-3). In general, the same methodologies detailed in DFW 9 as part of the surface sweep will be employed here; however, as this is a surface clearance and not a surface sweep, QC and validation seeding will be conducted within these areas.

Additionally, analog-based removal activities will be conducted within areas identified as inaccessible to digital geophysical survey methods.

Field activities will be recorded on applicable daily digital field forms. In general, the following data will be recorded in the digital field forms:

1. Date and time of ITS testing and the outcome of the test for each instrument
2. GPS coordinates for survey grid corners or grid location (as needed)
3. GPS coordinates for all MEC items found and description of the item (as applicable)
4. Visual observations and condition of MEC items found
5. Photographs of MEC items found
6. Number of seeds recovered, their location, and type

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

7. Amounts of metal debris found (as pounds per gridblock(s) for each day)
8. When and where QC checks were performed and their outcomes
9. When and where QA checks were performed and their outcomes
10. Date, time, location, and method of disposal for MEC items (if performed)
11. Explosives used to perform demolition (if performed)

See DFW 18 for discussion of munitions handling and disposal.

Documentation

Daily Report(s) (including analog instrument function tests), MRP database entries (including photographs, descriptions, and locations), QC Report(s), Surface and Subsurface Clearance Technical Memorandum," "disposal records (as applicable).

Decision Point

Proper documentation in the daily report of any MEC or metallic items encountered.

DFW 11: Detection Survey

Upon completion of the surface sweep, the Munitions Removal and Geophysical Contractor will perform a detection survey over the accessible horizontal extents of each survey area to identify subsurface anomalies at or above the target selection threshold, as established in Worksheet #11. Detection surveys will be performed in accordance with the appropriate SOPs[11] (Attachments A and B) for the sensor/technology being used. If one-pass technology is used, classification will be performed from the detection data.

Any gaps in data collection resulting from obstructions, steep terrain, vegetation, or other causes will be identified and documented for analog investigation (as applicable). Field observations of site conditions that may aid in interpreting the data (e.g., sources of geophysical interference, or cultural items that produce a response in the data) and support the CSM, including indications of munitions or non-munitions-related activity, will be documented. If a gap in coverage is suspected, the field team will re-collect data in the data gap area.

Ongoing QC field-testing will be performed as part of geophysical activities per the applicable SOPs and Worksheet #22 to monitor system performance. Any failures to achieve the MQO acceptance criteria will be reported to the QA Contractor and the failure criteria stipulated in Worksheet #22 will be followed. As applicable, an RCA will be performed to identify the source of the nonconformance, identify appropriate CAs, and to determine any impacts on data usability. Approved CAs will be implemented, and re-work performed, as necessary. The RCA and CAs will be documented in a stand-alone report.

Geophysical survey related field activities will be documented in Survey123 and field logs. Any handwritten field logs will be scanned or photographed such that they are legible and uploaded with the raw data at the end of each day of data collection. Any applicable photographs collected of the day's field activities will be included with the raw data upload. Raw data files and documentation will be uploaded at the end of each field day to a secure project server or SharePoint site and made available to the QA Contractor.

[11] It is possible a sensor will be used whose SOP is not available at the time of writing of this QAPP. In these cases, the SOP will be attached to the appropriate report, for example the Target Selection Technical Memorandum or Classification Report.

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

Documentation

Daily Report(s), QC Report(s), MRP database entries

Decision Points

Were data collected in accordance with the SOPs and this QAPP? Are any data gaps present?

DFW 12: Detection Data Processing and Data Usability Assessment

Geophysical survey data will be processed in accordance with the applicable SOPs[12] (Attachments A and B). Anomalies will be identified and selected from the data using the response amplitude approach (where discrete anomalies above the designated threshold not associated with site cultural features or anomalies above the designated SNR threshold are assumed to be potential TOIs). If applicable, coherence anomalies may also be selected, and ISS may be used to eliminate anomalies based on evaluation of dipole fit coherence and/or

thresholds for size and decay rates. Anomalies caused by known cultural features, such as surface structures, or anomalies clearly related to noise will be documented and identified on or removed from the target list.

If ISS is used, a cued survey will be performed on an additional 100 anomalies or 10 percent of the anomalies, whichever is lower, excluded on the basis of the size and decay parameters used to perform ISS. If any of the anomalies are classified as a TOI, the nonconformance/RCA/CA process will be implemented to determine the root cause and appropriate CA(s).

Noise levels will be evaluated across each survey area to confirm the appropriateness of the preliminary target selection threshold identified in the IVS Technical Memorandum. Noise levels will be evaluated by calculating the RMS of sensor data collected over areas devoid of anomalies or using custom built tools in the processing software. If five times RMS of the average noise of the survey area is greater than the preliminary target selection threshold, the threshold should be adjusted to five times RMS of the survey area. Additionally, areas of elevated noise in the survey area will be identified and delineated and data usability implications for these areas will be discussed in the DUA Report.

Processing of the geophysical data will include review and validation of the data to ensure that the MQOs in Worksheet #22 are being achieved for both ongoing QC tests and production data. Performance relative to the MQOs will be assessed per this QAPP and/or the appropriate SOPs and documented at the conclusion of data processing activities for each defined survey unit (or, gridblock) in the processing Survey123 forms.

Areas identified as SRAs (i.e., anomaly density too high for target selection) will be identified and the extents of the SRA defined. SRAs will be marked in the field to undergo analog-supported removal until the anomaly density supports individual target selection from geophysical data. Resurvey is not required if the SRA is associated with a known, non-munitions related metallic feature to be left in place.

If a portion or portions of the survey area is inaccessible to the geophysical survey team the resulting gap(s) in coverage will be defined, and their extents delineated. Individual targets that overlap with the data gap area edges will be selected as targets and investigated prior to any analog survey of the inaccessible area. Inaccessible areas will be subject to an analog clearance assuming they are accessible to the Munitions Removal and Geophysical Contractor team(s) using analog equipment.

[12] It is possible a sensor will be used whose SOP is not available at the time of writing of this QAPP. In these cases, the SOP will be attached to the appropriate report, for example the Target Selection Technical Memorandum or Classification Report.

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

As needed, background locations may be identified from the detection data for use during follow-on cued surveys or other sensor verification. Background locations will be selected in electromagnetically "quiet" areas devoid of anomalous response and be representative of the noise conditions where the cued measurements are planned.

The Target Selection Technical Memorandum[13] will include a summary of the geophysical data processing and anomaly selection approach. The Target Selection Technical Memorandum will also, at a minimum, summarize

- Survey area coverage
- Relative anomaly density
- Number and type of anomalies selected
- Survey area noise calculations
- Whether the MQOs have been met for the detection survey

Data validation will be performed in accordance with Worksheet #35. Detection data usability will be summarized in the DUA Report per Worksheet #37. All changes to planning assumptions based on fieldwork and data processing, data gaps, and any limits on data usability will be documented and discussed in the Detection DUA[14]; which will be prepared for the QA Contractor's review and acceptance.

The QA Contractor will determine whether validation seeds have been selected and inform the Munitions Removal and Geophysical Contractor of any missed seeds. The QA Contractor will review and accept target selection memoranda on survey units of the site as they are completed.

Documentation

Daily Report(s); Target Selection Technical Memorandum, including Final Target List (as applicable), SRA coordinates (as applicable), data coverage gap coordinates (as applicable); MRP database entries; QC Report(s); Detection DUA Report

Decision Points

Moving from the detection phase to the appropriate subsequent phase (i.e., cued interrogation or intrusive) requires successful detection and selection of geophysical anomalies representing QC and QA seeds and achievement of the applicable MQOs. If any QC or QA seeds are not detected and selected as a target, or other MQOs identified in Worksheet #22 are not achieved, the nonconformance/RCA/CA process will be implemented.

DFW 13: Collect Classification Data

Various technologies may be used to achieve classification of anomalies. Classification is limited to DAGCAP validated sensors and approaches. For one-pass sensors, classification may be performed as part of the detection survey. If not reflected in Worksheet #22, any sensor-specific metrics and requirements specified in the sensor specific SOP will be used to assess data validity and included in the appropriate report. A detection survey followed by a cued survey may also be performed.

[13] For one-pass sensors the Target Selection Technical Memorandum may be included in a single report with the classification results.

[14] For one-pass sensors a single Classification DUA may be drafted that includes the elements of the detection and classification survey.

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

Cued Instrument Verification Strip Survey

An initial cued IVS will be performed with the sensor to be used for cued surveys in accordance with the applicable SOP (Attachment A). The IVS from the detection survey is suitable for the cued survey. The results will be reported in the IVS Technical Memorandum or a stand-alone Cued IVS Technical Memorandum as applicable. The memorandum will summarize sensor assembly, the cued IVS survey and results, and include documentation of compliance with the applicable MQOs in Worksheet #22. As needed, addendums to the IVS memoranda will be drafted for any additional sensors utilized.

Decision Points

Was the geophysical sensor determined to be operating properly? If the sensor fails to meet the applicable MQOs established in Worksheet #22 the nonconformance/RCA process will be implemented to determine the root cause and appropriate CA(s).

Cued Data Collection

Anomalies identified for cued interrogation will be re-acquired. The field operator will select anomaly IDs for re-acquisition through the geophysical sensor's navigation software interface. Once cued interrogation begins, the anomaly ID will be automatically stored in the associated data file and the target will be removed from the re-acquisition list. It is assumed background measurements will be collected at a minimum of once per hour or per the sensor manual. Background measurement locations will be identified from the dynamic survey data, demarcated in the field, and verified prior to use for background removal.

The Munitions Removal and Geophysical Contractor will use the selected advanced sensor in the configuration tested at the IVS to collect data over cued locations. Detailed procedures in the sensor-specific SOP or user's manual will be followed. For the TCRA, the following general data collection steps will be followed:

- The field geophysicist or designee will conduct function tests at the beginning and end of each survey day.
- The field geophysicist or designee will test the system at the IVS at the beginning and end of each survey day.
- The field geophysicist or designee will re-acquire anomalies, collect cued data, and record field observations.
- The field geophysicist will collect background validation and ongoing background data.
- The field geophysicist or designee will conduct an immediate real-time screening of cued data to determine whether metrics for position offset were achieved. Failures identified in the field evaluation will be immediately re-collected.
- The field geophysicist will collect cued data over the verification anomalies identified.
- The field geophysicist will conduct field inversions and ongoing QC (as applicable).
- The QC geophysicist will validate cued data (evaluate conformance to SOPs and MQOs).

Documentation

Daily Report(s), QC Report(s) (including IVS and function test results), MRP database entries

Decision Points

Were data collected in accordance with the SOPs and this QAPP? Are any data gaps present?

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

DFW 14: Data Processing, Classification, Ranked Anomaly List, and Classification DUA

Classification of sources, whether one-pass or cued, will be performed in accordance with the applicable SOP (Attachment A). The Munitions Removal and Geophysical Contractor will process the data using UX-Analyze (or other validated software) as described in the method-specific SOP. In general, the following steps will be taken (these steps may be modified as applicable for one-pass surveys):

- All data will be delivered to the QA contractor as the survey area (or gridblock within the survey area) is completed. All data processing validation checks will be performed per survey area. The formal classification DUA will be conducted when all survey areas are completed.
- The project geophysicist or designee will use UX-Analyze or other validated software as described in the appropriate SOP to process the data daily to produce target polarizability curves and perform library matches to identify TOI.
- TOI will include: (1) all anomalies that match to a library member, (2) clusters of items not in the library that have similar polarizability curves and require investigation, and (3) anomalies with polarizability curves that suggest the properties of a munition (i.e., long, narrow, and axisymmetric or spherical).
- All data and the TOI list will be passed to the QC Geophysicist who will determine whether all QC seeds were correctly classified and verify that all QC metrics in Worksheet #22 were achieved. Any missed QC seeds will be reported to the QA contractor and accompanied by an RCA/CA.
- The project geophysicist or designee will create a ranked anomaly list, arranged in order from highest likelihood the object is a TOI to highest likelihood the object is a non-TOI. The project geophysicist or designee will identify the threshold that will separate TOI and non-TOI to create a dig list as described in the applicable SOP.
- The project geophysicist or designee will identify additional potential "threshold verification" targets such that 200 additional targets or 10 percent additional targets, whichever is lower, beyond the initial threshold will be identified for the total area where AGC is performed. These targets will be the next targets below the TOI/non-TOI threshold in order. For example, if the last TOI recovered from the ranked list is 50 places before the threshold, an additional 50 of the threshold verification digs will be conducted. If the last target on the dig list is a TOI, an additional 200 targets (or 10 percent) will need to be dug. If no additional TOI are recovered, the threshold will be considered verified.
- The project geophysicist or designee will assemble a dig list to include all TOI, any signals that could not be analyzed, and the threshold verification targets.
- The project geophysicist will determine if any TOI are in the verification targets.

The QA contractor's geophysicist will review any missed QC seed RCA/CA and approve or make recommendations to the Munitions Removal and Geophysical Contractor for modifications. The QA geophysicist will review all TOI lists to determine whether all validation seeds were correctly classified and inform the contractor of any failures (all information about the missed seed). The QA geophysicist will review data submissions for conformance with metrics in Worksheet #22. The QA contractor will review and accept the classification results. The QA contractor will review interim spread sheets and inform the contractor if any validation seeds are not on the preliminary dig lists.

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

Data validation will be performed in accordance with Worksheet #35. Classification data usability will be summarized in the Classification Report per Worksheet #37. All changes to planning assumptions based on fieldwork and data processing, data gaps, and any limits on data usability will be documented and discussed in the Classification DUA, which will be prepared for the QA Contractor's review and acceptance.

Documentation

Daily Report(s), Classification Report (including library match results, TOI/non-TOI classification spreadsheet, classification decision plots, ranked anomaly list, and DUA), dig list, QC Report(s), MRP database entries.

Decision Points

- If observations and conclusions are consistent with the CSM, the project team will continue with the TCRA under the current assumptions. If observations are inconsistent with the CSM, the project team will update the CSM and determine the impacts on the DQOs and TCRA design. [This applies at any point in the process where such observations occur.]
- If AGC analyses meet any of the following criteria, they will be selected as TOI and placed on a ranked dig list:
  - The polarizability decay curve matches that of an item in the project-specific TOI library
  - Estimates of the size, shape, symmetry, and wall thickness indicate the item is long, cylindrical or spherical, and thick-walled
  - There is a group (cluster) of unknown anomalies having similar polarizability decay curves that, after investigation, are discovered to be TOI
- If AGC analyses yield inconclusive results curves, they will be added to the dig list or otherwise resolved.

DFW 15: Excavate Buried Objects (Intrusive Investigation)

The Munitions Removal and Geophysical Contractor will excavate all buried objects subject to intrusive investigation per the SOPs provided in Attachment A. In general, this will involve the following steps:

- The excavation will take place per survey area. All validation checks will be performed per survey unit. The formal final DUA will be conducted when all survey units are completed.
- The field team lead or designee with a UXO Technician escort will use an RTK-GPS to relocate anomaly locations and emplace plastic pin flags. The pin flag location will be measured as emplaced. A comparison will be made between the target location and the reacquired position to ensure the appropriate source is investigated.
- The intrusive team comprising qualified UXO Technicians will navigate to each pin flag and conduct intrusive operations. All digging will be conducted according to the detailed procedures described in applicable SOP(s) (Attachment A) and the ESS.
- For each anomaly location, the intrusive team will record the approximate size, depth, and specific information that can be obtained about the identity of the source.
- If any clusters are identified, the CSM will be revised to include their locations and sources. If they are munitions, their signatures will be added to the library.
- If excavation of any anomalies that were deemed munitions-like are found to be munitions, their signatures will be added to the library.

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

- The intrusive team lead or designee will photograph each recovered item for later comparison with AGC analysis.
- The QC Geophysicist or their designee will qualitatively compare excavated objects against the classification spreadsheet to evaluate whether the discovered items are appropriate to the classification results.
- The intrusive investigation will include re-acquisition and flagging of targets (TOIs) on the Final Dig List.

"Analog and Dig"

Intrusive investigation will include the use of analog equipment (i.e., all-metals detector) in any areas specified within this QAPP and where there are gaps in the detection data caused by obstructions, site features, or SRAs. The analog-supported approach will be conducted in accordance with applicable SOPs (Attachment A); where the SOPs refer to the use of magnetometers, all-metals detectors will be utilized. After each target source is removed, the UXO Technicians will ensure no additional sources exist at that location, using the same type of analog geophysical instrument employed during removal of the original source. QC of a minimum of 10 percent of each grid where analog equipment is used to support removal will be performed by the UXOQCS.

QA of the subsurface removal work will be conducted by the onsite QA Contractor's SUXOS.

Documentation

Daily Report(s), QC Report(s), MRP database entries (excavation results, including photographs, descriptions, and locations), disposal records (as applicable)

Decision Points

- If field observations are consistent with the CSM, the project team will continue with the TCRA under the current assumptions.
- If field observations are inconsistent with the CSM, the project team will update the CSM and determine the impacts on the DQOs and remedial design. [This applies at any point in the process where such observations occur.]
- If any clusters are identified, the CSM will be revised to include their locations and sources. If they are munitions, their signatures will be added to the library.
- If excavation of any anomalies that were deemed munitions-like are found to be munitions, their signatures will be added to the library (as applicable).

DFW 16: Verify Dig/No-Dig Threshold, Update Verification/Validation Plan

The QC Geophysicist will determine whether any TOI are in the verification digs.

- The intrusive team will excavate items from the threshold verification list such that 200 items or 10 percent of the items, whichever is lower, beyond the last TOI recovered are investigated.
- If a TOI is found in the threshold verification list, the contractor will conduct an RCA/CA and the team will reevaluate the threshold selection.

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

- After determination of a new threshold, the threshold verification will be repeated by selecting another 200 targets or 10 percent additional targets, whichever is lower, past the last TOI in the list at the new threshold. For example, if the last TOI recovered from the ranked list is 500 places before the threshold, an additional 50 of the threshold verification digs will be conducted. If the last target on the dig list is a TOI, an additional 200 targets or 10 percent, whichever is lower, will need to be dug. If no additional TOI are recovered, the threshold will be considered verified.

Once a final threshold has been established, the project team will conduct the Classification DUA, select 200 classification validation targets or 10 percent additional as classification validation targets, whichever is lower, review the draft verification/validation plan, and make changes, as necessary. For each validation target, the team will document the characteristics that resulted in the non-TOI designation. Note: The classification validation targets will be selected to address any questions or uncertainties in the data. The remaining validation targets may be selected randomly or using the custom-built Automated QA Tool.

The final set of anomaly sources to be investigated will be those selected as part of the validation process approved in the final Verification and Validation Plan. Any anomaly source investigated from the Validation Dig List that is identified as a TOI will trigger the nonconformance/RCA/CA process to determine the root cause and appropriate CA(s).

Documentation

Daily Report(s), Final Verification/Validation Plan.

Decision Rule

If the threshold verification digs do not uncover any TOI as described previously, then the threshold is verified. If any TOI are recovered, then the project team will conduct RCA/CA that results in adjustment of the threshold and determination of the impacts on the project objectives.

DFW 17: Excavate and Evaluate Classification Validation Targets

Validation targets will be re-acquired, flagged, and intrusively investigated per the guidelines in DFW 15. The general steps for target validation for AGC are as follows:

- For each anomaly location, the intrusive team will record the approximate size, depth, and specific information that can be obtained about the identity of the source.
- The intrusive team lead or designee will photograph each recovered item for later comparison with AGC analysis.
- The QC geophysicist will determine whether any TOI are in the validation digs. If a TOI is found in the validation digs, the contractor will conduct a QA stand-down and recommendation for CA, and the TCRA site team will determine the next steps.
- For each recovered classification/validation object, the QC geophysicist will compare the characteristics of the object to the AGC results. If any properties are inconsistent, the project team will conduct an RCA/CA and determine the impacts on project objectives.

Documentation

Daily Report(s), Final Verification/Validation Plan

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

Decision Rules

- The geophysical classification results will be valid if:
  - Validation digs do not uncover any TOI
  - Properties of all recovered objects are consistent with predicted properties
- If the validation digs uncover any TOI as described previously, the project team will conduct a QA stand-down and evaluate the impacts on MPCs and DQOs.
- If the properties of recovered objects are inconsistent with predicted properties, the project team will conduct an RCA/CA and determine the impacts on the achievement of MPCs and DQOs.

DFW 18: Conduct MEC/MPPEH Handling and Disposal

The Munitions Removal and Geophysical Contractor will handle and disposition munitions as described in SOP(s) (Attachment A) and the ESS.

MEC Management and Disposal

At least two UXO Technicians will conduct 100 percent inspection of all items encountered for classification as MEC or MDAS in accordance with SOPs (Attachments A and B). All munitions will be dispositioned in accordance with the ESS.

Demolition and Demilitarization

MEC items will be detonated on an as-needed basis. Demolition activities will be performed in accordance with applicable SOPs (Attachments A and B) and the ESS. The minimum safe distance for intentional detonations will be observed during demolition operations in accordance with the approved ESS. Demolition explosives will be transported to the demolition site in accordance with the ESS. All explosives transport vehicles will be inspected daily and documented on DoD DD Form 626. If demolition is required and soil is excavated for demolition activities, then native material within the vicinity will be used to backfill the hole and will be graded to match the existing topographic contours, as warranted.

With respect to breached items, if a breached munition is discovered during the TCRA, not only will the item be removed, but any visible contents on the ground from the breached item will also be removed.

Munitions items not possessing an explosive hazard will be transported to a laydown area and segregated in a locked container for further demilitarization, as required, followed by inspection, certification, and verification prior to recycling. They will undergo a 100 percent inspection by a UXO Technician III under the supervision of the SUXOS and/or UXOQCS prior to final certification as MDAS. The SUXOS, UXOSO, UXOQCS, and UXO Technicians III shall be qualified according to DDESB TP-18 (DDESB, 2020) and authorized to document MPPEH as MDAS with dual signature on the Disposal Turn-in Document DD Form 1348-1A. The disposal Turn-in Document DD Form 1348-1A will include the following statement: “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.” MDAS will be demilitarized in accordance with DoD 4160.28-M, Volume 3 (series), Defense Demilitarization Manual (DoD, 2011), prior to its release to an offsite recycler. The MDAS will be released in sealed containers, along with the Disposal Turn-in Document DD Form 1348-1A that serves as both the explosives safety status documentation and the chain-of-custody documentation. The recycler will issue a certificate of destruction for MDAS.

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

Documentation

Daily Report(s), disposal records (as applicable).

DFW 19: Removal at Berm(s), Cliff Face, and Beach Cove

Berm Removal

The previously identified berm running along the western portion of Range 4B will be addressed as part of this TCRA. It is anticipated sections of the berm will be dismantled and spread on the ground surface using remotely operated equipment (i.e., excavator). Specifically, the remotely operated equipment will pull/push the berm to ground level with the spoils spread out on the ground adjacent to the removed section. Once the spoils have been spread out, the TCRA approach defined for Range 4B will be followed.

While the planned TCRA includes the western berm associated with Range 4B, additional berms associated with this or other ranges (e.g., Range 3) may be encountered. If so, the additional berms will undergo the same clearance processes as described here.

Cliff Face and Associated Beach Cove

A long-reach excavator or other suitable equipment/method will be used to remove MEC and associated debris observed on or protruding from the cliff face from the top of the cliff to the beach cove at its base. The long-reach excavator that is currently in use on the former VNTR has a maximum vertical reach of 40 feet. If utilized, it will be positioned at the top of the cliff to remove items from the cliff face wall as far as it can reach and, if necessary, placed on the beach to remove remaining items from the cliff face above. A crane equipped with a large magnet may also be used to remove metallic items from the cliff face or beach area with the crane position at the top of the bluff. UXO Technicians may also rappel down the cliff face to investigate and/or remove MEC and other MPPEH from the cliff face. Ultimately, the equipment and process used to perform removal along the cliff face will be the one or ones that can perform the removal action in the safest manner.

Items dislodged from the cliff face falling onto the beach will be screened using analog equipment (i.e., all-metals detector) by UXO Technicians. Remote controlled operable units (i.e., front loaders, skid steer, etc.) that can access the beach and navigate along the base of the cliff face may be used along the beach to remove MEC and other MPPEH.

The cove beach itself will additionally undergo the removal action processes that the other northern beaches will undergo as part of the TCRA.

Documentation

Daily Report(s), DFW 18 documentation (disposal records [as applicable]), MRP database entries [results, including photographs, descriptions, and locations])

Decision Rule

If no equipment/process is deemed suitable or safe for performing some or all of the cliff face MEC clearance, the approximate area where clearance cannot be performed will be documented and discussed in the TCRA Completion Report.

DFW 20: Conduct Final Data Usability Assessment

The project team will perform a final DUA for all data streams used during the TCRA per Worksheet #37.

Worksheet #17: Survey Design and Project Workflow for UXO 13 TCRA Removal Areas (Surface and Subsurface Removal) (continued)

Documentation

Final DUA Report

Decision Rule

If all data are determined to be of sufficient quantity and quality for the intended use, the DUA will provide the supporting lines of evidence that the TCRA met its objective. If not all data are determined to be of sufficient quantity and quality for the intended use, the DUA will provide details regarding data limitations that can be used by the project team to assess the impact on the TCRA objective and inform the path forward decision-makers.

DFW 21: Demobilization

Prior to demobilization, the Munitions Removal and Geophysical Contractor will perform completion inspections to verify all work has been completed, verify that the project objectives have been met to the extent possible, and ensure that MEC or other debris associated with MEC removal was dispositioned properly. The Munitions Removal and Geophysical Contractor will then inform the QA Contractor that the UXO 13 TCRA is complete and hand over all documents for final acceptance.

Upon final acceptance by the QA Contractor, the Munitions Removal and Geophysical Contractor will perform any necessary housekeeping of the site, including removing waste materials and other debris resulting from field activities. A post-completion photographic survey also will be performed, as warranted.

Upon receiving final concurrence from the QA Contractor, all equipment, personnel, facilities, and equipment will be demobilized from the site in an orderly manner.

Documentation

Daily Report(s)

Decision Points

N/A

DFW 22: UXO 13 TCRA Completion Report Preparation

A UXO 13 TCRA Completion Report will be prepared following completion of the TCRA activities to provide a record of activities/results. The UXO 13 TCRA Completion Report will document the TCRA activities at UXO 13 and will demonstrate the achievement of the TCRA objective or identify any data gaps or where the TCRA objective was not met and why. The results of the DUA (as discussed in Worksheet #37) will be included in the UXO 13 TCRA Completion Report, which will contain sufficient documentation to support conclusions of the DUA.

Documentation

UXO 13 TCRA Completion Report, including updated CSM

Decision Points

Whether the data support that the UXO 13 TCRA has been successfully implemented.

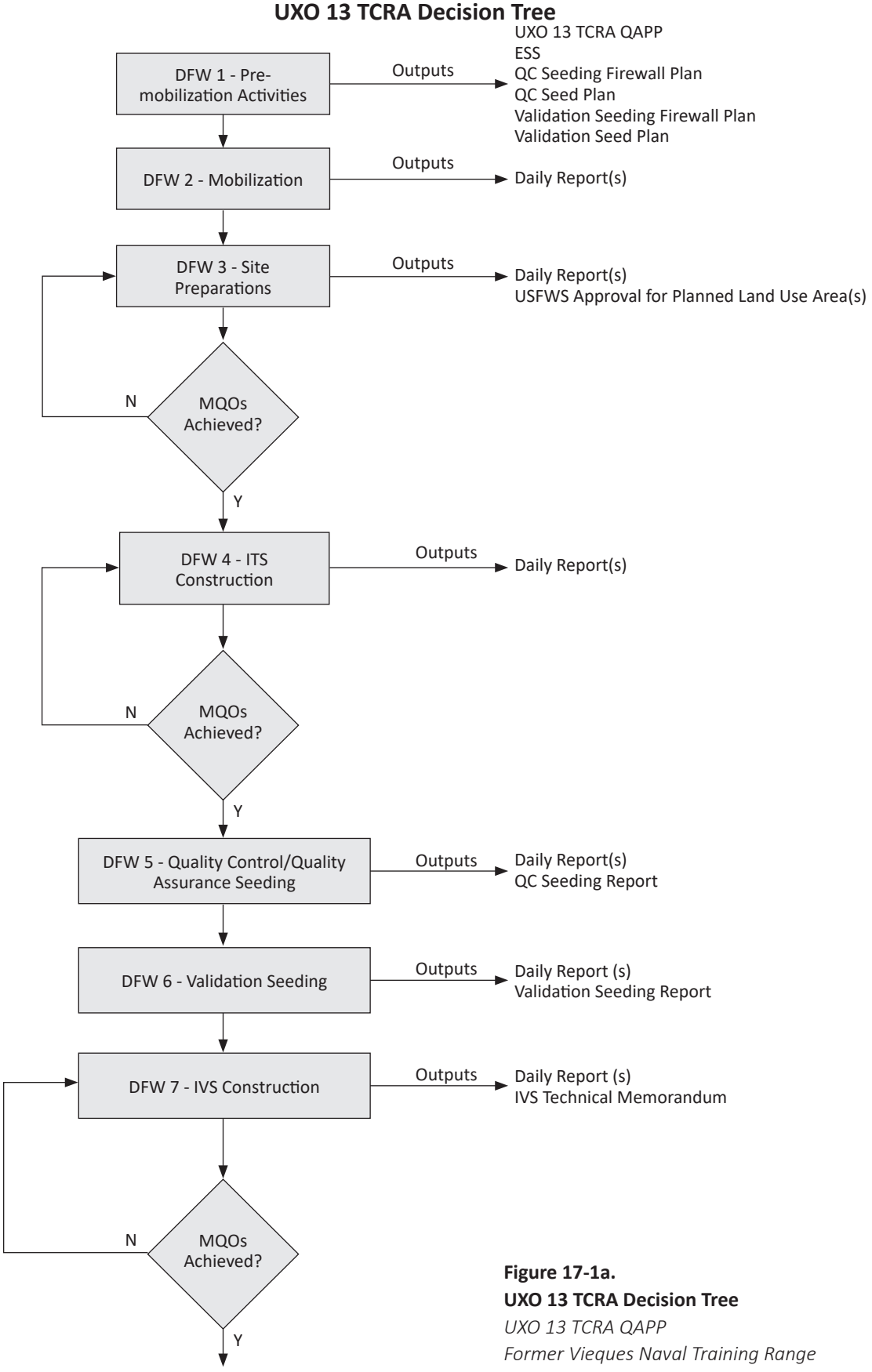


Figure 17-1a.
UXO 13 TCRA Decision Tree
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

Continued from Figure 17-1a

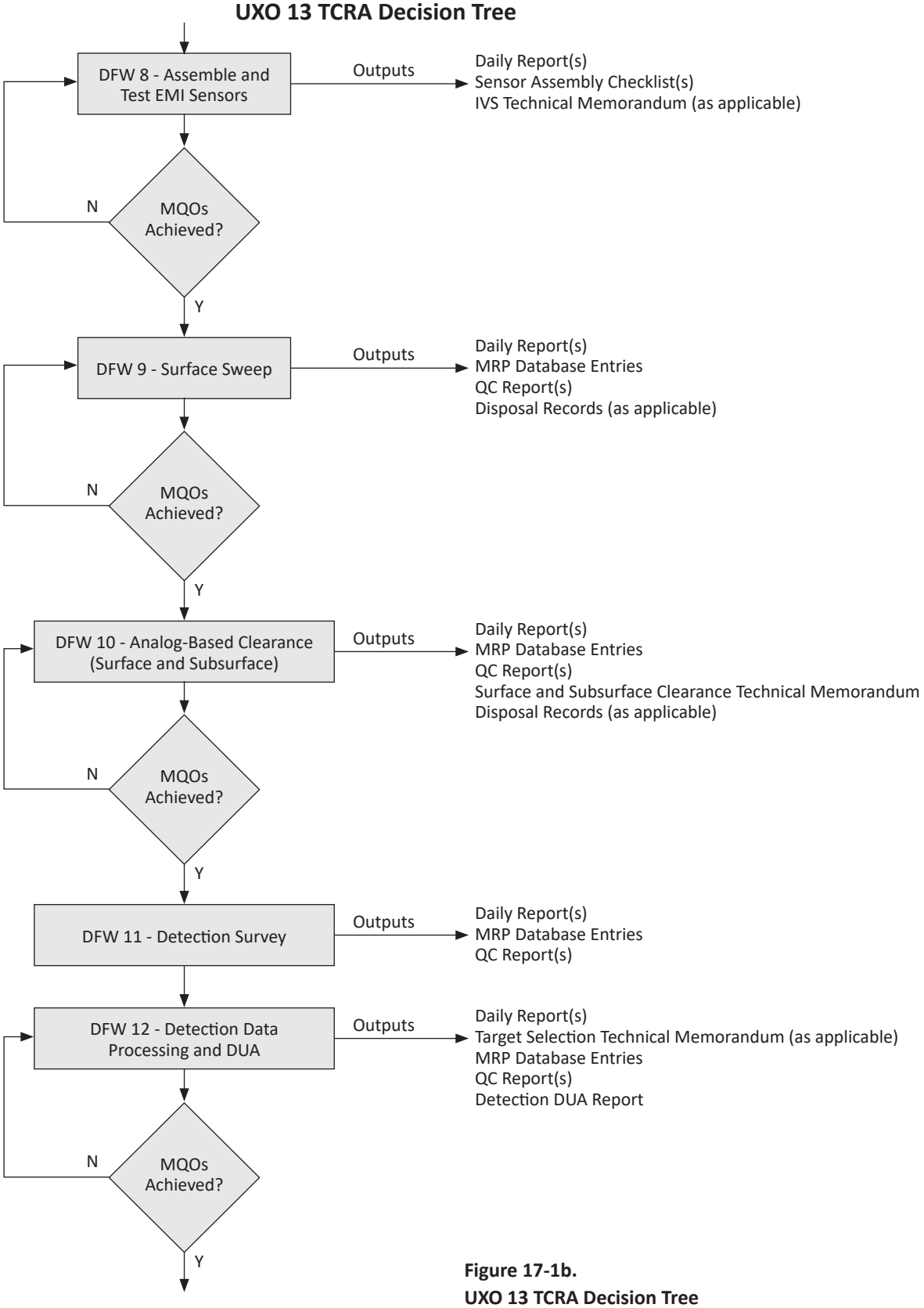


Figure 17-1b.
UXO 13 TCRA Decision Tree
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

Continues onto Figure 17-1c

Continued from Figure 17-1b

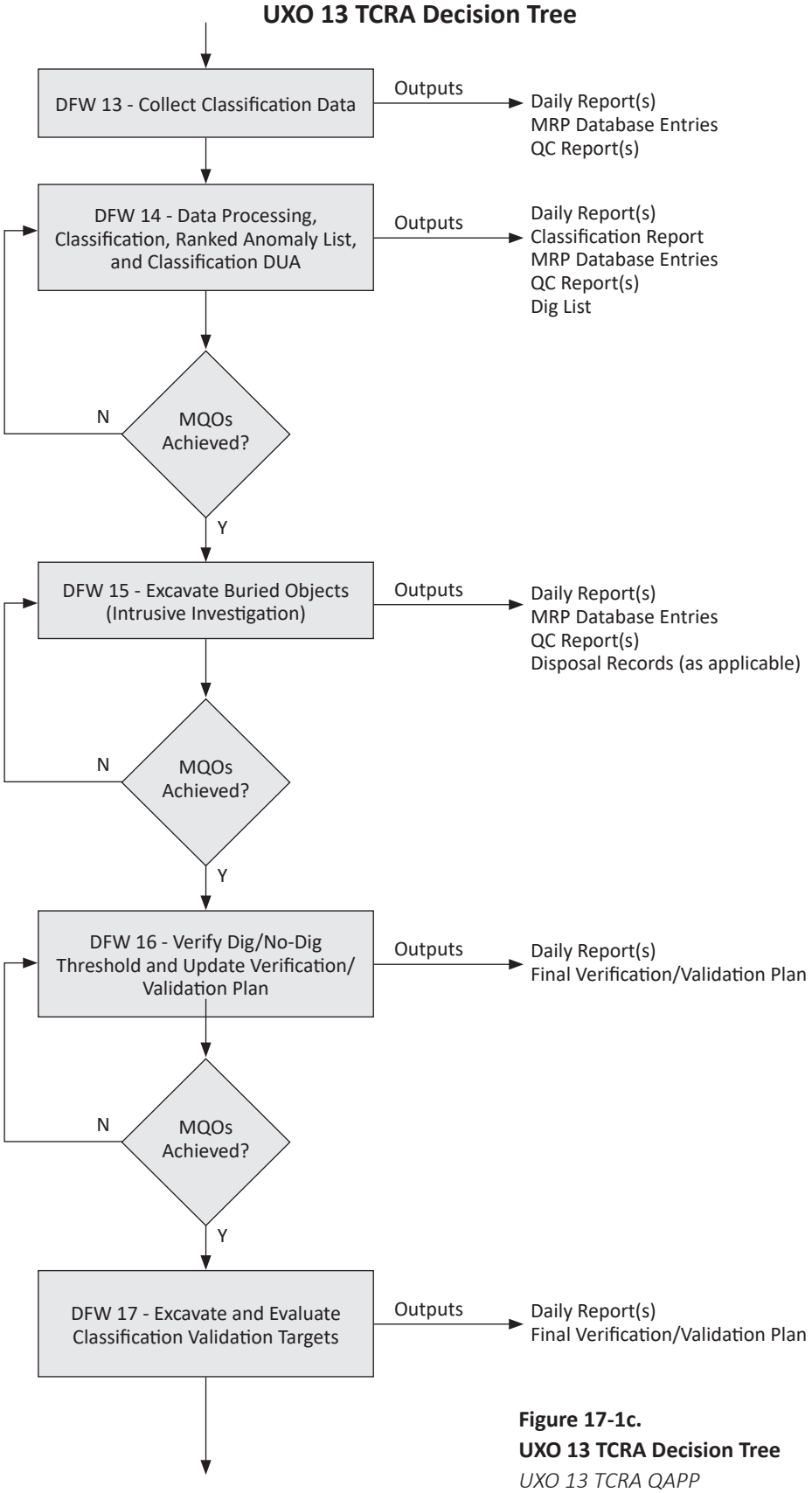


Figure 17-1c.
UXO 13 TCRA Decision Tree
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

Continues onto Figure 17-1d

Continued from Figure 17-1c

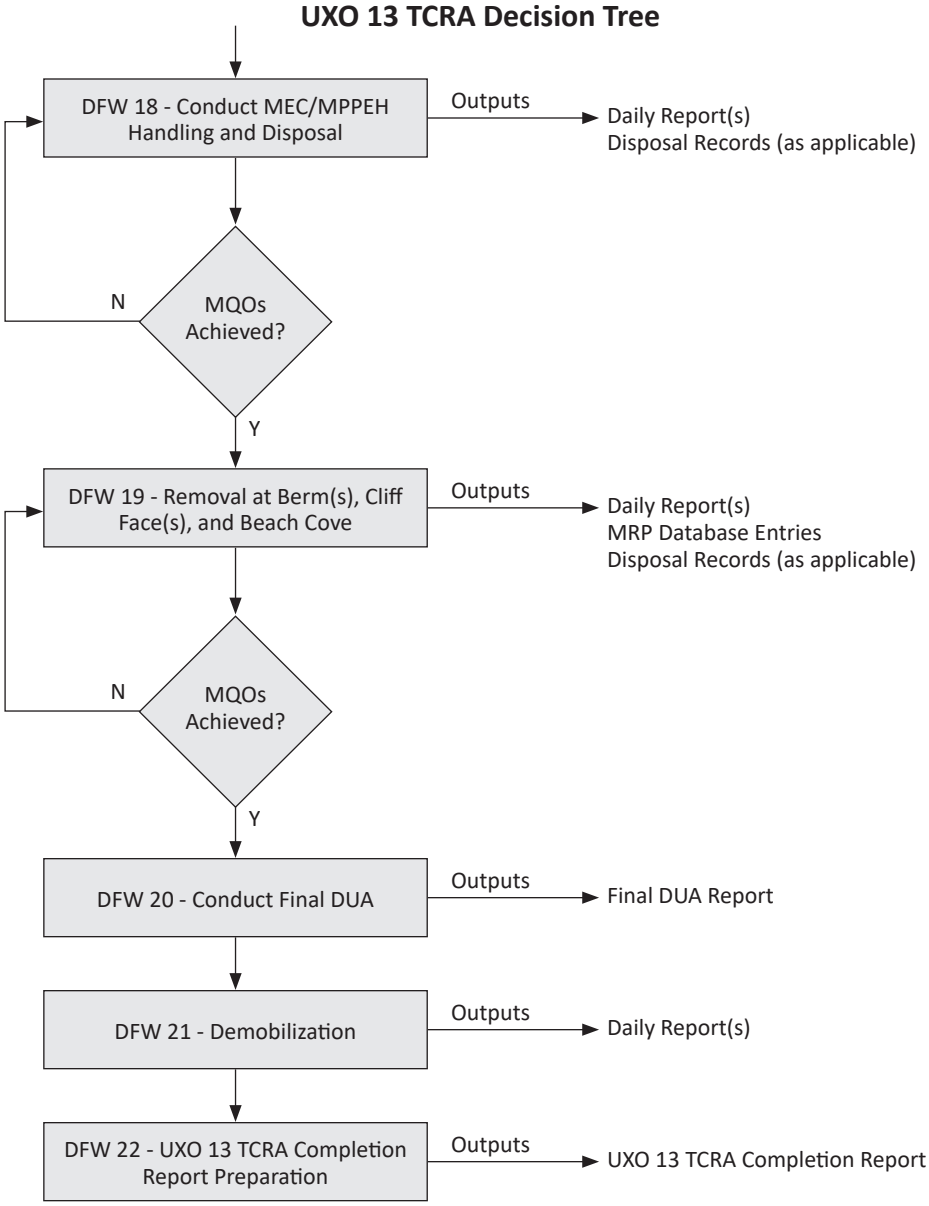
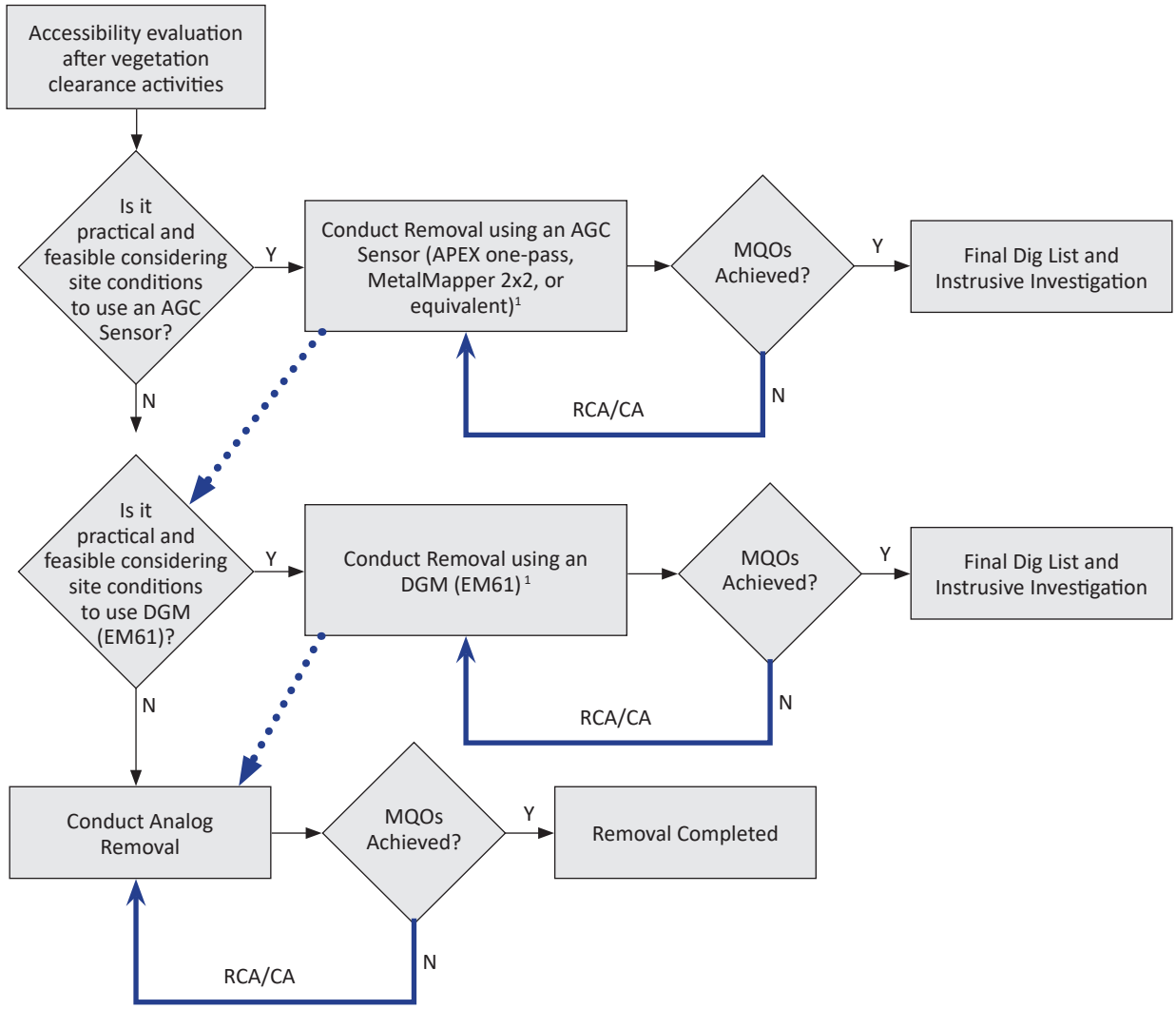


Figure 17-1d.
UXO 13 TCRA Decision Tree
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

Selection of Removal Methodology Decision Tree



Primary decision logic

Contingency decision logic (see footnote 1)

[1]: Should an issue arise (i.e., steep terrain, accessibility of sensor, etc.) in which the selected geophysical survey is unable to continue as started or intended the following will apply: an AGC survey would default to DGM. Should DGM not be able to be implemented, the removal will default to analog.

Figure 17-2.
Selection of Removal Methodology Decision Tree
UXO 13 TCRA QAPP
Former Vieques Naval Training Range
Vieques, Puerto Rico

This page intentionally left blank.

Worksheet #22: Equipment Testing, Inspection, and Quality Control

This worksheet documents the MQOs[15] and their respective acceptance criteria for the UXO 13 TCRA. For one-pass sensors or other DAGCAP validated sensors considered during drafting of the QAPP, the MQOs in the sensor specific SOPs or user's manuals will be included for evaluation of performance.

Table 22-1. Equipment Testing, Inspection, and Site Preparation

Measurement Quality Objective	MQO#	Frequency	Responsible Person/ Report Method/ Verified By	Acceptance Criteria	Failure Response[a]
Survey Control (loop closure)	SP1	At beginning of project	Project Geophysicist or Surveyor/ Surface Control Report/QC Geophysicist	All loop closures within 0.5 meters (m) (if established from existing monument(s)) Estimated accuracy from static GPS occupation calculations (e.g., OPUS) less than or equal to 0.5 meter (m)	RCA/CA: Reset survey monuments
Construct ITS: Verify As-built ITS Against Design Plans (analog sensors)	SP2	Once following ITS construction	SUXOS/Daily Report/UXOQCS	Seeds emplaced in accordance with DFW 4	RCA/CA: Make necessary changes to seeded items and re-verify
Construct IVS: Verify As-built IVS Against Design Plan (digital EMI sensors)	SP3	Once following IVS construction	Project Geophysicist/IVS Technical Memorandum/QA Geophysicist	Seed items emplaced in accordance with DFW 7	RCA/CA: Make necessary changes to seeded items and re-verify
Verify Correct Assembly (all sensors)	SP4	Once following assembly and after any changes to deployment assembly	Field Geophysicist/Instrument Assembly Checklist/Project Geophysicist	As specified in instrument assembly checklist and/or User's Manual	RCA/CA: Make necessary adjustments and re-verify
Initial Instrument Function Test (analog)	SP5	Beginning and end of each day of use and following instrument battery changes	SUXOS/Daily Report/UXOQCS	Audible response consistent with expected change in tone in presence of standard objects in the ITS	CA: If an instrument fails to detect the ISOs during function test, the instrument will be repaired or removed from service and replaced
Initial Instrument Function Test (EM61)	SP6	Once following assembly	Field Geophysicist/IVS Technical Memorandum/Project Geophysicist	Response (mean static spike minus mean static background) within 20 percent of predicted response	RCA/CA: Make necessary adjustments, and re-verify
Initial Instrument Function Test (AGC)	SP7	Once following assembly	Field Geophysicist/IVS Technical Memorandum/Project Geophysicist	Response (mean static spike minus mean static background) within 20 percent of predicted response for all Tx/Rx combinations	RCA/CA: Make necessary adjustments, and reverify
Initial Sensor Function Test: Five measurements over a small ISO80 target, one in each quadrant of the sensor and one directly under the center of the array; Derived polarizabilities for each measurement are compared to the library (AGC)	SP8	Once following assembly	Field Geophysicist/IVS Technical Memorandum and instrument assembly checklist/Project Geophysicist	Library match metric greater than or equal to 0.95 for each of the five sets of inverted polarizabilities	RCA/CA: Make necessary repairs/adjustments and re-verify

[15] The MQOs listed in this QAPP are appropriate for the anticipated geophysical sensors (i.e., AGC [APEX, MetalMapper 2x2] and DGM [EM61]).In the event a geophysical sensor is used that has specific MQOs not listed in this Worksheet (or the MQOs are different from those listed) the appropriate sensor specific MQOs will be reviewed and approved for use by the Project Geophysicist and the QC Geophysicist and will be provided as an appendix or attachment to the appropriate technical memorandum or report.

Worksheet #22: Equipment Testing, Inspection, and Quality Control (continued)

Table 22-1. Equipment Testing, Inspection, and Site Preparation

Measurement Quality Objective	MQO#	Frequency	Responsible Person/ Report Method/ Verified By	Acceptance Criteria	Failure Response[a]
Initial Detection Survey: Check for interference surrounding seed response (IVS) (all sensors)	SP9	Once prior to start of data acquisition	Project Geophysicist/IVS Memorandum/ QC Geophysicist	All seeds placed in locations that are free of detected anomalies within a radius of less than or equal to 1.5 m.	RCA/CA: and re-verify MQO
Initial Detection Survey Positioning Accuracy (IVS) (digital EMI sensors)	SP10	Once prior to start of data acquisition	Project Geophysicist/IVS Memorandum/ QC Geophysicist	Derived positions of IVS target(s) are within 0.25 m of the ground truth locations	RCA/CA: Make necessary adjustments, and re-verify
Initial Derived Polarizabilities Accuracy (IVS) (AGC)	SP11	Once during initial system IVS test	Project Geophysicist/IVS memorandum/ QC Geophysicist	Library match metric greater than or equal to 0.90 for each set of inverted polarizabilities	RCA/CA
Geodetic Equipment Function Test	SP12	Daily (RTK-GPS or SLAM) Each time equipment is moved (robotic total station [RTS])	Field Geophysicist/GIS data recorded/ Project/QC Geophysicist or designee	Measured position of control point within 0.10 m of ground truth	RCA/CA: Document questionable information in database
Surface Sweep: Documenting Recovered Surface MEC and Debris	SP13	Daily	UXOQCS/GIS data recorded/Project Geophysicist or designee	All metallic debris collected is counted and documented in the project database for the following attributes: designation as UXO, MD, RRD, or NMRD; UXO and MD described by type and weight. Photos displaying all MEC recovered (individual MD photos not necessary) are recorded.	RCA/CA: Document questionable information in database; justify safety concerns
Initial Equipment Warm-Up (EM61)	SP14	Following assembly and prior to initial testing	Field Geophysicist /Daily Report/Project Geophysicist	EM61 warm-up of at least 15 minutes	CA: Repeat any tests affected by inadequate warm-up time
Initial Cable Shake Test (EM61)	SP15	Once following assembly	Field Geophysicist/IVS Technical Memorandum/Project Geophysicist	No spikes or responses greater than +/-2 millivolts (mV) on target selection channel	RCA/CA CA assumption: Check cable connections and retest
Initial Personnel Test (EM61)	SP16	Once following assembly	Field Geophysicist/IVS Technical Memorandum/Project Geophysicist	No spikes or responses greater than +/-2 mV target selection channel	RCA/CA CA assumption: Check personnel for sources of interference (metal on their person, cell phones, etc.) and retest

Note:

[a] An RCA/CA is an internal investigation and assessment to identify the source of the nonconformance(s) or issue(s) resulting in the failure response as well as the corrective action to address this moving forward. Additionally, the RCA/CA process also addresses any data usability issues associated with the nonconformance. Rows in which an RCA/CA are listed with no additional actions are associated with MQOs in which the ultimate corrective actions are unknown until the RCAs are performed. Where specific corrective actions are provided in certain rows, it is because those corrective actions can be more easily determined (or assumed) based on the type of MQO.

Worksheet #22: Equipment Testing, Inspection, and Quality Control (continued)

Table 22-2. Detection Survey (AGC and DGM)

Measurement Quality Objective	MQO#	Frequency	Responsible Person/ Report Method/ Verified By	Acceptance Criteria	Failure Response
Geodetic Equipment Function Test	D1	Daily (RTK-GPS or SLAM) Each time equipment is moved (RTS)	Field Geophysicist/GIS data recorded/Project/ QC Geophysicist or designee	Measured position of control point within 0.10 m of ground truth	RCA/CA: Document questionable information in database
Ongoing Instrument Function Test (EM61)	D2	Beginning and end of each day	Field Geophysicist/Running QC Summary/ Project/QC Geophysicist or designee	Response (mean static spike minus mean static background within 20 percent of predicted response	RCA/CA: Make necessary repairs and reverify
Ongoing Instrument Function Test (AGC)	D3	Beginning and end of each day	Field Geophysicist/Running QC Summary/ Project/QC Geophysicist or designee	MetalMapper 2x2 and TEMSENSE: Response (mean static spike minus mean static background) within 20 percent of predicted response for all transmit/receive (Tx/Rx) combinations. APEX: For all channels tested, the response (mean static spike minus mean static background) is within 25 percent of reference response. Channels selected for testing will verify functionality of all 3 Tx coils and all 18 Rx coils. Others: as specified in SOP or User's Manual	RCA/CA: Make necessary repairs and reverify
Ongoing Detection Survey Positioning Precision (IVS) (digital EMI sensors)	D4	Beginning and end of each day	Field Geophysicist/Running QC Summary/ Project/QC Geophysicist or designee	Derived positions of IVS target(s) within 25 cm of the ground truth locations	RCA/CA
Ongoing Cable Shake Test (EM61)	D5	Beginning of each day	Project Geophysicist/Running QC Summary/ Project/QC Geophysicist or designee	No spikes or responses greater than +/-2 mV on target selection channel	RCA/CA CA assumption: Check cable connections and retest
Ongoing Personnel Test (EM61)	D6	Beginning of each day	Project Geophysicist/Running QC Summary/ Project/QC Geophysicist or designee	No spikes or responses greater than +/-2 mV on target selection channel	RCA/CA CA assumption: Check personnel for sources of interference (metal on their person, cell phones, etc.) and retest
Geodetic Accuracy (confirm valid position) (digital EMI sensors)	D7	Evaluated for each measurement	Field Geophysicist/GIS data recorded/ Project/QC Geophysicist or designee	GPS status flag indicates RTK fix (RTK-GPS) SLAM: per manufacturers specifications RTS passes Geodetic Function Test (RTS)	RCA/CA: Document questionable information in database
In-line Measurement Spacing (digital EMI sensors)	D8	Verified for each survey unit Geosoft's Sample Separation module (or equivalent) based upon data positions	Project Geophysicist/Running QC Summary/ QC Geophysicist	MetalMapper 2x2 and TEMSENSE: 100 percent ≤ 0.20 m between successive measurements APEX: 100 percent ≤ 0.2 m between successive measurements with mean ≤ 0.1 m EM61: 99 percent ≤ 0.25 m between successive measurements; 100 percent ≤ 0.40 m Other: Per SOP or User's Manual Coverage gaps are filled or adequately explained (e.g., unsafe terrain)	RCA/CA

Worksheet #22: Equipment Testing, Inspection, and Quality Control (continued)

Table 22-2. Detection Survey (AGC and DGM)

Measurement Quality Objective	MQO#	Frequency	Responsible Person/ Report Method/ Verified By	Acceptance Criteria	Failure Response
Coverage (digital EMI sensors)	D9	Per survey area	Project Geophysicist/Daily Report/ Project/QC Geophysicist or designee	MetalMapper 2x2 and TEMSENSE: 100 percent at 0.70 m spacing. APEX: 100 percent at 0.80 m spacing. EM61: 100 percent at 0.75 m spacing. Other: Per SOP or User's Manual. All: excludes site-specific access limitations, e.g., obstacles, unsafe terrain. Small "sliver" gaps will be inspected and if the response on transects surrounding the gap are sufficiently small that a TOI at the maximum detection depth could not possibly exist, the gap does not need to be filled. If the response on adjacent transects is large enough that a TOI could be present, the gap will be filled with another dynamic line or cued measurements.	RCA/CA: Coverage gaps are filled or adequately explained (for example, unsafe terrain)
Detection Survey Performance (digital EMI sensors)	D10	Blind QC seeds will be distributed such that each field team encounters an average of at least one seed per day Seeds to be placed throughout expected detection depth range	QC Geophysicist/Target Selection Technical Memorandum and Running QC Summary/ QA Geophysicist	AGC: All blind QC seeds must be detected and positioned within a 0.40 m radius of ground truth EM61: All blind seeds much be detected and positioned within a 0.75 m radius of ground truth	RCA/CA: Verify instrument is functioning correctly; if so, reduce threshold, or determine if item is buried too deep. If instrument is not functioning correctly, re-collect data.
Detection Survey Performance (digital EMI sensors)	D11	Blind validation seeds will be distributed such that each field team encounters an average of at least one seed per day	QA Geophysicist/Validation Seed Log	All blind validation seeds must be detected and positioned within a 0.40 m radius of ground truth	RCA/CA: Verify instrument is functioning correctly; if so, reduce threshold, or determine if item is buried too deep. If instrument is not functioning correctly, re-collect data.
Sensor Transmit (Tx) Current	DD12	Per measurement	Project Geophysicist/Running QC Summary/ QC Geophysicist	MetalMapper 2x2: Current must be ≥ 6 amperes All other sensors: As specified by the manufacturer	RCA/CA: Out-of-spec data rejected
Battery Voltage (digital EMI sensors)	DD13	Verify battery voltage is within operating specifications of sensor	Field Geophysicist/Running QC Summary/ Project Geophysicist	Voltage must be above manufacturer specifications	RCA/CA: Out of spec data rejected
Confirm Adequate Spacing Between Units (digital EMI sensors)	DD14	Evaluated at the start of each day or per grid	Field Geophysicist/Running QC Summary/ Project Geophysicist	Minimum separation of 100 m	RCA/CA: Re-collect all coincident measurements

Worksheet #22: Equipment Testing, Inspection, and Quality Control (continued)

Table 22-3. Cued Survey

Measurement Quality Objective	MQO#	Frequency	Responsible Person/ Report Method/ Verified By	Acceptance Criteria	Failure Response
Geodetic Equipment Function Test	C1	Daily (RTK-GPS or SLAM) Each time equipment is moved (RTS)	Field Geophysicist/GIS data recorded/ Project/QC Geophysicist or designee	Measured position of control point within 0.10 m of ground truth	RCA/CA: Document questionable information in database
Geodetic Accuracy (confirm valid position)	C2	Evaluated for each measurement	Field Geophysicist/GIS data recorded/ Project /QC Geophysicist or designee	GPS status flag indicates RTK fix (RTK-GPS) SLAM: per manufacture specifications RTS passes Geodetic Function Test (RTS)	RCA/CA: Document questionable information in database
Background Location Verification (five background measurements: one centered at the flag and one offset at least ¼ sensor spacing in each cardinal direction)	C3	Once per background location	Field Geophysicist/IVS Memorandum/ Project Geophysicist	A 37 mm projectile at 0.30-m (12 inches) bgs synthetically seeded in the data results in polarizabilities with a library match of ≥ 0.9	RCA/CA: Reject background location and find alternative
Ongoing Production Area Background Measurements	C4	Background data collected a minimum of every 1 hour for MetalMapper 2x2 and 2 hours for other sensors during production (or more frequently, per instrument-specific requirements)	Field Geophysicist/Field Log and Running QC Summary/ Project/ QC Geophysicist or designee	Background data from a verified location collected within 1 hour for MetalMapper 2x2 data and two hours for other equivalent sensors This may be adjusted downward based on assessment of sensor drift	RCA/CA: Document environmental changes; Project Geophysicist must approve before proceeding
Ongoing Production Area Background Measurements Confirm measurements are valid (MetalMapper 2x2 or equivalent)	C5	Evaluated for each background measurement over verified background locations	Project Geophysicist/Running QC Summary/ QC Geophysicist	All decay amplitudes qualitatively agree with the original and ongoing measurements at each location unless environmental changes that may have led to deviations are documented and approved by the QC Geophysicist	RCA/CA: Background measurement rejected and removed from active background measurements
Derived Target Position Precision (IVS)	C7	Beginning and end of each day as part of IVS testing	Project Geophysicist/Running QC Summary/ QC Geophysicist	All IVS items fit locations within 0.25 m of ground truth location	RCA/CA
Derived Polarizabilities Precision (IVS)	C8	Once before the start of data acquisition	Project Geophysicist/Running QC Summary/ QC Geophysicist	Library match to initial polarizabilities metric ≥ 0.9 for each set of three inverted polarizabilities	RCA/CA
Ongoing Instrument Function Test (instrument response amplitudes)	C9	Beginning and end of each day and each time instrument is turned on	Field Geophysicist/Running QC Summary/ Project/QC Geophysicist or designee	MetalMapper 2x2 and TEMSENSE: Response (mean static spike minus mean static background) within 20 percent of predicted response for all Tx/receive (Rx) combinations APEX: For all channels tested, the response (mean static spike minus mean static background) is within 25 percent of reference response. Channels selected for testing will verify functionality of all 3 Tx coils and all 18 Rx coils Other: Per SOP or Instrument Manual specifications	RCA/CA: Make necessary repairs and reverify
Cued Survey Coverage (APEX)	C10	All cued paths	Project Geophysicist/QC Database/ QC Geophysicist or designee	All flag locations > 1m from transect ends and located within 0.40 m of sensor center at the closest point of approach	Re-collect cued survey paths
Transmit Current Levels	C11	Evaluated for each sensor measurement	Field Geophysicist/Running QC Summary/ QC Geophysicist or designee	*MetalMapper 2x2*: Current must be ≥ 6 amperes For all other sensors: Per manufacturers specification	RCA/CA: Stop data acquisition activities until condition corrected

Worksheet #22: Equipment Testing, Inspection, and Quality Control (continued)

Table 22-3. Cued Survey

Measurement Quality Objective	MQO#	Frequency	Responsible Person/ Report Method/ Verified By	Acceptance Criteria	Failure Response
Valid Position Data	C12	Per measurement	Field Geophysicist/Running QC Summary/ Project/QC Geophysicist or designee	GPS status flag or SLAM metric indicates adequate positional data (for example, RTK fix GPS)	RCA/CA: Analyst reviews affected area, determines attitude (roll, pitch, yaw) of sensor during loss of GPS quality, and determines if interpolation across the gap is acceptable (up to 3 m) as long as the trend of the path and sample separation before/after/within the gap is still preserved
Valid Orientation Data	C13	Per measurement	Field Geophysicist/Running QC Summary/ Project/QC Geophysicist or designee	Orientation data reviewed and appear reasonable within bounds appropriate to site (e.g., roll and pitch < 15 degrees absolute value)	CA: Unreasonable data rejected, stop data acquisition until condition is corrected if persistent
Confirm All Cued Measurements Are Valid (APEX)	C14	Evaluated for each cued measurement taken with APEX	Project Geophysicist/QC Database/ QC Geophysicist	Ensure cued data can be leveled correctly (no artifacts) using local background response from each measurement.	RCA/CA: Re-collect cued transects that do not provide adequate background response
Confirm Response is Not Saturated (APEX)	C15	Evaluated for each cued measurement taken with APEX	Project Geophysicist/QC Database/ QC Geophysicist	Monitor for response clipping (identifiable as consecutive measurements of similar response [flat line] for individual Tx/Rx pair)	CA: Cued measurements exhibiting saturation will be classified as possible TOI. Re-collect cued measurement.
Confirm Adequate Spacing Between Units (all AGC sensors)	C16	Evaluated at start of each day (or grid)	Field Geophysicist/Field Logbook/ Project Geophysicist	Minimum separation of 100 m or as specified by the manufacturer	RCA/CA: Re-collect data
Confirm Inversion Model Supports Classification (AGC, 1 of 3)	C17	Evaluated for all models derived from a measurement (that is, single item and multi-item models)	Project Geophysicist/UX-Analyze Source Geosoft database/QC Geophysicist	Derived model response must fit the observed data with a fit coherence ≥ 0.8	CA: Target classified as inconclusive or recollected unless analyst can justify poor coherence (dynamic target looks like noise, pick on edge of anomaly, etc.)
Confirm Inversion Model Supports Classification (AGC, 2 of 3) (APEX excluded)	C18	Evaluated for derived target	Project Geophysicist/UX-Analyze Source Geosoft Database/QC Geophysicist	Fit location estimate of item ≤ 0.4 m from center of sensor	RCA/CA
Confirm Inversion Model Supports Classification (AGC, 3 of 3) (all AGC sensors)	C19	Evaluated for all seeds	QC Geophysicist/Seed Tracking Log/ Navy QA Geophysicist	100 percent of predicted seed positions (QC and validation) ≤ 0.25 m radially from known position (x, y) Z ≤ 0 .15 meter	RCA/CA
Confirm Re-acquisition GPS Precision (digital)	C20	Daily	Field Geophysicist/Daily QC Report/ Project Geophysicist	Control point positions repeatable to within 10 cm	RCA/CA
Classification performance (AGC)	C21	Evaluated for all seeds	QC Geophysicist/Seed Tracking Log/ QA Geophysicist	100 percent of QC and validation seeds classified as TOI and match classification response curve expectations for general size and shape	RCA/CA

Worksheet #22: Equipment Testing, Inspection, and Quality Control (continued)

Table 22-4. Surface and Subsurface Removal (Analog Clearance)

Measurement Quality Objective	MQO#	Frequency	Responsible Person/ Report Method/ Verified By	Acceptance Criteria	Failure Response
Survey Control (loop closure)	SR1	At beginning of project	Project Geophysicist or Surveyor/Surface Control Report/QC Geophysicist	All loop closures within 0.5 m (if established from existing monument(s)) Estimated accuracy from static GPS occupation calculations (e.g., OPUS) less than or equal to 0.5 m	RCA/CA: Reset survey monuments
Geodetic Function Test	SR2	Daily (RTK-GPS) Each time equipment is moved (RTS)	Field Team Leader/GIS Data Recorded/ Project/QC Geophysicist or designee	Measured position of control point within 0.10 m of ground truth	RCA/CA; Document questionable information in database
Placement of QC Seeds	SR3	Prior to survey unit production. Seeds placed at variable densities throughout survey units at 95-100 percent of reliable detection such that each team encounters at on average 10 seeds per day	UXOQCS/QC Seed Log/QC Geophysicist	All seeds recovered	RCA/CA
Placement of Validation Seeds	SR4	Prior to survey unit production. Seeds placed at variable densities throughout survey units at 95-100 percent of reliable detection such that each team encounters at on average 10 seeds per day	QA Contractor SUXOS/QA Seed Log/QA Geophysicist	All seeds recovered	RCA/CA
Survey Lane Spacing	SR5	Each grid or lot	UXOQCS/QC Summary/QC Geophysicist	Survey lanes are planned at 3 feet apart with a maximum allowable spacing of 5 feet	RCA/CA; Replace survey lanes
Ongoing Instrument Function Test	SR6	Beginning and end of each day and each time instrument is turned on	FTL/Daily Report/UXOQCS	Audible response consistent with expected change in tone in presence of standard objects in ITS	RCA/CA: Make necessary repairs and re-verify
Coverage	SR7	Verified for each defined survey area/gridblock	FTL/Daily Report/UXOQCS	GPS tracked locations to demonstrate that survey lanes were appropriately covered	RCA/CA
QC Survey of Surface and Subsurface Areas	SR8	Upon completion of surface MEC removal within each gridblock	SUXOS/Daily Report/UXOQCS	Approximate 10 percent coverage of the gridblock(s) inspected and no surface MEC is identified QC acceptance of gridblock	RCA/CA: Resurvey of all failed gridblock(s)
QA Survey of Surface and Subsurface Areas	SR9	Following QC surface and subsurface MEC removal acceptance for each gridblock	QA SUXOS/Daily Report/UXOQCS	Approximate 10 percent coverage of the gridblock(s) will be inspected by QA Contractor SUXOS and no surface or subsurface MEC is identified QA acceptance of gridblock	RCA/CA: Resurvey of all failed gridblock(s)
Seed Recovery	SR10	Survey unit	UXOQCS/QC Summary/QC and QA Geophysicists	100 percent of the QC and QA seeds recorded in the intrusive database	RCA/CA; Redo survey unit

Worksheet #22: Equipment Testing, Inspection, and Quality Control (continued)

Table 22-5. Intrusive Investigation

Measurement Quality Objective	DFW/SOP Reference	Frequency	Responsible Person/ Report Method/ Verified By	Acceptance Criteria	Failure Response
Geodetic Equipment Function Test	I1	Beginning and end of each day and each time instrument is turned on	FTL/Daily Report/UXOQCS	Measured position of control point within 10 cm of ground truth	RCA/CA: Make necessary repairs and re-verify
Geodetic Accuracy (confirm valid position)	I2	Evaluated for each measurement	FTL/Daily Report/UXOQCS	GPS status flag indicates RTK fix (RTK-GPS) SLAM: per manufacturer specifications RTS passes Geodetic Function Test	RCA/CA: Document questionable information in database
Anomaly Reacquisition	I3	Each target on the dig list	FTL/Project Geophysicist	RTK-GPS coordinates of placed pin flag is within ± 0.1 m of target location	RCA/CA: reacquire points that exceed acceptance criteria
Documenting Recovered Sources (all sensors)	I4	Daily	UXOQCS/GIS data recorded and Daily Report/ QC Geophysicist	All metallic debris collected documented for the following attributes: – Designation as MEC, MD, Seed, RRD or NMRD; MEC and MD described by type; weight; depth; and as TOI or non-TOI Photos displaying all MD recovered at each target location (individual MD photos not necessary), and photos showing all surfaces of each MEC are recorded	RCA/CA: Document questionable information in the database
Confirm Anomaly Resolution (EM61)	I5	Evaluated for all intrusive results	Project Geophysicist/Intrusive Database/ QC Geophysicist	Verification of anomaly footprint after excavation, using original instruments, confirms anomaly is resolved	RCA/CA
Confirm Derived Features Match Ground Truth (1 of 2) (AGC)	I6	Evaluated for all recovered items including seeds (applies only to single, compact objects [e.g., does not apply to a bed of nails or long wires])	Project Geophysicist/Running QC Summary or Intrusive Database/QC Geophysicist	100 percent of recovered item positions (excluding inconclusive category) less than or equal to 0.25 meter from predicted position (x, y) Recovered item depths are recorded within 0.15 m of predicted depth	RCA/CA
Confirm Derived Features Match Ground Truth (2 of 2) (AGC)	I7	Evaluated for all recovered items including seeds	Project Geophysicist/Running QC Summary or Intrusive Database/QC Geophysicist	Cued data analysis shows 100 percent of seeds and recovered items have polarizability parameters that are consistent with their actual size, shape/symmetry, and wall thickness	RCA/CA
Verification of TOI/Non-TOI Threshold (AGC)	I8	Dig 200 or 10 percent (whichever comes first) beyond the last recovered TOI on the ranked dig list for the total area where AGC is performed	Project Geophysicist/Running QC Summary or Intrusive Database/QC Geophysicist	100 percent of predicted non-TOI intrusively investigated qualitatively matches predicted size/shape and are non-TOI	RCA/CA: Adjust threshold
Classification Validation (AGC)	I9	Selection of 200 or 10 percent (whichever comes first) non-TOI for the total area where AGC is performed	QC Geophysicist/Verification and Validation/ QA Geophysicist	100 percent of predicted non-TOI intrusively investigated qualitatively matches predicted size/shape and they are not TOI	RCA/CA

Worksheet #29: Data Management, Project Documents, and Records

Part 1: Data Management Specifications

GIS Electronic File Management

A project-specific GIS will be established and maintained by the QA Contractor GIS Lead. This geodatabase will be used to store and manage all relevant geospatial-related project data and information. All geospatial data will conform to the FGDC Geospatial Positioning Accuracy Standards, "Part 2: National Standard for Spatial Data Accuracy" (FGDC, 1998) and "Part 4: Standards for Architecture, Engineering, and Construction, and Facility Management" (FGDC, 2002). Each GIS data set will be accompanied by metadata conforming to the FGDC Content Standard for Digital Geospatial Metadata and provided in a database that complies with the Spatial Data Standards for Facilities, Infrastructure, and Environment. An internet-based file sharing site will be established to provide NAVFAC personnel and stakeholders access to the database.

AGC Electronic File Management

AGC data files will be delivered to the QA Contractor in accordance with the requirements in Engineering Manual 200-1-15 (USACE, 2018). It is expected that all AGC data transfers will be accomplished via a secure, internet file sharing site. If the large size of the AGC data files makes the process untenable, the data may be transferred on an external hard drive or other digital media.

AGC detection data may be split or consolidated by transect/grid and/or survey unit for storage and target selection, although initial QC checks for all data, except for coverage, will be performed by date. Coverage QC will be performed for grids or entire survey units. Raw AGC cued data will be named by target ID; processed cued data will be organized, stored, and QC checked by date or survey unit.

For APEX data, the latest validated version of EMClass may be used for processing and interpreting APEX data. If the UltraTEM or other sensor provided by Black Tusk Geophysics is used, UXOLab may be used for processing and interpretation of AGC data. For other AGC sensors[16] the latest validated version of UX-Analyze will be used for data processing and interpretation. TOI libraries used for classification will be developed using the DoD-maintained library. The TOI library will be included in the data deliverables to document what library was used for classification.

Computer Files and Digital Data: All final document files, including reports, figures, and tables, will be submitted in electronic format as specified by the QA Contractor and NAVFAC. Data management and backup will be performed in accordance with QA contractor's documented quality system.

TOI Library: The most up-to-date version of the DoD TOI library at the time the classification process begins will be used for this project. The library may be augmented with data collected during previous projects. A site-specific library of polarizabilities for candidate munitions items identified in the CSM will be used as the primary means of classification. Intrinsic parameters of items listed in the CSM not confirmed to be in existing libraries will be derived from test measurements before the start of the classification process (if the items are available). TOI clusters and individual items identified via feature space analysis will be identified and may be considered TOI. The TOI library will be included in data deliverables.

In addition to comparison versus the site-specific CSM library, cued data may also be compared to the full augmented DoD TOI library containing polarizabilities for items not expected at the site if warranted. If a comparison against the full library is performed, close matches to items in the full DoD TOI library may be considered TOI.

[16] Excluding the UltraTEM.

Worksheet #29: Data Management, Project Documents, and Records (continued)

Part 2: Control of Documents, Records, and Databases

Table 29-1. Minimum Required Documents and Records

Document/Record	Purpose	Completion/Update Frequency	Format/Storage Location/Archive Requirements
TCRA QAPP	Integrates all technical and quality aspects for the lifecycle of the project, including planning, implementation, and assessment. Documents how QA and QC are applied to data collection operations to ensure that the results obtained will satisfy the stated performance objectives.	Will be completed prior to mobilization of surface clearance operations.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
ESS	Addresses hazards associated with the MEC removal and demolition operations.	Will be completed prior to mobilization.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
QC Seed Plan	Report providing details (types, quantities, depths, orientations, and locations) of QC seed placement within investigation area.	Provided during project planning process.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
QC Seeding Firewall Plan	Report outlining how QC seed ground truth information will be firewalled from production team members.	Provided and approved during project planning process.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
QC Seeding Report	Report summarizing QC seeding activities and providing the as-built details for all emplaced QC seeds. This should include a summary of surface seeding for the Surface Clearance Only Areas.	Once following completion of QC seeding activities. Will be provided to the QA within 30 working days following completion of QC seeding activities.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Validation Seed Plan	Report providing details (types, quantities, depths, orientations, and locations) of QA seed placement within investigation area.	Provided and approved during project planning process.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server

Worksheet #29: Data Management, Project Documents, and Records (continued)

Table 29-1. Minimum Required Documents and Records

Document/Record	Purpose	Completion/Update Frequency	Format/Storage Location/Archive Requirements
Validation Seeding Firewall Plan	Report outlining how QA seed ground truth information will be firewalled from production team members.	Provided and approved during project planning process.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Validation Seeding Report	Report summarizing QA seeding activities and providing the as-built details for all emplaced QA seeds.	Once following completion of QA seeding activities. A draft version will be completed within 30 working days following completion of QA seeding activities.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Daily Project Field Forms/Logbooks (digital copy of field logbook)	Hard copy of daily field notes for all teams (e.g., geophysical team, re-acquisition team, intrusive team, etc.).	Completed daily/end of day; relevant content included as part of Daily Report and/or TCRA Completion Report.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Daily Report	Documents all field activities to track the progress, activities, and data of each day's work.	Completed daily/end of day.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Photographic Documentation (as warranted)	Highlights and visually documents all important site features and field activities, to be later included as part of the photographic log for final reports.	Completed daily at end of day as part of Daily Report.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Instrument Assembly Checklists	Documents that SOPs were followed in the assembly of field equipment.	Completed during assembly.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
QC Seed Tracking Log	File tracking daily QC seed emplacement.	As needed based on actual QC seeding activities; information included in Daily Report and/or QC Report, as applicable.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Validation Seed Tracking Log	File tracking daily QA seed emplacement.	As needed based on QA seeding activities; information included in Daily	Digital/QA Contractor network and secure SharePoint library/Project file and computer server

Worksheet #29: Data Management, Project Documents, and Records (continued)

Table 29-1. Minimum Required Documents and Records

Document/Record	Purpose	Completion/Update Frequency	Format/Storage Location/Archive Requirements
		Report and/or TCRA Completion Report, as applicable	
Surface and Subsurface Clearance Technical Memorandum	Documents the surface and subsurface clearance activities, seeding results, items recovered, and performance against MQOs.	Completed after clearance activities and submitted 30 days following completion.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
IVS Technical Memorandum	Documents IVS construction, initial IVS performance, and results.	Completed after initial IVS performed and submitted one week following completion. Addendums completed on an as need basis as new IVSs are constructed or new sensors used.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Target Selection Technical Memorandum	Report documenting detection data collection, data processing, target selection, site noise, final target selection thresholds, and data QC. Should include results compared against MQOs outlined in QAPP or sensor-specific SOP.	Within 30 days of completion of survey unit.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Cued IVS Technical Memorandum	Documents pre-cued interrogation survey (AGC) IVS performance and results.	Completed after initial cued IVS.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Preliminary Ranked Dig List Final Ranked Dig List	Documents preliminary Prioritized Dig List and Final Prioritized Dig List for targets selected as TOIs and non-TOIs.	Completed 10 days following completion of a survey unit. Completed 20 days following completion of a survey unit.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Classification Report	Report documenting the classification process including data collection, data processing, development of the final ranked dig list, and data	Within 30 days of completion of survey unit.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server

Worksheet #29: Data Management, Project Documents, and Records (continued)

Table 29-1. Minimum Required Documents and Records

Document/Record	Purpose	Completion/Update Frequency	Format/Storage Location/Archive Requirements
	QC. Should include results compared against MQOs outlined in QAPP.		
Data Usability Assessments (i.e., detection, classification, and final DUA, as applicable)	Provides assessment of data usability at various stages of project.	Following completion of each phase of work. Within 30 days of completion of detection and/or classification work. Within 45 days following completion of all site survey activities.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Re-acquisition Results	GPS file or other document detailing re-acquisition of targets.	Daily as re-acquisition takes place.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
MRP Enterprise Database Update Forms (for all MEC/MD items) (I.e., Intrusive Investigation Results)	Documents the findings of each intrusive investigation to describe the quantity, depth, size, orientation, description of item, and other pertinent data related to the intrusive investigation.	Intrusive investigation results will be uploaded daily to a database.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Disposal Records (as applicable)	Documents the proper disposal of MEC/MPPEH	Completed as needed	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Field Audit Checklists (if performed)	Provides documentation that field audits have been completed.	Competed during field audits.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Final Data Archives	All project files will be maintained on the QA Contractor computer server as archives and stored for 3 years.	Pertinent data and documents will be transported to the final archives at the completion of the project.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server

Worksheet #29: Data Management, Project Documents, and Records (continued)

Table 29-1. Minimum Required Documents and Records

Document/Record	Purpose	Completion/Update Frequency	Format/Storage Location/Archive Requirements
Field Change Request Forms	Provides information on any changes to QAPP-documented approach for approval and documentation.	Completed on an as-needed basis.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Nonconformance, RCAs, and CARs	Documents any nonconformance and provides the root cause(s) of the nonconformance and any corrective actions required. Should also identify any data usability issues associated with the nonconformance.	Completed on an as-needed basis. Notification to QA contractor within 7 working days of discovery.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Raw Geophysical Data Packages	Provides "raw" (i.e., unprocessed) geophysical data as collected in the field.	Provided on a daily basis with Daily Report.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Processed Geophysical Data Packages (including course-over-ground)	Provides a complete record of the fully processed and corrected data including geophysical data, gridded data, QC test data, target selections, SRAs, data gap areas, etc.	Within 7 days following completion of each defined survey unit in conjunction with applicable Daily Report.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
Final Verification/Validation Plan	Documents that the AGC data meet the requirements and specifications and that the data collected fulfill the intended purpose.	Within 21 days following completion of AGC activities.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server
UXO 13 TCRA Completion Report	Provides documentation of the TCRA completion and achievement of objectives as defined in the QAPP.	Prepared and issued following TCRA completion in accordance with the document preparation timeline provided in the Vieques Site Management Plan for the associated fiscal year.	Digital/QA Contractor network and secure SharePoint library/Project file and computer server

Worksheet #31, 32 & 33: Assessments and Corrective Action

Three Phases of Control

The Munitions Removal and Geophysical Contractor UXOQCS and QC Geophysicist are responsible for verifying compliance with the QAPP through implementation of a three-phase control process, which ensures that project activities comply with the approved plans and procedures. The specific QC monitoring requirements for each DFW are discussed in the subsections that follow. This section specifies the minimum requirements that must be met and to what extent QC monitoring must be conducted and documented by the Munitions Removal and Geophysical Contractor UXOQCS. The Munitions Removal and Geophysical Contractor UXOQCS will ensure the three-phase control process is implemented for each DFW listed in Table 31-1. Each phase is considered relevant for obtaining necessary product quality. However, the preparatory and initial inspections are particularly invaluable in preventing problems. Work will not be performed on a DFW until the preparatory and initial phase inspections have been completed and any nonconformance issues are resolved.

Preparatory Phase Inspection

The Preparatory Phase comprises the planning and design process leading up to the actual field activities. The Munitions Removal and Geophysical Contractor UXOQCS will perform a Preparatory Phase inspection before beginning each DFW. The purposes of this inspection are to review applicable specifications and plans to verify that the necessary resources, conditions, and controls are in place and compliant before work activities start. The Munitions Removal and Geophysical Contractor UXOQCS or designee will review work plans and operating procedures. The Munitions Removal and Geophysical Contractor UXOQCS will verify that required plans and procedures have been approved and are available to the field staff; field equipment is appropriate, available, functional, and properly calibrated for its intended/stated use; staff responsibilities have been assigned and communicated; the staff members have the necessary knowledge, expertise, and information to perform their jobs; arrangements for support services have been made; training in accordance with the requirements of this QAPP has occurred; and the prerequisite mobilization tasks have been completed. The Munitions Removal and Geophysical Contractor UXOQCS will verify that lessons learned during previous similar work have been incorporated, as appropriate, into the project procedures to prevent recurrence of past challenges. Project personnel must correct or resolve discrepancies between existing conditions and the approved plans/procedures identified by the Munitions Removal and Geophysical Contractor UXOQCS during the Preparatory Phase inspection. The USAE UXOQCS or designee will verify that unsatisfactory and/or nonconforming conditions have been corrected in this QAPP before beginning work.

Initial Phase Inspection

The Initial Phase occurs at the startup of field activities associated with a specific DFW. At the onset of a particular DFW, the Munitions Removal and Geophysical Contractor UXOQCS will perform an Initial Phase inspection. The main objectives of the inspection are to check preliminary work for compliance with procedures and specifications, establish an acceptable level of workmanship, check for omissions, and resolve differences of interpretation. The Initial Phase inspection will also verify that the Site Safety and Health Plan adequately identifies all hazards associated with actual field conditions and promulgates the appropriate safe work practices. The inspection results will be documented by the Munitions Removal and Geophysical Contractor UXOQCS in the QC logbook and summarized in the QC report. Should results of the inspection be unsatisfactory, the Initial Phase will be rescheduled and performed again.

Worksheet #31, 32 & 33: Assessments and Corrective Action (continued)

Follow-up Phase Inspection

Completion of the Initial Phase of QC activity leads directly into the Follow-up Phase, which covers the routine day-to-day activities at the site. The Munitions Removal and Geophysical Contractor UXOQCS will perform a Follow-up Phase inspection at regular intervals while a particular DFW is performed. This inspection ensures continuous compliance and verifies an acceptable level of workmanship. The Munitions Removal and Geophysical Contractor UXOQCS will monitor onsite practices and operations taking place and verify continued compliance with the specifications and requirements of this QAPP. Discrepancies between site practices and approved plans/procedures will be resolved, and corrective actions for unsatisfactory and nonconforming conditions or practices will be resolved by the Munitions Removal and Geophysical Contractor UXOQCS or designee before continuing work.

Additional Inspections

Additional inspections performed on a particular DFW may be required at the discretion of the Navy, QA Contractor, the Munitions Removal and Geophysical Contractor PM, the Munitions Removal and Geophysical Contractor SUXOS, the Munitions Removal and Geophysical Contractor UXOQCS, or other supervisory personnel as appropriate. Additional preparatory and initial inspections would be warranted under the following conditions: unsatisfactory work, as determined by QA Contractor or Navy; changes in key personnel; resumption of work after a substantial period of inactivity (2 weeks or more); or changes to the project scope of work. These additional inspections will be documented on the appropriate inspection checklist forms and in the QC logbook.

Final Phase Inspection

The Final Phase inspection is performed upon conclusion of the DFW and before closeout to verify that project requirements relevant to the particular DFW have been satisfied. The Final Phase inspection results will be documented in a checklist or the TCRA Completion Report. Outstanding and nonconforming items will be identified and documented.

Worksheet #31, 32 & 33: Assessments and Corrective Action (continued)

Table 31-1. Assessments and Corrective Action

Assessment Type	Three Phases of Control	Schedule/Frequency	Responsible Party	Assessment Deliverable	Deliverable Due Date	Responsible for Responding to Assessment Findings	Assessment Response Documentation and Timeframe
Planning Documents – Remedial Action Work Plan (including this QAPP), ESS, QC Seeding Firewall Plan, QC Seeding Plan, QA Seeding Firewall Plan, QA Seeding Plan	Preparatory	Finalization approximately one month prior to the TCRA activities/Once	QA Contractor/Munitions Removal and Geophysical Contractor	Final documentation approval from interagency team	Prior to mobilization	QA Contractor/Munitions Removal and Geophysical Contractor	Email or other written communication within approximately one month of mobilization
GIS and Data Management Systems Establishment	Preparatory	Finalization approximately one month prior to the TCRA activities/Once	QA Contractor/Munitions Removal and Geophysical Contractor	GIS Database with specific project folders Electronic forms and platform establishment for Data Management System	Prior to mobilization	QA Contractor/Munitions Removal and Geophysical Contractor	Email or other written communication within approximately one month of mobilization
Establishment of Gridblocks	Initial/Follow-up	Prior to and during TCRA activities/Once and then as required	QA Contractor/Munitions Removal and Geophysical Contractor	Daily Report, email, or other documentation	Prior to start of the TCRA activities within a given area	QA Contractor/Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 3 days
GPS Function Test	Initial/Follow-up	Daily/when used	Munitions Removal and Geophysical Contractor	Daily Report	Daily	Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 3 days
Coordination with USFWS	Preparatory	Finalization approximately one month prior to TCRA activities within the planned land use areas/Once	USFWS and QA Contractor	Formal email confirmation from USFWS	Prior to mobilization	QA Contractor	Email or other written communication within approximately one month of mobilization
Vegetation Clearance	Initial/Follow-up	Prior to the start of TCRA activities within a given area/As required	Munitions Removal and Geophysical Contractor	Daily Report	Daily (when applicable)	Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 3 days
ITS Construction	Initial/Follow-up	Prior to the start of TCRA activities/Once	Munitions Removal and Geophysical Contractor	Daily Report	Prior to the start of TCRA activities	Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 3 days
Analog Function Test	Initial/Follow-up	Twice daily/As required	Munitions Removal and Geophysical Contractor	Daily Report	Daily	Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 3 days
Surface and Subsurface MEC Removal Completion per Survey Area	Initial/Follow-up/Final	Once/until QA acceptance	QA Contractor (ensuring removal was completed in accordance with verification and validation requirements)/ Munitions Removal and Geophysical Contractor	Daily Report; Surface and Subsurface Technical Memorandum	Daily for Daily Reports and within 20 days for the Surface and Subsurface MEC Removal Technical Memorandum	QA Contractor (ensuring data are of sufficient quantity and quality to achieve the associated objectives and any findings have been adequately addressed)/Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 3 days

Worksheet #31, 32 & 33: Assessments and Corrective Action (continued)

Table 31-1. Assessments and Corrective Action

Assessment Type	Three Phases of Control	Schedule/Frequency	Responsible Party	Assessment Deliverable	Deliverable Due Date	Responsible for Responding to Assessment Findings	Assessment Response Documentation and Timeframe
MEC/MD Removal (including munitions management, demolition, and demilitarization)	Initial/Follow-up/Final	When encountered or reported/Each occurrence	Munitions Removal and Geophysical Contractor	Daily Report, Disposal Records	Daily (when required)	Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 3 days
Surface/Subsurface QC Seeding	Initial/Follow-up/Final	Prior to TCRA activities/As required	Munitions Removal and Geophysical Contractor	QC Seeding Report, Daily Report	Within 20 days of completion of subsurface QC seeding, daily	Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 3 days
Surface/Subsurface QA Seeding	Initial/Follow-up/Final	Prior to TCRA activities/As required	QA Contractor	UXO 13 Completion Report (includes QA Seeding Report)	Completion of TCRA activities	QA Contractor (for confirming QA seeding was done in accordance with Validation Seeding Plan)/Munitions Removal and Geophysical Contractor (for addressing QA seed failures)	Email or other written communication within approximately 60 days of receipt of draft UXO 13 Completion Report
Geophysical Sensor Assembly - AGC/DGM	Initial/Follow-up/Final	Prior to TCRA activities/ Once	Munitions Removal and Geophysical Contractor	Daily Report	Day of completion	Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 3 days
Geophysical Sensor Function Test	Initial/Follow-up/Final	Twice daily/As required	Munitions Removal and Geophysical Contractor	Daily Report	Daily	Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 3 days
IVS Construction	Initial/Follow-up/Final	Prior to TCRA activities/ Once	Munitions Removal and Geophysical Contractor	IVS Technical Memorandum	Within 10 days of construction and initial dynamic survey	Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 3 days
IVS Surveys	Initial/Follow-up/Final	Daily/As required	Munitions Removal and Geophysical Contractor	IVS Technical Memorandum, Daily Reports	Within 10 days of construction and initial dynamic survey, Daily Reports	Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 3 days
Geophysical Surveys	Initial/Follow-up/Final	Daily/As required	QA Contractor (ensuring geophysical survey was completed in accordance with QAPP)/Munitions Removal and Geophysical Contractor	Daily Reports, Target Selection Technical Memorandum, DUA Report (Detection Phase), Classification Report, DUA Report (Cued Phase), DUA Report	Daily, within 30 days of data collection and processing	QA Contractor (ensuring data are of sufficient quantity and quality to achieve the associated objectives and any findings have been adequately addressed)/Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 7 days
Intrusive Investigations	Initial/Follow-up/Final	Daily/As required	QA Contractor (ensuring removal was completed in accordance with verification and validation requirements)/ Munitions Removal and Geophysical Contractor	Daily Reports, TCRA Completion Report	Daily, within 90 days of completion of focused MEC removal activities	QA Contractor (ensuring data are of sufficient quantity and quality to achieve the associated objectives and any findings have been adequately addressed)/Munitions Removal and Geophysical Contractor	Email or other written communication within approximately 60 days

Worksheet #35: Data Verification, Validation, and Validation Procedures

The draft Verification and Validation Plan is included as Attachment C to this QAPP. The draft Verification and Validation Plan describes how each of the decision-making thresholds for detection and classification will be tested and identifies how anomalies will be selected for the threshold verification and classification validation. It addresses the detection threshold, classification verification and classification validation. The number, type, and placement of QC seeds depend on the project-specific DQOs. The final number and distribution of threshold verification targets and classification validation targets depends on the DQOs, as well as actual performance in the field against established MPCs. For this reason, the validation approach evolves as the project is implemented.

Worksheet #35: Data Verification, Validation, and Validation Procedures (continued)

Table 35-1. Data Verification and Validation Procedures

Activity and Records Reviewed	Requirements/ Specifications	Process Description/Frequency	Responsible Person	Documentation
Geophysical Field Logbook/Digital Forms/Running QC Summary	QAPP/SOPs	All information is complete for each day of field activities. Any changes/exceptions are documented and reported in accordance with requirements. Required signatures are present.	Munitions Removal and Geophysical Contractor Project Geophysicist	Survey123 forms, daily data upload with notes, QC summary
Analog Equipment-supported Activities	QAPP/SOP	Operations supported by analog equipment (i.e., all-metals detector) have been conducted according to QAPP and SOP All specifications have been achieved, or exceptions noted. If appropriate, corrective actions have been completed. Signatures and dates are present.	SUXOS/Munitions Removal and Geophysical Contractor QC Manager	Daily logbook, Surface and Subsurface Clearance Technical Memorandum, UXO 13 TCRA Completion Report
QC Seeding	QAPP/SOP	QC seeding has been conducted according to QAPP and SOP (see requirements/specifications). All specifications have been achieved, or exceptions noted. If appropriate, corrective actions have been completed. Signatures and dates are present.	SUXOS/ Munitions Removal and Geophysical Contractor QC Manager	QC seeding log files, QC Seeding Plan, QC Seeding Report
Instrument Assembly	QAPP/SOP	Instrument assembly completed according to sensor specific SOP. MQOs have been achieved, with any exceptions noted. If appropriate, corrective actions have been completed. Signatures and dates are present. Required photographs taken.	Munitions Removal and Geophysical Contractor Field Geophysicist/ Munitions Removal and Geophysical Removal Contractor Project Geophysicist	Instrument assembly checklist, IVS Technical Memorandum
ITS Construction and Testing	QAPP/SOPs	ITS constructed per QAPP specifications. Analog sensors tested at frequency required for activities being supported.	Munitions Removal and Geophysical Contractor Field Geophysicist/Munitions Removal and Geophysical Removal Contractor Project Geophysicist	Field logbook and Surface and Subsurface MEC Removal Technical Memorandum

Worksheet #35: Data Verification, Validation, and Validation Procedures (continued)

Table 35-1. Data Verification and Validation Procedures

Activity and Records Reviewed	Requirements/ Specifications	Process Description/Frequency	Responsible Person	Documentation
Initial IVS Survey	Worksheet #22, SOPs	Initial IVS survey has been conducted according to appropriate SOPs (see requirements/specifications). Checklists have been completed. All specifications have been achieved, or exceptions noted. If appropriate, corrective actions have been completed. Signatures and dates are present.	Munitions Removal and Geophysical Contractor Field Geophysicist/Munitions Removal and Geophysical Removal Contractor Project Geophysicist	SOP checklists provided in process description, 123Survey report
Detection Surveys	QAPP/SOPs	Detection survey has been conducted according to the QAPP and appropriate SOPs (see requirements/ specifications). Checklists have been completed. All specifications have been achieved, or exceptions noted. If appropriate, corrective actions have been completed. Signatures and dates are present.	Munitions Removal and Geophysical Contractor Field Geophysicist/Munitions Removal and Geophysical Removal Contractor Project Geophysicist	SOP checklists specified in process description, Survey123 reports, Target Selection Technical Memorandum, Detection DUA Report
Classification Survey	QAPP/SOPs	Classification survey has been conducted according to the QAPP and appropriate SOPs (see requirements/ specifications). Checklists have been completed. All specifications have been achieved, or exceptions noted. If appropriate, corrective actions have been completed. Signatures and dates are present.	Munitions Removal and Geophysical Contractor Field Geophysicist/Munitions Removal and Geophysical Removal Contractor Project Geophysicist	SOP checklists specified in process description, Survey123 reports, Classification Report, Classification DUA Report

Worksheet #35: Data Verification, Validation, and Validation Procedures (continued)

Table 35-1. Data Verification and Validation Procedures

Activity and Records Reviewed	Requirements/ Specifications	Process Description/Frequency	Responsible Person	Documentation
Target Re-acquisition	QAPP/SOPs	Target re-acquisition has been conducted according to the QAPP and appropriate SOPs (see requirements/ specifications). Checklist have been completed. All specifications have been achieved, or exceptions noted. If appropriate, corrective actions have been completed. Signatures and dates are present.	Munitions Removal and Geophysical Contractor Field Geophysicist/Munitions Removal and Geophysical Removal Contractor Project Geophysicist/SUXOS	SOP checklists specified in process description, MRP Enterprise, UXO 13 TCRA Completion Report
Intrusive Investigation	QAPP/SOPs	Intrusive investigation has been conducted according to the QAPP, appropriate SOPs, and safety documents. All specifications have been achieved, or exceptions noted. If appropriate, corrective actions have been completed. Signatures and dates are present.	SUXOS	Lot sheets, MRP Enterprise, final DUA Technical Memorandum, UXO 13 TCRA Completion Report

Worksheet #37: Data Usability Assessment

This worksheet documents procedures to be used to perform a DUA. A DUA will be performed at the end of each phase of investigation, including detection, classification, and intrusive investigation. The DUA involves a qualitative and quantitative evaluation of the collected data to determine if the project data are of the right type, quality, and quantity to support the decisions that need to be made. It involves a retrospective review of the systematic planning process to evaluate whether underlying assumptions are supported, sources of uncertainty have been managed appropriately, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence.

Personnel (Organization and Position/Title) Responsible for Participating in the DUA[17]

- QA Contractor, Dennis Ballam, Project Manager
- QA Contractor, Jeff McCauley, Munitions Response Safety and QAO
- QA Contractor, Brett Doerr, Project Delivery and Quality Manager
- QA Contractor, Jennifer Weller, Geophysical QAO
- Munitions Removal and Geophysical Contractor, Bob Hannan, Project Manager
- Munitions Removal and Geophysical Contractor, Al Crandall, Geophysical QC Manager
- Munitions Removal and Geophysical Contractor, Ric MacNeil, Project Geophysicist

Note: NAVFAC and regulatory personnel involvement in the DUA is done at the TCRA Completion Report review stage.

Documents Used as Input to Each Phase of the DUA

- Contract Specifications
- QAPP
- Final Verification and Validation Results (see Worksheet #35)
- Weekly and Daily QC Reports, as applicable
- Reports and Technical Memoranda (listed in Worksheet #14 & 16)
- Nonconformance/RCA/CA Reports
- QC and QA Seeding Technical Memoranda
- IVS Memoranda
- Target Selection Technical Memoranda
- Site-specific Library
- Classification Report
- Ranked Target Dig List (AGC); Dig List (EM61)
- Surface and Subsurface Technical Memoranda
- Intrusive investigation results

[17] As of preparation of this QAPP; any individual may be substituted with another qualified individual during implementation of this QAPP.

Worksheet #37: Data Usability Assessment (continued)

How will the Geophysical DUA be Documented?

The detection and classification survey DUAs will be documented in a detection survey DUA report and classification survey DUA report[18], respectively. The final DUA report will be included as an appendix to the UXO 13 TCRA Completion Report.

Data usability will be discussed in the DUA Report, which will contain sufficient documentation to support conclusions of the DUA. The following steps describe the documentation and processes to be used during the geophysical DUA and notes how DUA results will be presented so they identify trends, relationships (correlations), and anomalies. Field geophysical personnel will submit geophysical field data to the Processing Geophysicist for initial QC verification and processing. The QC Geophysicist will review the data and submit them as deliverables. Copies of original paper forms, if any, will be maintained onsite for reference, and the originals will be forwarded to the data coordinator for review, inclusion in the project database, and final storage in the central project files. The minimum documents used as inputs to the DUAs are listed previously.

Table 37-1. Data Usability Assessment and Documentation

Step 1	Review the project's objectives and sampling design. Are underlying assumptions in the initial CSM valid? Review the data quality objectives. 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 sampling design and describe their impacts on the data quality objectives.
Step 2	Review the data verification/validation outputs and evaluate conformance to MPCs documented on Worksheet #12. 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. For any nonconformances, was the RCA/CA effective? Evaluate conformance to MPCs documented on Worksheet #12. Summarize the impacts of nonconformances on data usability. Evaluate data completeness. Identify data gaps (i.e., data inputs that have not been satisfied) and summarize their impact on the DQOs.

[18] If one-pass technology is used only a classification DUA is required, it should include any required elements related to detection.

Worksheet #37: Data Usability Assessment (continued)

Table 37-1. Data Usability Assessment and Documentation

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. Determine whether the data are suitable for proceeding to next phase of the project. Update the CSM, apply decision rules, and draw conclusions.
Step 4	Document lessons learned and make recommendations. Summarize lessons learned and make recommendations for changes to DQOs or the sampling design for the next phase of investigation or future investigations. Prepare the data usability summary report.

This page intentionally left blank.

References

CH2M HILL, Inc. (CH2M). 2006. *Munitions and Explosives of Concern (MEC) Master Work Plan, Former Vieques Naval Training Range (VNTR), Vieques, Puerto Rico*. December.

CH2M. 2008. *Work Plan for Munitions and Explosives of Concern Subsurface Interim Removal Action Beaches and Select Roadways. Former Vieques Naval Training Range (VNTR) and Former Naval Ammunition Support Detachment (NASD) Solid Waste Management Unit 4, Vieques, Puerto Rico*. October.

CH2M. 2010. *Expanded Range Assessment/Site Inspection Report, Former Vieques Naval Training Range (VNTR), Vieques, Puerto Rico.* September.

CH2M. 2012. *Non-Time-Critical Removal Action Work Plan Munitions Response Site UXO-13. Former Atlantic Fleet Weapons Training Area, Vieques, Puerto Rico*. February.

CH2M. 2019. *UXO 13 Non-Time-Critical Removal Action After Action Report, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico*. March.

CH2M. 2020a. *Public Use Beaches Explosives Safety Submission, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico.* February.

CH2M. 2020b. *UXO 13 Remedial Investigation/Feasibility Study Report, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico*. Draft. May.

Department of Defense (DoD). 2011. *DoD Defense Demilitarization: Procedural Guidance.* Number 4160.28, Volume 3. June 7.

Department of Defense Explosives Safety Board (DDESB). 2020. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities.* Technical Paper 18, Revision 1. 24 June.

Environmental Protection Agency (EPA). 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4. EPA/240/B-06/001. February.

Federal Geographic Data Committee (FGDC). 1998. *Geospatial Positioning Accuracy Standards, Part 2: Standards for Geodetic Networks*. FGDC-STD-0007.2-1998. Federal Geodetic Control Subcommittee, Federal Geographic Data Committee.

FGDC. 2002. *Geospatial Positioning Accuracy Standards, Part 4: Standards for Architecture, Engineering, Construction (A/E/C) and Facility Management*. FGDC-STD-007.4-2002. Facilities Working Group, Federal Geographic Data Committee.

Goodwin, R. Christopher & Associates, Inc. (Goodwin). 1998. *Phase I Cultural Resource Survey of Agricultural Lease Areas in the Vicinity of Vieques Airport, Naval Facilities Vieques Island Naval Station Roosevelt Roads, Vieques, Puerto Rico.* April 10.

Intergovernmental Data Quality Task Force (IDQTF). 2023. *Uniform Federal Policy for Quality Assurance Project Plans, Munitions Response QAPP Toolkit, Module 2: Remedial Action.* March.

Naval Facilities Engineering Command (NAVFAC). 2003a. *Environmental Baseline Survey, Vieques Naval Training Range, Vieques Island, Puerto Rico.* Draft Final Report. 1 April.

NAVFAC. 2003b. *Preliminary Range Assessment Report, Vieques Naval Training Range, Vieques Island, Puerto Rico*. Final Draft. April.

Naval Sea Systems Command (NAVSEA). 2023. *Ammunition and Explosives Safety Ashore: Safety Regulations for Handling, Storing, Production, Renovation, and Shipping of Ammunition and Explosives Ashore. Ordnance Pamphlet 5. Eighth Revision.*

United States Army Corps of Engineers (USACE). 2018. *Engineer Manual No. 200-1-15, Environmental Quality Technical Guidance for Military Munitions Response Actions.* 30 October.

Attachment A
Munitions Removal and Geophysical Contractor Standard Operating Procedures

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

LEASED AND RENTAL VEHICLES

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Explosives Safety Submission (ESS) – current version
- Applicable sections of DOT, 49 CFR Parts 100 to 199, Transportation
- Vehicle owner's manual
- Leasing/Rental agreement
- Administrative Policies
- USA Drug Free Workplace Policy.

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

This space is intentionally left blank.

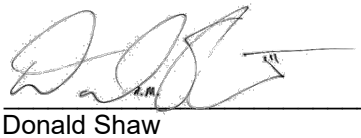
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

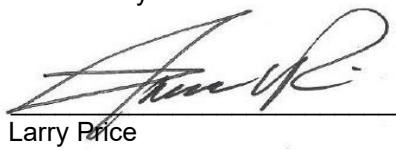
Developed by:



Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date:

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

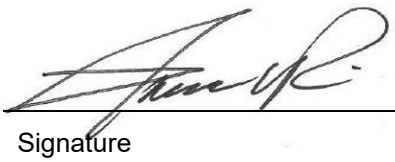
This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's or Operator's	Worker's or Operator's Signature	Supervisor's Name	Supervisor's Signature	Date

This page is intentionally left blank.

8. PROCEDURES

The following USA policies and/or procedures will be used by personnel utilizing leased or rental vehicles for project purposes in accordance with USA's Drug-Free Work Place Policy. Personnel are reminded to obey and observe all applicable Federal, State, and Local traffic laws, regulations or guidance, as well as contractual restrictions and requirements imposed by the leasing or rental company.

Rental vehicles are to be used for the purpose of transporting project personnel and equipment to and from work locations and other authorized locations or facilities. The driver of any rental vehicle may be liable for damages in the event that vehicle damage is incurred and it is determined that the driver has not complied with this SOP.

All vehicles will have a copy of this SOP, Vehicle Inspection Forms, Accident/Incident Report forms, and a list of project contact phone numbers, as well as all safety-related equipment (fire extinguisher, First Aid kit, etc.). A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

8.1 Requirements

Personnel assigned project vehicles must be listed on the Authorized Drivers List and be legally permitted to operate the assigned vehicle. Personnel assigned project vehicles are responsible for maintaining positive control of keys. Personnel not assigned project vehicles may not use a vehicle unless specifically authorized by the Project Manager. The Project Manager may delegate this authority to the Site Manager/SUXOS under special circumstances.

Personnel utilizing leased or rental vehicles will comply with the following:

- Only properly licensed personnel will operate vehicles.
- Operators will obey and observe all applicable traffic laws.
- Operators will be familiar with the vehicle in use.
- Operators will observe the cautions and warnings located in the owner's manual.
- Operators will be familiar with accident reporting procedures.
- Operators will perform daily inspections of vehicles.
- Operators will report all unsafe or defective conditions found.
- Unsafe conditions will be corrected prior to vehicle use.
- Vehicles will be maintained in a clean and serviceable condition.
- Rental/lease contractual requirements will be followed.
- Completion of a Vehicle Liability Form for USA's records.

8.2 Procedures

The procedures listed below are to be followed by personnel receiving, using, and returning leased or rental vehicles.

- Receiving – Personnel responsible for receiving leased or rental vehicles are to ensure that:
  - Vehicle documentation is accurate and complete, with proper signatures.
  - Contract documents accurately reflect mileage, fuel level, and overall vehicle condition including any exterior or interior damage.
  - Operators are properly licensed.
  - Vehicle is clean and in a serviceable condition.
  - Vehicle has all required safety/spare equipment.
  - Owner's/operator's manual is on hand.
  - Copy of lease or rental contract is in vehicle.

- Perform an inspection of the vehicle prior to acceptance. Note all damage on the rental contract inspection sheet and obtain a copy of it. When renting work vehicles, take photos of all damage present on the vehicle upon delivery.
- Use "Lower Option" vehicle if available (e.g., vinyl instead of cloth or leather interior).

- Use – Personnel responsible for the use of leased or rental vehicles are to ensure that they:
  - Are properly licensed.
  - Obey and observe all applicable traffic laws.
  - Always use seatbelts.
  - Observe safe operating procedures.
  - Do not allow unauthorized use of the vehicle.
  - Maintain the vehicle in a clean and serviceable condition.
  - Report all unsafe or defective conditions.
  - Do not operate an unsafe vehicle.
  - Always use a ground guide when backing vehicle if available.
  - Report all accidents immediately.
  - Follow all rental/lease contractual requirements.
  - Perform daily/weekly inspections and document these inspections on the Weekly Vehicle Inspection Sheet.
  - Maintain added safety equipment (i.e.; fire extinguishers and first aid kits).
  - Purchase (at company expense) materials to assist in keeping the vehicle clean.
  - Purchase (at company expense) inexpensive floor mats and/or seat covers if necessary.
  - Utilize "Wash Racks" (at company expense) if high pressure washing is necessary.
  - Wipe down and sweep out the vehicle interior as needed.
  - Do not use vehicle off road unless necessary.
  - Do not overload the vehicle.
  - Use/maintain the vehicle in a manner that reflects favorably upon the personnel, the project and USA.
  - Prohibit the use of tobacco products in project vehicles by all occupants at all times.
  - Do not use cell phones while operating project vehicles.
  - Do not use any other portable headphones, earphones, or other listening device while operating project vehicles.
  - Decrease speed when adverse weather conditions are present.
  - Obey Stop, Yield, Parking, and other traffic regulating signage.
  - Drinking alcohol and driving leased or rental vehicles is strictly prohibited.
  - Personnel taking “over the counter” medications or prescription medications are prohibited from operating project vehicles until the effects of the medication(s) are known not to inhibit the individual’s driving abilities.

- Turn-In – Personnel responsible for the turn-in of leased or rental vehicles are to ensure that:
  - The vehicle is **cleaned**, inside and out, prior to turn-in (should be in a condition that is "as good as or better than” when received).
  - The vehicle is inspected and results are recorded. Take photographs of all damage to the vehicle.
  - All documentation is accurate and complete, with proper signatures.
  - Any discrepancies are corrected or reported prior to departure.
  - All rental/lease contractual requirements have been met.
  - Copies of all documentation are received.
  - Copies of all documentation are forwarded to USA’s corporate office.
  - Damage requiring claims forms have been initiated and USA’s corporate office has been notified.
  - Points of Contact for all parties involved in a claim are listed.

8.3 After Hours for Personal Use of Vehicles

After hours use of rental or leased vehicles is not permitted and project personnel are responsible for securing their own transportation to and from the job site and for personal use. In rare instances, the Project Manager may approve a leased or rental vehicle for after-hours use. In such cases, the driver must adhere to the rules set forth in this Vehicle SOP and any requirements/restrictions stipulated by the Project Manager.

8.4 Damage/Accident Reporting

Should an employee become involved in an accident while operating a project vehicle or the vehicle sustains damage while in the possession of the employee, the operator will:

- Immediately notify their Team Leader, the UXOSO, SUXOS, or Site Manager of any accident involving another vehicle or personnel injuries.
- Complete an Accident/Near Miss Report Form. See UXOQCS for equipment damage form.
- Further document the accident by photographing the accident scene and damage incurred to the vehicle(s).
- Submit to breathalyzer and saliva tests within 2 to 4 hours after the accident if there is suspicion of alcohol use. The tests will be administered by the Site Medic if impairment is suspected.

Site management personnel will report all accidents and incidents in accordance with the procedures outlined in the project Accident Prevention Plan. The Project Site Manager is to be immediately notified of any accident involving injury that requires medical treatment to the driver or other parties.

8.5 Summary

The procedures contained within this SOP are not all inclusive. Personnel are reminded to comply with the referenced material. To eliminate, reduce and mitigate the risks to the vehicle operator, vehicle passengers and the surrounding populace, good, safe driving skills and habits are essential to an accident free project.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

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 emergency response and change procedures if necessary.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved Explosives Safety Submission. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

This section is not applicable to Leased and Rented Vehicle procedures.

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

This page is intentionally left blank.

ATTACHMENT A.
AUTHORIZED DRIVER'S LIST

This page is intentionally left blank.

AUTHORIZED DRIVERS LIST FORM (EXAMPLE)

USA Environmental, Inc.

AUTHORIZED DRIVERS LIST

Project Site/Location: _____ _____ Project Number: _____

Date Vehicle Assigned:	Name of Person Vehicle Assigned To:	Drivers License State, Number and Expiration Date:	Type Vehicle Assigned and Identifying Number: (i.e., license plate number)	Signature of Assigned USA Employee:	Signature of Senior USA Employee Assigning Vehicle:
	Last: First:	State: No.: Expiration:			
	Last: First:	State: No.: Expiration:			
	Last: First:	State: No.: Expiration:			
	Last: First:	State: No.: Expiration:			
	Last: First:	State: No.: Expiration:			
	Last: First:	State: No.: Expiration:			
	Last: First:	State: No.: Expiration:			
	Last: First:	State: No.: Expiration:			

010 USA Form
Original: November 2009

This page is intentionally left blank.

ATTACHMENT B. VEHICLE LIABILITY FORM FOR VIEQUES, PR, PROJECT SITE

This page is intentionally left blank.

USA Environmental, Inc.

Vehicle Liability Form

USA Environmental, Inc., requires you to complete this form if you are flying to the job site and wish to drive a company-leased vehicle after work hours for personal use. USA Environmental, Inc., will acquire a Motor Vehicle Report (MVR) from the state where your license is issued and may revoke driving privileges based on report results.

If you do not intend to drive a company-leased vehicle after work hours for personal use, please print your name, check the box below and sign and date the form.

Employees will be given a copy of, and are expected to adhere to, the company's Standard Operating Procedures (SOP) for Leased Vehicles. Employees who damage a vehicle while in non-compliance of the SOP may be liable for all damages incurred. USA Environmental, Inc., reserves the right to deduct these costs from your pay, as permitted by applicable state law.

Negligent use of company-leased vehicles may also result in disciplinary action, up to and including termination.

☐ I **do** intend to drive a company-leased vehicle for personal use. The following is my personal information:

Employee Name: _____

Address: _____

City/State/Zip _____

Job Site: _____

Driver's License State: _____

Driver's License Number: _____

Expiration Date: _____

☐ I do **not** intend to drive a company-leased vehicle for personal use.

My signature below verifies that I have received a copy of the SOP for Leased Vehicles.

_____ _____
Signature Date

This page is intentionally left blank

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

HEAT STRESS

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- SECNAVINST 5100.10, "Department of the Navy Policy for Safety, Mishap Prevention, Occupational Health and Fire Protection." – current version
- OPNAVINST 5100.23, "Navy Occupational Safety and Health Program." – current version
- DODINST 6055.1, "Department of Defense Occupational Safety and Health Program." – current version
- DODINST 6055.5, "Industrial Hygiene and Occupational Health." – current version
- EM 385-1-1, U.S. Army Corps of Engineers Safety and Health Requirements Manual
- Project Accident Prevention Plan – current version
- NIOSH/OSHA/USCG/EPA. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. DHHS (NIOSH) 85-115. Cincinnati, OH. – current version
- American Conference of Governmental Industrial Hygienist (ACGIH). Threshold Limit Values and Biological Exposure Indices, Cincinnati, OH. – current version

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

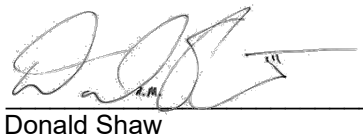
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

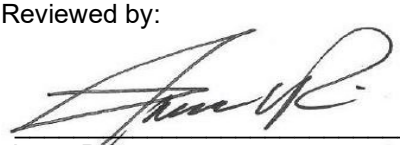
(Signature to be provided in Final SOP)

Developed by:



Donald Shaw — 01/03/2020
Project Manager — Date

Reviewed by:



Larry Price — 01/03/2020
Vieques Senior UXO Supervisor — Date:

Approved by:

Jason W. Wagner, CMQ/OE — Date
Corporate Quality and Safety Manager

This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's or Operator's	Worker's or Operator's Signature	Supervisor's Name	Supervisor's Signature	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 INTRODUCTION

Heat stress is one of the most common (and potentially serious) illnesses that affect hazardous waste site workers. USA has been increasingly involved in performing work in areas such as Puerto Rico, where the ambient air temperatures can create a heat stress hazard for most of the year. Our work during the summer months in North America creates the same hazardous situations. When site personnel are engaged in operations involving hot environments and/or the use of semi- or impermeable clothing, a number of physiological responses can occur which may seriously affect the health and safety of the workers. These affects can be eliminated or controlled through the use of comprehensive heat stress prevention and monitoring procedures. Therefore, it is the objective of this SOP to outline the methods and procedures USA personnel will implement to prevent, control and/or treat heat related illnesses.

8.2 SCOPE

This procedure will be implemented under normal conditions with Level D PPE whenever the ambient air temperature reaches 75ºF, for all site personnel. When personnel will be donning semi- or impermeable clothing required in Level C PPE and higher, this procedure will be implemented whenever ambient air temperatures reach 70°F.

8.3 RESPONSIBILITIES

8.3.1 Project Manager

The Project Manager is responsible for the overall implementation of this SOP, and management of the USA resources needed for its implementation. The Project Manager will assign specific functions and responsibilities to the Site Manager, SUXOS and the UXOSO.

8.3.2 Senior UXO Supervisor (SUXOS)

The SUXOS will assure that all site workers have been trained to recognize the signs and symptoms of heat stress, heat stress monitoring procedures and how to react to a heat stress emergency. He will assure that all site workers are following appropriate heat stress prevention procedures applicable to the Level of PPE and environment in which they are working.

8.3.3 UXO Safety Officer (UXOSO)

The UXOSO is responsible for the onsite implementation of this SOP, to include the following:

- Training site workers to recognize and treat heat related illnesses
- Implementing preventive measures as specified in this SOP
- Setting the work/rest cycles on the site based on site conditions and PPE
- Knowing the signs, symptoms and treatment for the heat stress disorders
- Monitoring site workers for signs or symptoms of heat stress.

The frequency of monitoring will be based on the temperature and level of PPE to be used. The UXOSO may modify the site procedures as required, based on site conditions, observations of field team monitoring, judgment and physiological monitoring results. The UXOSO will keep the Corporate Safety and Health Manager informed of conditions on the site and any changes in procedures that may be made due to site conditions.

8.3.4 All Site Workers

All site workers will be responsible for maintaining their hydration levels throughout the day. When in a hot environment, the body's thirst mechanism is not to be relied on to let the workers know they have ingested enough water. Drink water frequently throughout the day, whether or not you are thirsty. All site workers are also responsible for being aware of the signs and symptoms of heat stress. Using the buddy system, buddies will monitor each other frequently throughout the day for signs and symptoms of heat stress and take appropriate action if signs or symptoms of heat stress become apparent.

8.4 PROCEDURE

8.4.1 Causes of Heat Stress

A combination of temperature, humidity, and level of exertion required to perform work on the site contribute to heat stress. The most common cause of heat stress during site activities is the affect that PPE has on the body's natural cooling mechanism. Impermeable PPE interferes with the evaporation of perspiration and causes the body to retain metabolic and environmentally induced heat. Individuals will vary in their susceptibility and degree of response to the stress induced by increased body heat. Heat stress can result in health effects ranging from transient heat fatigue to serious illness or death. Heat stress is caused by a number of interacting factors including environmental 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 which may predispose a worker to heat stress include:

- Lack of physical fitness
- Lack of acclimatization to hot environments
- Degree of hydration
- Level of obesity
- Current health status (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. PPE is selected based on these factors. Once PPE is selected, the safe duration of work/rest periods should be determined by the UXOSO 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 will inspect the site personnel for evidence of the previously mentioned factors to determine those personnel who are at increased risk for heat stress related disorders. Evidence of extreme dehydration, illness or drug or alcohol use may require the UXOSO to restrict the worker's activities until such time as the worker is fit for duty. Personnel identified as being at high risk for heat stress who are allowed to participate in site operations will be monitored frequently by the UXOSO throughout the day.

Using the buddy system, site workers will monitor their buddy frequently throughout the day for signs and symptoms of heat stress and take action if signs or symptoms of heat stress become apparent. Tell your buddy to take a break in a cool area, and drink some cold water. Call for assistance if necessary.

8.4.2 Heat Stress Disorders

This Section outlines the major heat related illnesses that may result from exposure to high heat environments and/or the use of semi- or impermeable clothing. For the purpose of this Procedure, 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.

8.4.2.1 Heat Rash

Heat rash is caused by continuous exposure to heat and humid air and is aggravated by wet, chafing clothes. This condition can decrease a worker's ability to tolerate hot environments.

Symptoms: Mild red rash, especially in areas of the body that sweat heavily.

Treatment: Decrease amount of time in protective gear and provide powder such as corn starch or baby powder to help absorb moisture and decrease chafing. Maintain good personal hygiene standards and change into day clothes if needed. Baby powder or cornstarch will be available on site during work in hot environments for this purpose.

8.4.2.2 Heat Cramps

Heat cramps are caused by a profuse rate of perspiration that is not balanced by adequate fluid and electrolyte intake. The occurrence of heat related cramps 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 twenty minutes thereafter. Consult with physician if condition does not improve. If available, an electrolyte replacement solution should be taken along with liquids. Drinking water and electrolyte replacement solutions should be done at a 2:1 ratio, with two cups of water to every one cup of electrolyte replacement solution. Cramps are often caused by a lack of potassium, which is lost through sweating. The UXOSO should encourage site personnel to consider adding foods that are high in potassium to their diet when working in hot environments.

Foods High in Potassium: Bananas, oranges, cantaloupe, apricots, avocado, strawberries, tomatoes, papayas, plantains, pears, mangoes, potatoes, cucumber, cabbage, cauliflower, chard, bell pepper, eggplant, squash, crimini mushrooms, Brussels sprouts, spinach, broccoli, carrots, lettuce, onions, radishes, lima beans, artichokes, tuna, halibut, honey, oat bran.

8.4.2.3 Heat Exhaustion

Heat exhaustion is a state of very definite weakness or exhaustion caused by increased stress on various organs to meet increased demands to cool the body due to excessive loss of fluids from the body. This condition leads to inadequate blood supply and cardiac insufficiency. Heat exhaustion is less dangerous than heat stroke, but nonetheless must be treated. If allowed to go untreated, heat exhaustion can quickly develop into heat stroke.

Symptoms: Pale or flushed, clammy, moist skin, profuse perspiration, and extreme weakness. Body temperature is basically normal or slightly elevated, the pulse is weak and rapid, and breathing is shallow. The individual may have a headache, be dizzy or nauseated.

Treatment: Remove the individual to a cool, air-conditioned place, loosen clothing, elevate feet and allow individual to rest. Cool compresses or other active cooling techniques may also be implemented. Consult physician, especially in severe cases. If the patient is conscious, have him/her drink one to two cups of cool liquids immediately, and every twenty minutes thereafter. NEVER POUR WATER INTO AN UNCONSCIOUS PERSON'S MOUTH AS THIS PRESENTS A CHOKING HAZARD. Total liquid consumption should be about one to two gallons per day. If the signs and symptoms of heat exhaustion do not subside, or become more severe, immediate medical attention will be required.

8.4.2.4 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of the heat regulating mechanisms of the body. The failure of the individual's temperature control system causes the perspiration system to stop working correctly. When this occurs, the body core temperature rises very rapidly to a point (105+°F) where brain damage and death will result if the person is not cooled quickly. HEAT STROKE IS A MEDICAL EMERGENCY. CALL 911 IMMEDIATELY.

Symptoms: The victim's skin is normally hot and red and dry. If the victim is wearing impermeable clothing he/she may have wet skin due to the sweating inside the clothing that does not evaporate. Other symptoms include: nausea; dizziness; confusion; extremely high body temperatures; rapid respiratory and pulse rate; delirium; convulsions; unconsciousness or coma. If victim does not receive medical attention quickly, this condition can be fatal.

Treatment: If the body temperature is not brought down quickly, permanent brain damage or death may result. Use both passive and active methods to cool the victim. The victim should be moved to a shady area; lie down and keep the head elevated. Cool the victim by either sponging or immersing the victim in cool water to reduce the core temperature to a safe level (<102°F). If conscious, give the victim cool liquids to drink. NEVER POUR WATER INTO AN UNCONSCIOUS PERSON'S MOUTH AS THIS PRESENTS A CHOKING HAZARD. Observe the victim and obtain immediate medical help. Do not give the victim caffeinated or alcoholic beverages.

8.4.3 Heat Stress Prevention

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 that will be taken on site and will include the following procedures:

- The UXO Tech III will examine each of their site workers 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 throughout the day.
- 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 Procedure.
- In order to maintain workers' body fluids at normal levels, workers will be encouraged to drink, as a minimum, approximately sixteen ounces of liquids prior to start of work in the morning, after lunch and prior to leaving the site at the conclusion of the day's activities. Disposable four (4) to twelve (12) ounce cups and liquids will be provided on site. Acceptable liquids will include water and an electrolyte replacement solution. It is recommended that the water to balanced electrolyte liquids be taken at a 2:1 ration with the intake of water being twice the intake of the balanced electrolyte liquids. Liquids containing caffeine are to be avoided.
- Site workers will be briefed in the importance of a good diet with foods that are high in potassium when working in hot environments.

- When ambient conditions and site workload requirements dictate, as determined by the UXOSO, workers will be required to drink a minimum of 16 to 32 ounces of liquids during each rest cycle. The normal thirst mechanism is not sensitive enough to ensure that enough water will be ingested to replace lost sweat. When heavy sweating occurs, workers should be encouraged to drink even though they may not be thirsty. The following strategies may useful in encouraging fluid intake:

    - Maintain water temperature at 50ºF to 60ºF (10ºC to 15.6ºC).
    - Provide small disposable cups that hold about 4 ounces (0.1 liter), or provide bottled water.
    - Have workers drink 16 ounces (0.5) liters) of fluids (preferably water or dilute drinks) before beginning work.
    - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.

- A shelter or shaded area will be provided where workers may be protected from direct sunlight during rest periods. Designated rest areas should ideally be air-conditioned and the temperature maintained between 72°F and 76°F if possible, based on site conditions.
- 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 Procedure.
- 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.

- 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.
- Alcohol should not be consumed in a hot environment because the loss of body fluids increases the risk of heat stress**.**

8.4.4 Heat Stress Monitoring

Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, will be monitored. When site workers are using Level D PPE, heat stress monitoring will begin when temperatures reach 75ºF. When higher levels of PPE are required that include semi-permeable or impermeable clothing, heat stress monitoring will begin when temperatures reach 70ºF. Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar

radiation and the level of physical work (see Table 1). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

Table 1: 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 sleeves and pants.

The goal of all heat stress monitoring is to ensure that the worker's body temperature does not exceed 100.4°F. The physiological monitoring methods listed below are to be implemented based upon the severity of the heat and workload. As a minimum, the UXOSO will monitor the potential for heat stress using the Wet Bulb Dry Globe Temperature (WBGT) Monitor. Based on site conditions, the UXOSO and/or Medic may also use physiological monitoring methods in addition to the WBGT readings. The worker's heart rate will be taken as an indication of potential heat stress. However, if monitoring with the heart rate method indicates the need for closer, more direct monitoring, the body temperature method will be implemented. The need for monitoring body water loss will be determined by the UXOSO and/or Medic, and will be based upon observation of the sweat loss experienced by site personnel during their work cycle. The frequency of physiological monitoring will be determined using the information presented in Table 1. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates to baseline (pre-work) levels are indicated

8.4.5 Wet Bulb Dry Globe temperature (WBGT) Monitoring

For site conditions where personnel are working in Level D PPE, and the ambient temperature is greater than 75°F, the UXOSO will conduct WBGT monitoring to assist in controlling the potential for site workers experiencing heat related adverse health effects. The UXOSO will use a real-time direct reading WBGT monitor, and after estimating the work load, use the values expressed in Table 2, to determine the work/rest schedule to be implemented. The values outlined in this table are designed such that nearly all acclimatized, fully clothed workers with adequate salt and water intake will be able to function without the body temperature exceeding 100.4°F. If conditions and/or workloads warrant, the UXOSO and/or on-site Medic may also implement the heart rate, oral temperature and water weight loss monitoring.

Table 2: 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.

[a] Values are given in ^{0}F and (^{0}C) WBGT, and are intended for workers wearing single layer summer type clothing. Use of semi- or totally impermeable clothing require monitoring IAW the USA Heat Stress Prevention Program. As workload increases, the heat stress impact on an unacclimatized worker is exacerbated. For unacclimatized workers performing a moderate level of work, the permissible heat exposure TLV should be reduced by approximately 2.5^{0}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.

8.4.6 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, and multiplying by 2 for the total beats per minute (bpm). Taking the radial (wrist) pulse rate is the preferred method, however the carotid (neck) pulse rate may be taken if a worker has difficulty finding the radial pulse. The PR at the beginning of the rest period should not exceed 110 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.

8.4.7 Body Temperature Monitoring

If deemed necessary by the UXOSO, and the conditions warrant, body temperature monitoring will be conducted. The worker's body temperature will be taken and recorded prior to initiation of site activities using a clinical thermometer placed under the tongue, or using an ear thermometer with disposable covers. The temperature must be taken prior to consumption of cool liquids and will be done at the end of each work period or at a frequency determined by Table 2. Whenever the body temperature exceeds 99.6°F, the work cycle must be shortened by one third, without changing the length of the rest period. If a worker's body temperature has exceeded 99.6°F, test the body temperature again at the end of the rest cycle, and do not allow the worker to return to work until the body temperature drops below 99.6°F. If a worker's body temperature exceeds 100.4°F the worker will not be allowed to work in impermeable or semi-permeable PPE for the remainder of that workday.

8.4.8 Body Weight Loss Monitoring

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

- Once the ending weight is obtained subtract it (W_{end}) from the daily starting weight (W_{start}) to obtain the weight lost (W_{lost}) during a given work period, i.e.,: (W_{start}) - (W_{end}) = (W_{lost}).
- Multiply the starting weight by 1.5% to obtain permissible weight loss (W_{perm}), i.e.,:
    - (W_{start}) x 0.015 = (W_{perm}).

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

8.5 HEAT STRESS DOCUMENTATION

The UXOSO will be responsible for recording all heat stress related information. This will include training sessions and monitoring data. Training sessions will be documented using the Documentation of Training form. Pulse rate monitoring data will be recorded on the Heat Stress Monitoring Log (Table 3), with the WBGT. Body temperature and/or water loss calculations will be recorded in the Site Safety Log, and/or Site Monitoring Log.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 Hazard Control Brief

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The paramedic will be equipped with a WBGT monitor.

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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.

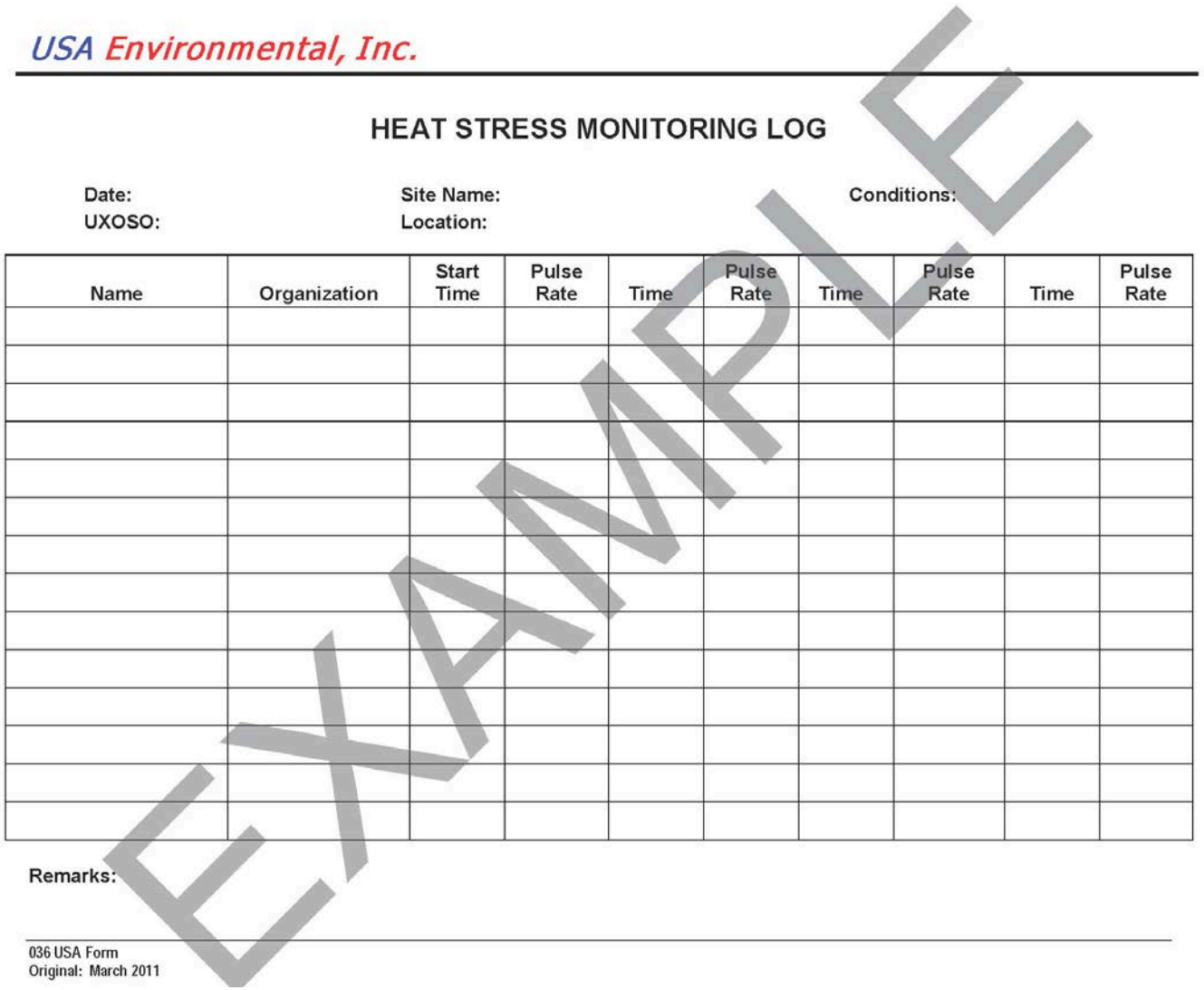
In the event of an emergency requiring evacuation, the evacuation signal will be given through verbal instructions. Personnel will evacuate to a pre-determined evacuation point in the support zone identified at the daily safety briefing. The UXOSO will account for all personnel and will summon emergency 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 emergency response and change procedures if necessary.

This space is intentionally left blank.



USA Environmental, Inc.

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

EXAMPLE

Figure 1: Heat Stress Monitoring Log

This page is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

VEGETATION REMOVAL

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA Environmental, Inc.

July 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
07/29/2020		13, 14, 15	8.1, 8.9, 8.10	Minor change: Revised to address Regulatory comments regarding accurate use of the terms MEC and UXO

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Occupational Safety and Health Administration (OSHA) General Industry Standard, 29 CFR 1910 Subparts O and R – current version
- OSHA Construction Standard, 29 CFR 1926 Subpart I – current version
- USACE, Engineer Manual 385-1-1 – current version
- Equipment Operator's Manual(s) and Manufacturer's Publications

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

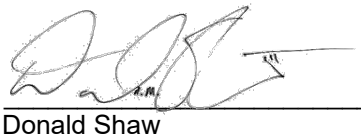
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

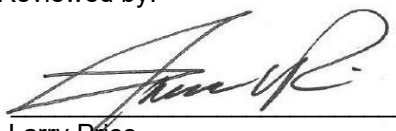
Developed by:



Donald Shaw
Project Manager

07/29/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

07/29/2020
Date

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

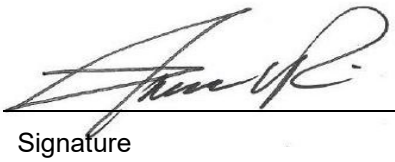
This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		07/29/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's or Operator's	Worker's or Operator's Signature	Supervisor's Name	Supervisor's Signature	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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 munitions and explosives of concern (MEC).

8.2 Scope

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in vegetation removal operations on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), applicable Federal, State, local regulations, and contract restrictions and guidance. Consult the documents listed in Section 4.0 of this SOP for additional compliance issues.

8.3 Selection

Only those personnel that meet the requirements set forth by the Navy and USA will be utilized at the project site to facilitate safe and efficient vegetation removal operations.

8.4 Training

All training on equipment will be either formal or on-the-job training (OJT). This training will be documented by site personnel and subject to review for accuracy and completeness.

8.5 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:

- Boots used during chainsaw de-vegetation activities must be constructed with cut-resistant material which will protect the employee against contact with a running chain saw, in accordance with 29 CFR 1910.266(d)(1)(v).
- Chainsaw Chaps
- Head protection, in accordance with 29 CFR 1910
- Face protection, in accordance with 29 CFR 1910
- Coveralls or work clothing as prescribed
- Work gloves, leather or canvas as appropriate
- Safety Glasses
- Dust mask, as required by wind conditions and/or the presence of airborne particulate matter
- Other PPE as needed. (e.g., hearing protection, noise attenuators or ear plugs, etc.)

8.6 Team Composition

The Vegetation Removal Team will consist of a minimum of two UXO Technicians and an appropriate number of deforesting personnel. Teams will be structured as an example; one UXO Technician III (UXOTIII), one UXO Technicians II (UXOTII) or UXO Technician I (UXOTI), and an appropriate number of deforesting personnel.

8.7 UXO Technicians

The UXOTIII directs the operation and other team personnel within the context of removal requirements. The UXOTII/I will assist the UXOTIII in overseeing the movement of personnel in and out of the powered equipment operating zone. In addition, the UXO Technician III must be familiar with the hazards, purpose and limitations of equipment being utilized.

8.8 Operator/s

The operator(s) of powered equipment will be qualified and trained on the equipment that they are utilizing (e.g., backhoes, chain saws, power trimmers, pole saws and other manually-operated cutting tools). These personnel do not need to be UXO qualified and will receive the appropriate formal training and OJT in order to 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.

8.9 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 minimum distance from other teams as established by the Explosives Safety Submission.
- Maintain safe separation distance from UXO personnel engaged in intrusive work.
- Distances may be increased by the Navy Technical Representative (NTR) as determined by site history, MEC items encountered, terrain features, and other factors that may apply.
- Use equipment safety features.
- Do not operate damaged or unserviceable equipment.
- 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 (hand signals and voice) will be maintained between the Team Leader and Operator(s) at all times.
- Maintain site control.
- Observe MEC safety precautions for items encountered or suspected.
- Ensure PPE is appropriate, serviceable, and worn/used in a proper manner.
- Do not use the front bucket of backhoes to slide vegetation across the ground.
- Removal of earth using the backhoe during vegetation removal is not permitted.
- Use of a ground guide is required at all times that the backhoe is in operation during vegetation removal operations.

8.10 Operational Procedures

Prior to commencing any vegetation removal operations, the UXOTIII conducts a tailgate safety briefing on the day's operations with emphasis on safety procedures ranging from operating zones, hand and arm and audible warning signals, PPE requirements, heat stress and hydration.

Hand and arm signals and/or audible hand-held devices will be utilized as means of communication. All team personnel must know these signals prior to operations commencing. The hand and arm signals will be documented on the tailgate safety-briefing sheet each morning of operations and at each change of team personnel.

The UXOTIII will be responsible for the direction and manner in which the vegetation is to be removed. Prior to removal operations commencing, and ahead of the vegetation clearing crew, a visual search/survey is conducted to determine the hazards that may be encountered, which may include terrain slope, vegetation types, condition and density, wildlife, environmental concerns, and MEC. The UXO Technicians will perform a visual search for MEC, ordnance scrap, surface debris, and any other obstruction/object that may pose a hazard to team personnel, these hazards will be marked with flagging tape, paint or pin flags. Hazardous items, impassable terrain, or vegetation that may affect operations will be marked and team personnel notified.

Vegetation removal will be performed by manual means by deforesting personnel. The deforesters will utilize chainsaws, power trimmers, pole saws and other manually-operated cutting tools to cut vegetation within a grid. Each piece of equipment will have a powered equipment operating zone (operating zone) of twenty feet that will not be entered by other team members while the equipment is in operation. A UXO Technician will be stationed outside of each operating zone and to the rear of the operator and maintain visual contact with operators at all times. Once the vegetation has been cut the operator will shut the equipment down and then move a minimum of 25 feet from the cut vegetation in the grid back to the UXO Technicians position. At this point, the UXO Technician will signal to the backhoe operator that all personnel are out of the operating area and he can move into position to remove the cut vegetation out of the grid and into a previously cleared grid. Once the vegetation has been removed from that grid by the backhoe the backhoe operator will move the backhoe out of the operating area and shut down the backhoe. Once the backhoe is shut down the UXO Technician will signal to the deforesters they can move into the cutting site, power up the equipment and resume cutting operations.

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 items encountered are marked and avoided. Notification of these items will be made to the appropriate personnel.

Backhoes will be operated by properly trained and authorized personnel only. Backhoe work will be performed with a ground guide. If the ground guide becomes distracted or is unable to maintain communication with the backhoe operator, operations will stop until the problem is resolved. Vegetation will be removed primarily with the tail bucket. The tail bucket allows for better control of the environment. The front bucket may be used in some cases. It will never be used in such a manner that causes vegetation to slide across the ground or causes the blade of the bucket to excavate earth.

8.11 Summary

USAE 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.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

The hazard analysis matrix (Table 1) lists the existing and potential hazards associated with conducting vegetation removal activities, along with methods to mitigate the hazards.

This space is intentionally left blank.

Table 1: Hazard Analysis Matrix

Activity	Hazard	Triggering Events	Initial Risk Index	Hazard Mitigation	Final Risk Index
Vegetation Removal and Surface Clearance	Slips, Trips, or Falls	Climbing slopes <30°; 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. Wear leather safety toe work boot with ankle support and non-slip soles.	D/IV/5
	Cold Weather	Seasonal weather patterns	C/III/4	Minimize exposure to cold temperatures, water and wind by wearing layered clothing and wet weather gear. Keeping the feet dry (carry extra socks). Monitor team members for signs of cold stress disorder IAW the APP.	D/IV/5
	Hot Weather Dust	Seasonal weather patterns	C/III/4	Heat stress monitoring, cool drinking water, work-rest schedule, and cool shelter for breaks. Wear eye protection/dust mask (optional). Provide dust suppression.	D/IV5
	Biological	Biting/stinging insects, spiders, rodents, and hazardous plants	C/III/4	Avoid biological hazards. Wear long-sleeve garments and apply repellent to clothing and exposed skin as needed. Use barrier cream, as necessary.	D/IV/5
	MPPEH	MPPEH reacts to impact by equipment, tools or personnel.	C/II/3	Refer to the ESS. Maintain the TSD between teams for the Northern MRSs (see the hazard control briefing that follows). All personnel will receive a safety briefing prior to commencing site activities. UXO-qualified person will locate an anomalous-free area with the Magnetometer, prior to placing a pin flag into the ground. Mark all MPPEH items with a red pin flag for later	D/III/5

Activity	Hazard	Triggering Events	Initial Risk Index	Hazard Mitigation	Final Risk Index
				assessment by the SUXOS and the UXOSO.	
	Equipment	Use of equipment	C/II/3	Follow appropriate lifting/carrying procedures. Vegetation removal crew will maintain distance of at least 20 ft from each other. Chainsaw engines will be started and stopped when all co-workers are clear of the saw. Chainsaws will be properly supported when in use. Operator will shut off saw when carrying chainsaw over slippery surfaces, through heavy brush, and when adjacent to personnel. Never use chainsaw above shoulder height. Use of required PPE.	D/III/5
	Fire	Fueling equipment and smoking cigarettes.	C/II/3	Never fuel equipment in back of a truck with a bed liner. Do it on the ground. Use bonding/grounding when transferring flammable liquids. No smoking within 50 ft of fueling operations. No smoking except in designated smoking area equipped with sand-filled bucket for cigarette butts and fire extinguisher.	D/III/5
	Sunburn	Work in outdoor environment.	B/IV/4	Use sunscreen and wear hard hat.	C/IV/5
	Weather or Natural Disaster Emergency	Meteorological or environmental event	C/II/3	Account for all team personnel and, if required, implement the emergency response procedures outlined in the APP.	C/IV/5

9.1 Hazard Control Briefing

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

Wear long-sleeved clothing and apply insect repellant as warranted to mitigate the impact of biting/stinging insects.

The potential for encountering MPPEH is high. Maintain the TSD as specified in the ESS.

If a munitions item with larger fragmentation distance is encountered, work is to be stopped in order to modify the ESS.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

Below is a process diagram for vegetation removal operations:

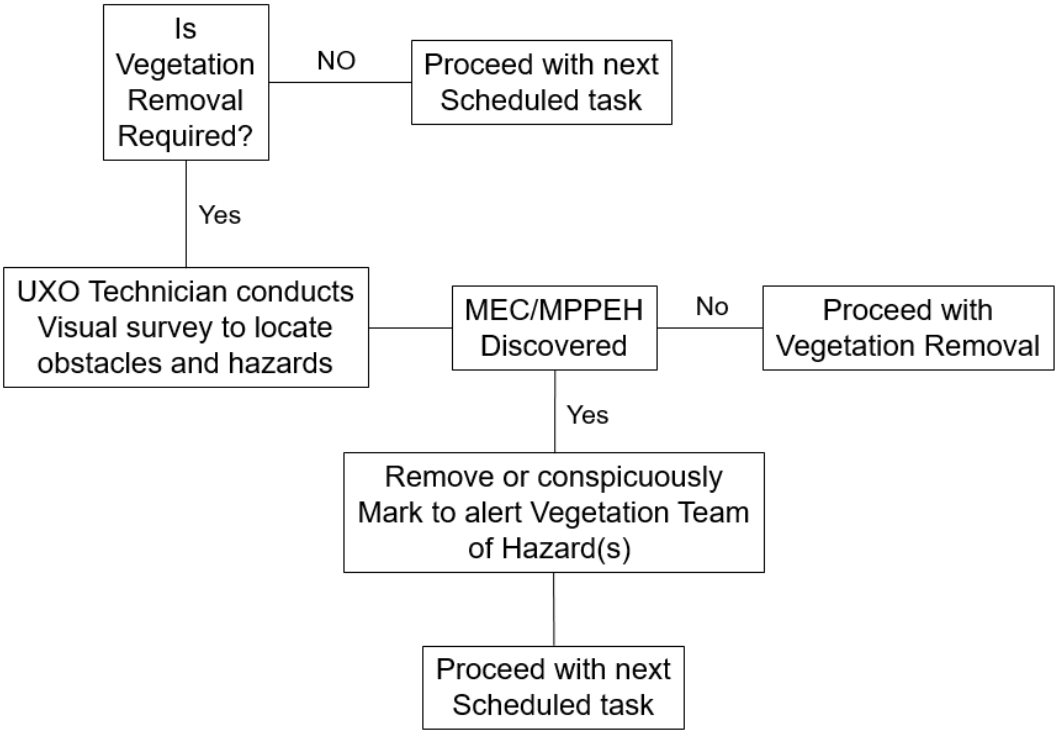


Figure 1: Diagram for Vegetation Removal Operations

12. EQUIPMENT

The team will be equipped with the following:

- Handheld analog detector
- Pin flags for marking suspected MPPEH items
- Logbook and/or personal digital assistant for recording data
- Camera
- Communications equipment.

Equipment used for vegetation cutting includes:

- Brush mower
- Gas-powered trimmers with line or metal blades
- Non-power tools for cutting branches
- Chainsaws.

The required safety equipment includes the following:

- First-Aid/Trauma kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only. The following constitute Level D equipment; it may be used as appropriate:
    1. Coveralls

2. Gloves (1)
3. Boots/shoes, safety-toe and shank
4. Safety glasses
5. Hard hat (1)
6. Escape mask (1)
7. Face shield (1)

Footnote (1) Optional, as applicable.

- Chainsaw Chaps if chainsaws are utilized
- Hearing protection (earmuffs/plugs)
- Inclement weather gear, as needed.

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital.

A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

REMOTE VEGETATION REMOVAL OPERATIONS

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

July 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
07/29/2020		13, 14, 15	8.1, 8.8, 8.9	Minor change: Revised to address Regulatory comments regarding accurate use of the terms MEC and UXO

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Explosives Safety Submission (ESS) – current version
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards – current version
- Chief of Naval Operations Instruction (OPNAVINST) 3500.39 – current version
- NAVSEA OP 5 Ammunition and Explosives Safety Ashore. – current version
- United States Army Corps of Engineers (USACE), Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual – current version
- Equipment Operator's Manual(s) and/or Manufacturer's Publications

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

LIST OF TABLES

LIST OF ATTACHMENTS

ATTACHMENT A: QUALITY CONTROL SURVEILLANCE CHECK SHEET

ATTACHMENT B: RFI STANDARD OPERATING PROCEDURE MANUAL

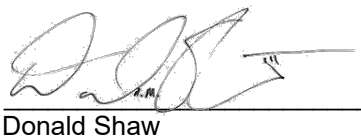
This space is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

Developed by:

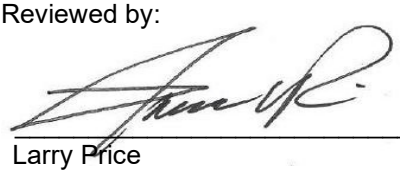


07/29/2020

Donald Shaw
Project Manager

Date

Reviewed by:



07/29/2020

Larry Price
Vieques Senior UXO Supervisor

Date

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

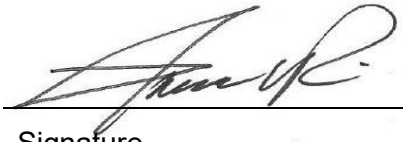
This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		07/29/2020
Supervisor's Name	Signature	Date

7. WORKER'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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 conduct and observe remote vegetation removal operations on sites contaminated with munitions and explosives of concern (MEC). These operations include, remote controlled equipment cutting and raking vegetation, relocating MEC items using a magnet in preparation for burning operations.

8.2 Scope

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in remote vegetation removal operations on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 3.0 of this SOP for additional guidance.

8.3 Selection

Only those personnel that meet the requirements set forth by the Navy and USA will be utilized at the project site to facilitate safe and efficient remote vegetation removal operations.

8.4 Training

All training on equipment will be either formal or on-the-job (OJT) training. For USA personnel training is documented by qualified site personnel who have certificates of completed training for subcontractors they provide copies of training to the Senior UXO Supervisor (SUXOS) and/or Site Manager (SM) for review for accuracy and completeness. Copies of all certificates and/or training will be kept on each personnel on the site and maintained by the Field Office Administrator (FOA).

8.5 Personnel Protective Equipment

Level D personal protective equipment (PPE) is required for all personnel engaged in remote vegetation removal operations. Clothing includes, but is not limited to:

- Coveralls or work clothing as prescribed
- Footwear consisting of sturdy work boots, as appropriate (i.e., lug sole and of sufficient height for ankle support). UXO personnel will not wear steel-toe safety boots when using metal detectors (composite toes are acceptable)
- Work gloves, leather or canvas as appropriate
- Safety Glasses
- Other PPE as needed. (e.g., hearing protection, noise attenuators or ear plugs, etc.)

The team will be outfitted with a trauma kit, equipment to complete their work and field sanitation equipment, which will consist of containers of water, paper towels, and soap. Good housekeeping and sanitation measures will be practiced.

8.6 Team Composition

The remote vegetation removal team will consist of a minimum of one UXO Technician (UXOT) III or UXOT II and two remote control equipment operators.

8.6.1 UXO Technicians

The UXOT III or UXOT II directs the remote operations based on the SUXOS daily operations briefing provided to the UXOT. The UXOT monitors the remote operations through a secondary video screen in the remote operations van where the operators control the remote equipment.

8.7 Equipment Operator

The operator(s) of remote control equipment will be qualified and trained on the equipment that they are utilizing (e.g., excavator, skid steer, etc.). These personnel do not need to be UXO qualified and will have received the appropriate formal and OJT in order to operate the equipment in a safe and efficient manner. The operator performs daily inspections and maintenance functions as recommended by the manufacturer's instruction manual. The operator will perform other duties as needed or directed.

8.8 Safety

Safety is paramount and all personnel will observe those safety precautions/warnings that apply or may apply to remote control operations and strictly adhere to the Site Safety and Health Plan (SHSP). The precautions listed below are general in nature and personnel will need to review applicable publications for more specific safety precautions/warnings.

- Maintain minimum distance from other teams as established by the Explosives Safety Submission for the specific operation.
- Maintain safe separation (K40) distance from UXO personnel engaged in intrusive MEC work.
- Distances may be increased by the Navy Technical Representative (NTR) as determined by site history, MEC items encountered, terrain features, and other factors that may apply.
- Use equipment safety features.
- Do not operate damaged or unserviceable equipment.
- Safety precautions/warnings found in the manufacture's publications will be observed.
- Communications (hand signals and voice) 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.
- Use of a ground guide is required when the remote equipment is being operated manually.

Remote vegetation removal activities at MEC sites will be under the supervision of UXO qualified personnel. Non-essential personnel will not be allowed in the exclusion zone (EZ) during remote controlled equipment operations unless directed by the SUXOS and/or UXOSO. If access is required, other than for safety observations, by non-essential personnel, all work will stop while they are in the EZ.

8.9 Remote Controlled Vegetation Removal Procedures

Based on the requirements for the day's work, the escort or TL will identify the grid(s) to be cut, and do a cursory survey of the area. When operating within the sub-munitions area (UXO-4), typical movement of

the excavator will be done remotely typically within the UXO-4 boundaries, manual movement can be done in QC/QA completed areas in UXO-4 and on roadways.

1. Once the grids are identified, the operation will begin in a cleared area, the remote link will be switched to “on”, and the equipment will be moved into the work area. When the team is back in the safe area, the escort or TL will call over the radio that the robotics is going “HOT” to ensure any personnel on the former VNTR are aware of the operation.
2. The remote controlled equipment operator starts the computer program and links the program to the equipment.
3. For each remote controlled operational period, a UXO Technician is inside the step van watching the operation for MEC.
4. Operations within the work area are conducted until the required cutting is complete.
5. Once the cutting is complete, the computer is unlinked from the excavator.
6. The UXO Technician calls over the radio that the robotics is going “cold.”
7. The team travels back to the work area.
8. The remote link on the excavator is turned to “off” and the excavator is moved out of the vicinity of the work site.
9. When cutting is complete, the rake attachment may be used to consolidate cuttings into piles
10. The magnet attachment may be used before or after cutting to remove large MEC or targets from the area

The above steps will be completed until the end of the day’s operations. Once operations have been completed for the day, the team will leave the work area and return to Camp Garcia.

Throughout each day’s operations the escort or TL closely monitors the team’s individual performance to ensure these procedures are being performed safely and correctly.

8.10 Work Area Designations

The SUXOS, or his designee, will provide the UXOT with the necessary information to conduct support the remote controlled equipment operations within the work area designations (WADs). The size and location of the WADs will vary based on most recent cut and burned area/s. The WAD could also be affected if an area was recently burned and is still showing signs of smoldering or smoking. Visual means such as flags, cones, or stakes will define the area to be cut and raked. The team will receive a map containing the necessary information to perform the assigned work.

8.11 Record Keeping

The UXO Escort will be responsible for maintaining a log book of the days operations, at a minimum the UXOT will keep a record of the following;

- Date
- Weather conditions
- Start and stop times (e.g. begin/end of the day, breaks, weather, etc.)
- Team composition
- Grids worked
- MEC/MPPEH encountered

- Any significant activities to the remote operations

Log visits by SUXOS, UXOQCS, UXOSO, and QA.

8.12 MEC and MPPEH Disposition

MEC and MPPEH may only be moved by the remote controlled robotics system during remote operations, from a designated safe area. All MEC and MPPEH will be identified, processed, managed and disposed of by appropriate MEC teams during follow-on operations.

8.13 Quality Control

The Quality Control Specialist (UXOQCS) will verify the quality of the task through the three-phased surveillance process and will document the results on the check sheet. Any area the UXOQCS determines to not meet the quality control metrics will be considered deficient or non-conforming. Nonconformance will require re-work of the lot. If the deficiency or nonconformance cannot be resolved immediately, the UXOQCS will prepare a Deficiency Notice (DN) and submit it to the SUXOS, PM, and QC Manager. The UXOQCS will conduct a root cause analysis and recommend corrective actions, and submit his findings for review and approval. The UXOQCS will monitor the implementation of the corrective actions, document the results of the corrective actions on a supplemental QC Surveillance check sheet, and close out the DN.

8.14 Summary

USA personnel will conduct remote controlled vegetation removal operations in a safe, efficient, and productive manner and will use this SOP and references, to include changes and revisions.

9. HAZARD ANALYSIS/RISK ASSESSMENT

The hazard analysis matrix (Table 1) lists the existing and potential hazards associated with conducting the MEC analog detection and removal tasks along with methods to mitigate the hazards.

This space is intentionally left blank.

Table 1: Hazard Analysis Matrix

Activity	Hazard	Triggering Events	Initial Risk Index	Hazard Mitigation	Final Risk Index
Remote Controlled Vegetation Removal	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
	Hot Weather	Seasonal weather patterns.	C/III/4	Heat stress monitoring, cool drinking water, work-rest schedule, and cool shelter for breaks.	D/IV5
	Biological	Biting/stinging insects, spiders, rodents and hazardous plants.	C/III/4	Avoid biological hazards. Wear long-sleeve garments and apply repellent to clothing and exposed skin, as needed. Use barrier cream, as necessary.	D/IV/5
	MPPEH	MPPEH reacts to impact by equipment, tools or personnel.	C/II/3	Maintain the team separation distance between teams 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. UXO-qualified person will locate an anomalous-free area with the metal detector (HERO certified), prior to placing grid corner stakes or other markers.	D/III/5
	Weather or Natural Disaster Emergency	Meteorological or environmental event	C/II/3	Account for all team personnel and, if required, implement the emergency response procedures outlined in the APP.	C/IV/5

9.1 Hazard Control Brief

All personnel will attend the tailgate safety briefing given by the UXO Technician II or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

- It is recommended to wear long-sleeve clothing and apply insect repellent as warranted to mitigate the impact of biting/stinging insects.
- The potential for encountering MPPEH is high.
- Maintain the TSD (K40) as described in the ESS.
- If a munitions item with larger fragmentation distance is encountered, the work will stop in accordance with the ESS requirements.
- In the event of severe weather or a natural disaster, account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan found in the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The team will be equipped with the following:

- Remotely controlled equipment with appropriate attachments and support equipment
- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    1. Coveralls
    2. Gloves(1)
    3. Boots/shoes
    4. Safety glasses
    5. Hard hat(1)

    Footnote (1) Optional, as applicable.
- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

ATTACHMENT A.
QUALITY CONTROL SURVEILLANCE CHECK SHEET

This page is intentionally left blank.

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM

CONTRACT/TO: N62470-17-D-8003, Task Order No. F-4023

DFW: REMOTE ROBOTIC VEGETATION REMOVAL

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:	**See Team Tailgate Safety Brief**	
Phase of Inspection (check one): ***Preparatory*** ☐ ***Initial*** ☐ ***Follow-Up*** ☐		

CHECKLIST						
Item		**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
1	SOP 003B 10.0	Are all Remote Vegetation Removal Team Members trained and qualified?	☐	☐	☐	
2	APP	Have all personnel read and signed all AHAs associated with the surface clearance?	☐	☐	☐	
3	SOP 003B 11.0	Are all team members properly outfitted with the appropriate PPE?	☐	☐	☐	
4	SHSP, SOP 003B 14	Have onsite communications been established prior to clearance activities?	☐	☐	☐	
5	ESS 6.2	Are Team Separation Distances maintained?	☐	☐	☐	
6	APP, SOP 003B 13.2	Has the UXO escort conducted Tail Gate Safety Briefing before beginning Vegetation Removal?	☐	☐	☐	
7	SOP 003B 13.1	Prior to operator approaching equipment in the work area, did UXO escort check the area around the machine?	☐	☐	☐	

CHECKLIST						
Item		**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
8	SOP 003B 14	Did the UXO escort call robotics as "HOT" prior to commencing remote operations and "COLD" at the completion of day's operations?	☐	☐	☐	
9	SOP 003B 14.2	Is the UXO escort completing all required Log book/PDA entries?	☐	☐	☐	

FINDINGS	
Item	**Comments**

Conducted By: _____ **Reviewed By:** _____

This space is intentionally left blank.

ATTACHMENT B.
RFI STANDARD OPERATING PROCEDURE MANUAL

This page is intentionally left blank.

1.0 PURPOSE

This standard operating procedure (SOP) establishes the overall safe practices and procedures for the set up and operation of assigned remotely controlled heavy equipment. Only personnel who are properly trained and annotated on the RFI Equipment Operators List will perform these procedures.

2.0 SCOPE

This SOP applies to all Robotic Fabrications, Inc. (RFI) personnel involved in remote equipment operations.

3.0 GENERAL REQUIREMENTS

All work will be performed in a manner that is consistent with Occupational Safety and Health Administration established standards and requirements. Refer to the site- or project-specific health and safety plan for relevant health and safety requirements

Personnel who use this procedure must document evidence to the RFI Team Leader that they have read and understand this procedure by completing the SOP acknowledgement form, Attachment 1. This documentation will be retained in the project file.

Any deviations from the procedures specified in this SOP will be approved by the Senior RFI Technician and UXO Safety Manager before implementing.

Prior to daily operations, all equipment will be checked out using the Equipment Checkout Sheet, Attachment 2.

4.0 GENERAL SAFETY GUIDELINES

All personnel must remain a minimum of 35 feet from any piece of equipment during remote operations. A piece of equipment is determined to be in a remote status when the on board Remote and Actuator switches are in the ON position and the engine is running.

There are 2 ways to place the equipment in a Standby status. 1. Placing the Ready/Standby switch on the operator's controller to the Standby position. 2. Turning the equipment on board Actuator switch to the OFF position.

Prior to approaching equipment in the remote status, the operator must first lower all parts to the ground and place the controller Ready/Standby switch in the Standby position.

Only one person shall approach a piece of equipment in a remote status for the purpose of turning the Actuator switch OFF to place that piece of equipment in a Standby mode. Note: Deactivating the Actuator switch isolates hydraulic energy from the equipment.

An E-STOP button is installed on each piece of remote equipment for the purpose of stopping all equipment functions instantaneously during any emergency situation.

An E-STOP button is programmed on each operator's controller for the purpose of instantaneously stopping all equipment functions during any emergency situation.

5.0 PROCEDURES

This section deals with the set up and operation of remotely controlled heavy equipment.

5.1 SET UP

The RFI Remote System consists of an Operator Control Unit (OCU), an Esteem Radio Network, and a Vehicle Interface mounted on each piece of equipment.

5.2 OPERATOR CONTROL UNIT (OCU) SET UP

The OCU consists of the following items: Laptop Computer, Controller, POE Power Injector, Video Monitor, Esteem Base Radio w/ Antenna, and associated cables and power cords.

1. **OCU Connections:**
   a Connect the antenna to the Esteem Base Radio. The antenna must match the frequency of the radio set being used. **NOTE: If the repeater is NOT required in the network, use the repeater radio as the base radio.** Attach the radio to the mast. Connect the radio to the POE Power Injector with a suitable length Ethernet cable to allow positioning of the radio and mast assembly. The cable will be connected to the 10/100 port closest to the green 12vdc connector on the radio and the LANOUT/PWR port on the power injector. The power injector may now be

plugged in to a 120VAC outlet to power the radio. **WARNING: Never apply power to a radio without an antenna attached. Severe damage to the radio will occur.**

b. Connect the LAN IN port of the power injector to the laptop with a suitable length Ethernet cable.

c. Connect the Video Monitor to the Laptop Computer using a suitable length HDMI cable.

d. Connect the controller to the laptop computer using the attached USB cable.

e. Power up the laptop computer and video monitor, open RFI OCU program and select the piece of equipment being operated from the pulldown menu.

5.3 REPEATER RADIO STATION SET UP

The Repeater Radio Station consists of a Esteem Repeater Radio w/Antenna, a Mast Assembly, POE Power Injector, Generator and associated cables and power cords.

1. **Repeater Radio Connections:**

   a. Connect the antenna to the Esteem Repeater Radio. The antenna must match the frequency of the radio set being used. Attach the radio to a mast. Connect the POE power injector to the radio using a suitable length Ethernet cable to allow for positioning of the radio and mast assembly. The cable will be connected to the 10/100 port nearest the green 12vdc connector on the radio and the LANOUT/PWR port on the power injector. The power injector may now be plugged in to a 120vac outlet (generator) to power the radio. **WARNING: Never apply power to a radio without an antenna attached. Severe damage to the radio will occur.**

   b. Position the repeater mast/radio assembly in an area within direct line of sight of the UCU and the equipment being operated.

5.4 REMOTE EQUIPMENT SET UP

The Remote Equipment portion of the package consists of the piece of heavy equipment being operated with an installed Interface unit, Esteem Vehicle Radio w/Antenna, AXIS Video Server, Cameras (up to 4), E-STOP Switch, Actuator Switch, and Remote Switch.

1. **Remote Equipment Connections:**

   a. Connect the Antenna to the Esteem Vehicle Radio. The antenna must match the

frequency of the radio set being used. Mount the radio inside the cab of the vehicle. Connect the pre-wired power cable to the green 12vdc power connector on the radio. Connect the Radio to the SBRIO board in the installed Interface Unit using a suitable length Ethernet cable. The cable will be connected to the 10/100 port nearest the green 12vdc power connector on the radio and the Ethernet port on the SBRIO Board. Also connect the Radio to the AXIS Video Server with a suitable length Ethernet cable. The cable will connect to the second 10/100 port on the radio and the Ethernet port on the AXIS Video Server. Connect the pre-wired power cable to the Power port on the AXIS Video Server. Connect the Camera Cables (up to 4) to the Video ports on the AXIS Video Server using the BNC connectors on the camera cables. **WARNING: Never apply power to a radio without an antenna attached. Severe damage to the radio will occur.**

b. Power is applied to the Interface Unit and all installed equipment by turning on the Remote Switch and Actuator Switch installed on the outside of the piece of equipment being used.

6.0 SYSTEM START UP AND OPERATION

Only personnel who are properly trained and annotated on the RFI Equipment Operators List will perform these procedures.

1. Set up the Remote System Network and prepare the equipment IAW Chapter 5 of this SOP.

2. Locate the E-STOP, Actuator and Remote Switches on the equipment.

   a. The assistant will twist the Red Knob on the E-STOP switch CLOCKWISE to ensure the E-STOP is deactivated.

   b. The assistant will place the Remote Switch in the on (up) position. This will supply power to the SBRIO board and allow remote connection between the equipment and the OCU.

   c. Once remote communication is established at the OCU, have the operator start the equipment remotely by activating the Engine Start switch on the controller.

   d. The assistant will place the Actuator Switch to the on (up) position and move clear of the vehicle. This will allow hydraulic flow to the equipment. The equipment is now in a Remote Status.

   e. Once clear of the vehicle, have the operator place the Ready/Standby Switch on the controller to the Ready position and test the operation of all functions.

f. Upon completion of the operational functions test, the equipment may begin remote operations.

6.1 SYSTEM SHUT DOWN

At the completion of the remote operations, the system is shut down as follows:

1. Park the equipment in a clear area to allow for Preventive Maintenance and inspection.
   a. The operator will place the Ready/Standby Switch on the controller in the Standby position.
   b. The operator will stop the engine by activating the E-STOP switch on the controller.
   c. The assistant will place the Actuator and Remote Switches on the equipment to the off (down) position.
2. Inspect the equipment for any damage or repairs necessary and perform Daily Preventive Maintenance.
3. Refuel and secure the equipment.
4. Power down the OCU and Repeater Station (if used) and secure.

7.0 DAILY PREVENTIVE MAINTENANCE

Daily preventive maintenance will be performed IAW the Manufacturers Maintenance Manual for each piece of equipment.

8.0 ATTACHMENTS

Attachment 1	SOP Acknowledgement Form
Attachment 2	Equipment Checkout Sheet

ATTACHMENT 1
SOP ACKNOWLEDGEMENT FORM

By signing this form, I confirm that I have read and understand this SOP. I further confirm that I am qualified and capable to perform the tasks outlined by this SOP. In the event of any situation which I may not feel qualified or comfortable with, I will immediately stop the operations and inform my supervisor.

NAME	ORG	SIGNATURE	DATE

ATTACHMENT 2
EQUIPMENT CHECKOUT SHEET

EQUIPMENT ITEM	SERIAL NUMBER		
	SAT	UNSAT	ACTION TAKEN
Walk around /Cleanliness/Overall Cond			
Check Engine Oil Level/Leaks			
Check Coolant/Antifreeze Level/Leaks			
Check Hydraulic Oil Level/Leaks			
Check Transmission Fluid Level/Leaks			
Check Brake Fluid Level/Leaks			
Check Turret Gear Oil Level/Leaks			
Check Fuel Level/Leaks			
Check Belts for Damage/Tension/Cracks			
Check Tracks/Tires for Tension/Pressure			
Check Windows/Mirrors - Damage/Clean			
Check Hoses - Damage/Leaks/Dry Rot			
Check Lights			
Check Horn/Back Up Alarm			
Check Fire Extinguisher			
Check Fire Suppression System			
Check Conveyor Belts - Tears/Damage			

Any item found to be unsatisfactory will be repaired prior to operation of the equipment. If an item cannot be immediately repaired or needs replacement parts, notify the Senior RFI person.

OPERATOR SIGN:_____ **DATE:**_____


RFI

This page is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

BACKHOE OPERATIONS

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

July 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
07/29/2020		13, 14, 15	8.1, 8.3.2, 8.3.7	Minor change: Revised to address Regulatory comments regarding accurate use of the terms MEC and UXO

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Explosives Safety Submission (ESS) – current version
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards – current version
- Applicable parts of OSHA General Industry Standard 29 CFR, Part 191, Subpart N
- United States Army Corps of Engineers (USACE), Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual – current version
- Equipment Operator's Manual(s) and/or Manufacturer's Publications

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

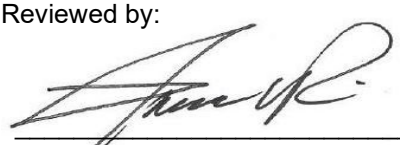
(Signature to be provided in Final SOP)

Developed by:

Donald H. M. Shaw III
Vieques Project Manager

07/29/2020
Date:

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

07/29/2020
Date

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		07/29/2020
Supervisor's Name	Signature	Date

7. WORKER'S STATEMENT

I have read this SOP and I have received adequate training to perform the procedures addressed in the SOP. If I identify a hazard not addressed in the SOP, or encounter an operation I cannot perform in accordance with the SOP, I will stop the process and notify my immediate supervisor.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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 conduct and observe backhoe operations on sites contaminated with munitions and explosives of concern (MEC).

8.2 SCOPE

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in backhoe operations on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 3.0 of this SOP for additional guidance.

Backhoes may be used during vegetation clearing operations to move piles of brush, investigation of subsurface anomalies, during clearing of rodent nests, and for minor road repair to facilitate site access and egress. This SOP contains information specific to backhoe operations. It may also include manuals and publications relevant to backhoes that may be leased, purchased, or otherwise employed on the site. It is incumbent upon all designated operators to familiarize themselves with this SOP and to periodically review it an effort to remain current with safe, productive backhoe procedures.

8.3 OPERATIONS

USA employees who operate backhoes on the project site will be qualified through on-the-job training (OJT). Equivalent OJT will be documented through previous employment or experience or through documented formal training. When engaged in backhoe operations the operator will perform daily inspection and maintenance functions (documented using Backhoe Safety Checklist at Attachment B to this SOP) and operate the backhoe as directed. The operator will also conduct OJT of other operators at the Senior Unexploded Ordnance Supervisor (SUXOS) or Team Leader's discretion.

8.3.1 PERSONAL PROTECTIVE EQUIPMENT

While conducting backhoe operations the backhoe operator and ground guide will be required to wear level D personal protective equipment (PPE) to included, at a minimum, the below items:

- Coveralls or work clothing as prescribed above
- Work gloves, leather or canvas, as appropriate
- Safety glasses - as wind conditions and airborne particulate matter dictates
- Hardhat
- High visibility vest
- Work Boots: Sturdy and of sufficient height to aid in ankle support
- Hearing Protection: Noise Attenuating Helmet or earplugs will be worn by anyone within 25 feet of the backhoe while it is operating
- Dust Masks - as wind conditions and airborne particulate matter dictates

8.3.2 GENERAL SAFETY PRECAUTIONS

The following lateral distances will be maintained when operating a backhoe on a UXO site:

- Personnel will conform to the approved safe separation distance, as specified in the ESS, for the task being performed by other personnel conducting manual, intrusive operations.
- Personnel will know and observe all applicable MEC safety precautions.
- Personnel will know and use appropriate hand signals.

These distances may be reduced or extended UXO Safety Officer (UXOSO), based on an assessment of site history, expected MEC, terrain features or other such factors that may apply. The backhoe will not be operated without a ground guide. This includes using the front and rear attachments, and backing of the tractor. Prior to starting an excavation, a safety arc will be etched in the ground with the rear boom, fully extended. If operating on a hard surface, the safety arc will be marked with bright spray paint, traffic cones, and/or other identifier. Prior to anyone entering the safety arc, the operators will:

- Swing the boom arm fully to one side
- Lower the bucket to the ground
- Return the engine to idle speed
- Hold his hands clear of the controls or in the "Hands Up" position

8.3.3 EQUIPMENT SAFETY PRECAUTIONS

See the Operator's Manual.

8.3.4 TEAM COMPOSITION

The Team Leader, a UXO Technician III, will designate a ground guide who will act as “safety observer” to the operator and direct all other team personnel as required. If conducting MEC operations members of the backhoe team (ground guide and operator) must be UXO qualified.

8.3.5 GROUND PERSONNEL

Team members working on a backhoe team will be qualified through OJT and/or formal training and will perform such tasks as magnetometer checks of area to be excavated prior to digging, manual excavation, and checks of the hole as appropriate.

8.3.6 TRAINING

Training will be documented in Team Leaders field notebooks and in USA on-site records.

8.3.7 GENERAL OPERATIONAL PROCEDURES

The operator and ground guide will ensure they are aware of where all the members of the team are while driving the backhoe to and from excavation work sites. Prior to shutting off the tractor engine, the operator should let the engine run at idle speed for a few minutes to allow the engine to cool.

Prior to excavation operations the Team Leader shall establish/review hand and arm and warning siren signals with all members of the team. The backhoe will not be used to excavate closer than 12 inches from any MEC. Removed dirt will be placed at least 2 feet from the expected edge of the excavation, and on the uphill side when working on a slope.

Excavations will not be deeper than 4 feet. Such excavations require the UXOSO/competent person to determine soil conditions, sloping, benching or shoring requirements.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The team will be equipped with the following:

- Backhoe Manual
- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    1. Coveralls
    2. Gloves(1)
    3. Boots/shoes, chemical-resistant safety-toe and shank
    4. Safety glasses or chemical splash goggles (1)
    5. Hard hat(1)
    6. Face shield (1)

    Footnote (1) Optional, as applicable.
- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

This page is intentionally left blank.

ATTACHMENT A.
BACKHOE OPERATIONAL PROCEDURES

This page is intentionally left blank.

Before Using The Machine

- Read the owner's manual to learn the characteristics of your machine.
- For your personal protection you will need to wear some or all of the following:
    - sturdy pants and shirt
    - safety shoes
    - hard hat
    - safety goggles or glasses
    - gloves
    - hearing protection
    - respirator for dusty conditions
- Sunscreen protection is vital in bright sunshine if not under a roof.
- Check the loader/backhoe for the presence of the following safety devices in good working order:
    - rollover protective structure (ROPS)
    - seat belt (if ROPS equipped)
    - guards
    - shields
    - backup warning system
    - lights, and mirrors
- Fill the fuel tank while engine is off and cool. Never fill inside a building. Do not smoke. Wipe up any spills immediately.
- Check the machine daily for broken, missing, or damaged parts. Make the necessary repairs or replacements.
- Keep the machine clean -- especially steps, hand rails, pedals, grab irons, and floor of the cab. Slippery surfaces are very hazardous.
- Remove or secure loose items in the cab that could interfere with operating the controls.
- Check the work area for hidden holes, obstacles, drop-offs, etc. Clear children, pets, and bystanders from the area.
- Check overhead for utility lines, roofs, and other obstacles.
- Request Blue Stake service to locate underground cables, gas lines, water, and sewer lines before digging. You need to request this service in advance.
- Always use the hand rails, ladders, and steps provided when mounting the machine; never grab controls or the steering wheel.
- The cab was designed for one person -- allow no riders, especially children.

Operating The Loader

- Adjust the seat, fasten the seat belt, set the brake, and place transmission in park or neutral before starting the engine.
- If machine is in a garage be sure ventilation is adequate. CARBON MONOXIDE KILLS!
- Start the engine and check all controls for proper function. Check horn and backup alarm. Do not use if anything is faulty.
- If the backhoe is still attached, be sure to use chains and locks to prevent it from swinging.
- If the backhoe is removed, you may have to use counterweights. Check your owner's manual.
- Keep the working area as level and clean as possible. Use the bucket to grade the area frequently.
- Always carry the bucket low for good visibility and maximum stability.
- Use extreme caution when backfilling to avoid collapsing the wall of the trench.
- When undercutting high banks or material piles be alert for falling rocks and/or cave-ins.

OPERATING THE BACKHOE

- Keep the loader bucket on the ground.
- Level the machine for maximum stability.
- Operate the backhoe only from the seat.
- Never swing the bucket over a truck cab.
- Dump the bucket uphill if possible when operating on a slope. If you must dump downhill swing slowly to avoid tipping the machine.
- If using the backhoe as a hoist, do so with the weight over the back of the machine -- NEVER THE SIDE -- to avoid tipping.
- Be sure the load you are lifting is balanced, and move the boom slowly to avoid swaying the load.

SAFE STOPPING PROCEDURE

- Park the machine on level ground if possible and set the parking brake. Place transmission in park if so equipped.
- Lower the loader and backhoe buckets to the ground.
- Stop the engine and remove the key.
- Work the hydraulic controls to relieve pressure.
- Wait until all motion has stopped and then dismount carefully using steps and safety holds. Do not jump from the machine.

ATTACHMENT B
BACKHOE SAFETY CHECKLIST

This page is intentionally left blank.

Site/Location: _____ Date: _____

Backhoe Characteristics

- ☐ Labeled for operating rated capacity.
- ☐ Steps and grab handles.
- ☐ Seat belts / ROPS.
- ☐ Protective shields or guards.
- ☐ Correct bucket size.
- ☐ Proper lighting and signals.
- ☐ Operating handles easy to reach for operator with full view of work area from all positions.
- ☐ Brake system.
- ☐ Appropriate type of fire extinguisher readily available.

Backhoe Operators:

- ☐ Trained and designated to use the equipment.
- ☐ Never exceed the equipment's rated capacity.
- ☐ Use warning signal to alert others in the work area to problems.
- ☐ Allow proper clearance, including overhead.
- ☐ Select correct size of bucket.
- ☐ Ensure area to be dug has been marked. Observe the area and contact the utilities company(s) for locations of utilities. Request “blue stake” service in advance of operations.
- ☐ Tighten sling without hands or fingers between sling and load.
- ☐ Know maximum depth capability.
- ☐ Ensure stop locks or barricades are placed near the excavation.
- ☐ Balance loads placed in buckets.
- ☐ Wear correct personal protective equipment while operating backhoe.
- ☐ Remove and secure loose clothing, tools, equipment, etc., out of operating area in cab.
- ☐ Never operate boom or bucket in an unsafe manner.
- ☐ Use equipment smoothly, avoiding sudden starts and stops.

Bucket Characteristics:

- ☐ Select by rated capacity and job requirements for model being operated.

Backhoe Inspection:

Operators are to check, observe, correct, and ensure the following at a minimum

- ☐ Observe warnings, cautions, precautions, and recommendations in the operator's manual.
- ☐ Operating mechanism: check all controls and throttle.
- ☐ Hydraulic system: Check hoses, lines, and connections or fittings
- ☐ Proper fluid levels: Check all fluid levels, use only approved fluid replacements.
- ☐ Hoses and lines: Check for cuts, excessive wear, or leaks.
- ☐ Air filter system: Check for cleanliness and in place.
- ☐ Frame-lock lever: Check lever and lock stop for damage.
- ☐ Lighting and mirrors: Check for serviceability.
- ☐ Frame, steps, and grab handles: Check for damage.
- ☐ Brakes: Check for stopping ability on and off road.
- ☐ Backup warning alarm: Check for serviceability.
- ☐ Seatbelts/ROPS: Check for cuts or missing/inoperable components.
- ☐ Exhaust system: Check for leaks or missing components.
- ☐ Check for fluid leaks: Check for any fluid leaks, use spill control methods until repaired.
- ☐ Tires: Check for proper inflation, tread wear and damage to rims.
- ☐ Grease fittings: Check fittings and grease every 8 hours of use, ensure correct type and amount is utilized.
- ☐ Inspect work area: Check for stop blocks or barricades, collapsed walls, unauthorized personnel in area, obstacles, or other hazardous or dangerous conditions/situations.
- ☐ Conduct repair/maintenance outside of populated work area. Turn equipment off, lower buckets, display warning signs.

Completed By:

Name _____ Position _____

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

SURFACE MEC REMOVAL

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Explosives Safety Submission (ESS) – current version
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards – current version
- Chief of Naval Operations Instruction (OPNAVINST) 3500.39 – current version
- NAVSEA OP 5 Ammunition and Explosives Safety Ashore. – current version
- United States Army Corps of Engineers (USACE), Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual – current version
- DDESB TB 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel – current version
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.09-M, Edition 1, Defense Explosives Safety Regulation
- DOD 4160.21-M, Defense Reutilization and Marketing Manual
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives.

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

LIST OF TABLES

This space is intentionally left blank.

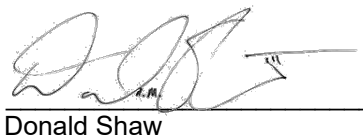
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

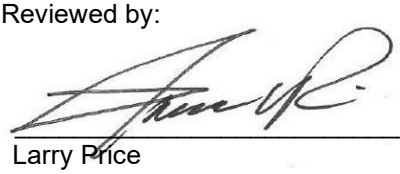
Developed by:



Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

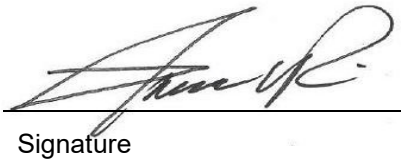
This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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 MEC removal operations at sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC).

8.2 Scope

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in surface MEC removal operations on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 3.0 of this SOP for additional guidance.

8.3 Surface MEC Removal Operations

All surface MEC removal operations at MEC sites will be performed under the direct supervision of fully qualified UXO Technicians. USAE personnel will strictly adhere to the SSHP and the following general safety practices:

- Operations will be conducted during daylight hours only.
- Personnel will NOT excavate to find items that are not visible on the surface during Surface MEC Operations. Grass and other vegetation will be removed to expose undisturbed soil in an effort to locate hidden items on the surface.
- 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 Explosives Safety Submission.
- 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.

8.4 Personnel Qualifications

All personnel involved in surface MEC removal 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

8.5 WORK AREA DETERMINATION AND GRID LAYOUT

Once the Work Area Determination (WAD) has been requested and the initial reconnaissance, WAD walk, has been completed, the removal teams will survey in the grids using a Global Positioning System (GPS) and marking the grids utilizing wooden stakes, or equivalent, in accordance with the MWP. Avoidance procedures will be utilized while performing these operations. The site layout procedures are as follows:

- Identify and mark search grids:
  - Search grids will be 30 Meters X 30 Meters or approximately 100 feet X 100 feet as identified in the WP
  - Grid boundaries will be marked with survey wooden stakes, with survey tape, and temporary survey lanes with white pin flags or rope/twine/string as necessary.
  - Grid stakes will be marked with the grid number using a PDA, the team leader will verify these.
- Establish and, mark if required, search lanes:
  - A typical search lane will be a width of approximately 5 ft. The lanes may or may not be established prior to sweeping. If temporary lanes are marked prior to sweeping it will be done by a UXO technician to ensure safety.
  - For wide area surface clearances, sweep lane boundaries may be marked while sweeping. For example, the sweep line would begin sweeping with a grid boundary on one side and place pin flags on the opposite side of the line as they sweep. This would provide a boundary for the return sweep and ensure 100% coverage.

8.5.1 Flags and Markers

USA uses a system of colored flags/flagging and markers to identify MEC scrap metal, search lanes, and site, zone, and grid boundaries. Table 1 lists the types of markers used.

Table 1: Marking Material

Type Marker	Flag/Flagging Color	Item/Area Marked
Stake	Pink	Grid boundary
Pin Flag	White	Temporary Boundary
Pin Flag	Red	MEC
Pin Flag	Red and Yellow	Sub-Munition
Pin Flag	Blue	MEC Scrap

8.5.2 Surface MEC Removal

The purpose of a surface MEC removal within a grid is twofold: first to locate, mark, and record the location of the surface MEC contamination contained in each grid; and second to consolidate the scrap metal contamination within each grid.

8.5.2.1 Surface MEC Removal Team Structure

The surface MEC removal teams will be supervised by a UXO Technician III and consist of a combination of the appropriate number of UXO Technicians II/I, not to exceed eight. MEC operations will only be performed by qualified UXO Technicians. The following is an example and composition of a typical Sweep Team:

- One UXO Technician III, who directs and supervises all team activities, confirms the identification of all MEC encountered, and maintains the sweep team journal.

- The UXO Technicians II/I's who visually search the area for MEC. These personnel perform their duties under the direction and supervision of the UXO Technician III.

8.5.2.2 Surface MEC Removal Team Procedures

All removal operations will be performed under the direct supervision of a qualified UXO Technician III. The UXO Technician III will assemble the UXOT II/I's into their sweep lane and direct their movement across the survey grid.

- At the direction of the UXOT III each grid will be broken down into 5 foot lanes and a UXOT II/I will sweep each lane. The UXOT's will move through their lane from one end to the other. During the surface clearance the following will occur with regards to items encountered;
  - When an item is encountered, the UXO Technician will stop and inspect the object to determine if it is scrap or MEC
  - If an item is MD scrap and can be moved it will be picked up and placed in the 5 gallon bucket
  - If the item is scrap but cannot be picked up or is buried the item will be left in place and marked with a blue pin flag
    If the item is MEC it is marked with a red pin flag
  - This procedure is continued until the grid 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 in the PDA as to the type, nomenclature, and location.
- Upon completion of the grid sweep the sweep 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 Scrap Management/Disposal Team.

8.5.3 Magnetometer Assisted Surface Sweep

Magnetometer assisted surface sweep procedures are basically the same as surface sweeps. In addition to identifying surface contamination, magnetometers are used to locate buried MEC that may be concealed by brush or heavy grasses. Instructions on the use and calibration of magnetometers are in the operations manual. The purpose of a magnetometer assisted-surface sweep of a grid is to first locate, mark, and record the location of the surface and buried MEC contamination contained in each grid; and second to consolidate the scrap metal contamination within each grid. The typical span of control for a UXOTIII should not exceed seven magnetometer operators. This ensures positive control and safety.

8.5.3.1 Magnetometer Assisted Surface Sweep Team Structure

The sweep team will consist of all UXO Technicians. The following is the structure and composition of a typical Sweep Team:

- One UXO Technician III, who directs and supervises all team activities, confirms the identification of all MEC encountered, and maintains the sweep team journal.
- The appropriate number of UXO Technicians II/I's, not to exceed eight, utilizing handheld magnetometers who visually and electronically search the area for MEC and scrap. These personnel perform their duties under the direct supervision of the UXO Technician III.

8.5.3.2 Magnetometer Assisted Surface Sweep Team Procedures

All sweep operations will be performed under the direct supervision of a qualified UXO Technician III. The UXO Technician III will assemble the Magnetometer Operators into a sweep line and direct their movement

across the survey grid. Procedures will be the same as detailed in Section 8.5.2.2 with the exception that the UXO Technicians will utilize the magnetometer to assist in searching in the grids.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

- It is recommended to wear long-sleeved clothing and apply insect repellant as warranted to mitigate the impact of biting/stinging insects.
- The potential for encountering MPPEH is high. Maintain the TSD as specified in the ESS.
- If a munitions item with larger fragmentation distance is encountered, work is to be stopped in order to modify the ESS.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The team will be equipped with the following:

- Handheld metal or all metals detector
- Pin flags for marking paths, and items not able to be moved or items that remain in the ground
- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    1. Gloves(1)
    2. Boots/shoes
    3. Safety glasses
    4. Hard hat(1)

    Footnote (1) Optional, as applicable.
- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

MEC TRANSPORTATION

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USAE, Inc. Final Work Plan Munitions and Explosives of Concern Removal for the Former Vieques Naval Training Range Vieques Island, Puerto Rico,
- CH2M HILL, Inc. Final Explosives Safety Submission, Former VNTR and the Former NASD, Vieques, Puerto Rico.
- CH2M HILL Inc. Final Non-Time Critical Removal Action/Interim Measures Work Plan for Surface Munitions and Explosives of Concern at Munitions Response Area-Surface Impact Area, Munitions Response Sites 1 through 7, Former Vieques Naval Training Range (VNTR), Vieques, Puerto Rico.
- NAVSEA OP 5. Ammunition and Explosives Safety Ashore

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

This space is intentionally left blank.

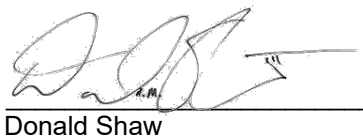
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

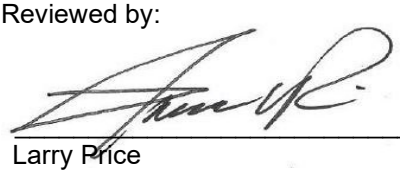
Developed by:



Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. UPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 General

The following USAE 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 (WP), Site Health and Safety Plan (SHSP), applicable Federal, State, Commonwealth, local regulations and, contract restrictions and guidance.

8.2 Introduction

Movement and/or Transportation of MEC and/or MPPEH may be a consideration once evaluated and determined to be safe to do and there is a compelling reason.

8.3 Determination to Move and/or Transport MEC and/or MPPEH

8.3.1 Movement

Prior to on-site movement, MEC and/or MPPEH must be evaluated and determined to be safe to move as follows:

- For MEC and/or MPPEH, including suspect munitions items, the SUXOS and UXOSO must determine that the risk associated with movement is acceptable and that the movement is necessary for the efficiency of the activities being conducted or the protection of personnel, property or critical assets. The SUXOS and UXOSO must agree with the risk determination and document this decision in writing prior to movement of the MEC or munitions item.
- Recovered military munitions or MEC will not be moved by personnel unless it is safe to do so. Movement of MEC by hand is authorized only after positive identification and a determination by the SUXOS and UXOSO that the MEC is safe to move. A conservative approach to MEC transportation will be taken and only considered when the item is positively identified as safe to move.

8.3.2 Transportation of Material Documented as an Explosive Hazard and Material Documented as Safe

MPPEH is assessed by visual inspection requires a 100% inspection by one UXOTIII or above, followed by an independent 100% re-inspection by a UXOTIII. The assessment categorizes the MPPEH as material documented as safe (MDAS). Documentation of the material's safety status must be maintained and accompany the movement or the material will revert to MPPEH and require the inspection process to be performed again.

8.4 Procedures for Transportation of MEC

If on-site movement of MEC for disposal or venting is approved, move the MEC in accordance with technical data. Movement over short distances for on-site consolidation will be done by hand-carrying the MEC in the position found.

Movement of greater distances (e.g., to another grid for disposal or venting) may be done in a specially-equipped pickup truck. The truck must have the appropriate placards and a non-sparking sand filled container with tie-down points. The MEC will be stabilized with sandbags and or additional sand. The wooden box will be securely tied down. The driver of the transport vehicle will be followed by another similar vehicle and driver to assist him in loading and unloading the MEC, and in the event of mechanical trouble.

During the transportation of any MEC the vehicle will be considered a non-smoking area.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the MPPEH holding area prior to commencing any MPPEH Management or Disposal activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The team will be equipped with the following:

- Handheld analog detector
- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera

- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    1. Coveralls
    2. Gloves(1)
    3. Boots/shoes, safety-toe and shank
    4. Safety glasses
    5. Hard hat(1)

    Footnote (1) Optional, as applicable.
- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This page is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

TRIMBLE RTK SYSTEM

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico current version.
- NOSSAINST 8023.11B, DON Standard Operating Procedures Development, Implementation, and Maintenance for Ammunition and Explosives
- Manufacturer's Publications

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

This space is intentionally left blank.

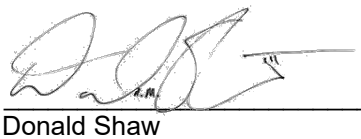
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

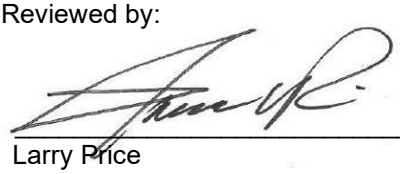
(Signature to be provided in Final SOP)

Developed by:



Donald Shaw — 01/03/2020
Project Manager — Date

Reviewed by:



Larry Price — 01/03/2020
Vieques Senior UXO Supervisor — Date

Approved by:

Jason W. Wagner, CMQ/OE — Date
Corporate Quality and Safety Manager

This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's or Operator's	Worker's or Operator's Signature	Supervisor's Name	Supervisor's Signature	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 INTRODUCTION

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 conduct Trimble RTK operations on sites contaminated with unexploded ordnance (UXO) or munitions and explosives of concern (MEC).

8.2 Scope

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in Trimble RTK operations on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 2.0 of this SOP for additional guidance

8.3 How to Perform a GPS Quality Control Test

1. *Location:* the standard QC checkpoint is located at OP-1 between the two bombs. The checkpoint name is OP-1-C. Written on one of the bombs is the Easting and Northing coordinates of checkpoint OP1-C. Additional control monuments with check points are located at various locations around Vieques. Find the closest control monument to the area that the work is being performed.
2. *Assemble GPS equipment:* Set up the RTK base station at a known control monument and start a survey using procedures taught during RTK GPS training. Set up RTK rover and ensure that the rover is receiving radio corrections from the base station. Check to make sure the batteries are charged by looking at the battery indicator lights on the receiver. Also, check the receiver's satellite and radio indicator lights. Both lights should be blinking at consistent intervals.
3. *Trimble Survey Controller procedures when measuring a QC point:* When in the data logger main menu (Figure 1), select Files> Open Job. Select the desired job name. Once loaded the name will be displayed in top left comer, and Survey Controller will return to main menu. Once a job has been selected, it will remain the active job even if the system is powered off and back on. Do not change the Job unless you are required to.
4. Measuring a Point

- From the main menu select Survey>RTK>Measure Points. A new window will appear prompting for point name and code. Enter the desired point name and accompanying code. The QC point naming convention is the date followed with "gpsqc". The code is the point's location, typically OP-1-C.
- Before measuring the point, check to the bottom middle of the screen to make sure there is a "fixed" position. If the RTK is in "float" or there is a "poor PDOP" message, do not measure the point. More about "float" will be addressed in the troubleshooting section of the SOP.
- There is a small black circle on the concrete labeled "qc point". Place the staff point inside this circle and use the bubble on the field staff level to center the GPS antenna on the QC checkpoint.
- Once the GPS antenna is positioned and leveled, hit the "measure point" button in the bottom right comer of the data logger screen. A timer will appear and count down, typically between 3-5 seconds, during which the staff must remain leveled and on the point. When the countdown is complete, tap the "enter" button in the bottom right comer. A new window will appear, tap the "store" button in the bottom right comer.

- To check the coordinates of the QC point, from the main menu tap Files>Review Current Job. Select the point name that matches the QC point name and tap. The data quality objectives for RTK GPS must be within l0cm of the original point location. Compare the original point coordinates to the QC point coordinates. If the QC point's Easting and Northing is measured to within l0cm of the original then it has passed the QC test and can be used throughout the day. If it fails, measure the point again. If the QC point fails a second QC, check the base station setup to be sure it was set up correctly. Check the coordinates entered for the base station monument to be sure they were entered correctly. Do not start survey work until the QC test passes the 10cm requirement.

8.4 HOW TO STAKEOUT A GPS POINT

1. When reacquiring a GPS coordinate use the "stakeout" function on the datalogger to guide you to the point's coordinates. Using the stakeout function is similar to measuring a point but instead of you measuring a new position, the GPS will guide you to a known coordinate.
2. In the Main Menu on the data logger screen select Survey>RTK>Stakeout.
3. Select a point name from the list of points. If the point name does not appear on the list then it has not been added. Select "add" on the bottom of the screen. Then select "all points". All points stored in the data logger "linked files" will be added to the point list. Select the point you want to stakeout.
4. A new window will appear with the direction of the desired point indicated with an arrow. Meters north, south, east, or west also lists the offset.
5. When you are within 1m of the point the directional arrow will change to crosshairs, and the point will be represented by two circles inside of one another.
6. Position the crosshairs inside the inner circle with the staff leveled and select "measure" in the bottom right corner. The screen will change, prompting the user to enter a new point name and associated code. Once completed, tap "measure" and a countdown will begin.
7. After the countdown, tap "store".
8. The window will change to indicate the computed offsets of the new stakeout versus the original point.

8.5 HOW TO DOWNLOAD DATA

1. From the main menu select Files>Import/Export>Send ASCII Data. In file format, select Comma Delimited (.CSV).
2. Send to "Trimble Data", Trimble Data is a folder in the data logger's file directory.
3. To name is where you enter what the file you are creating is going to be called.
4. The remaining drops down menus have "fields". The "fields" are columns in the .CSV file format and are similar to columns in an Excel file but unlike Excel files .CSV format does not have headers. Point name is assigned Field 1. Point Code is assigned Field 5. Northing is assigned Field 2. Easting is assigned Field 3. Elevation is assigned Field 4.
5. Select enter and the file is created and stored in the "Trimble Data" folder.
6. To transfer the file from the data logger to a different computer you will need the data logger, a multiport connector (if using a TSCe data logger), and a USB cable. In addition, Microsoft ActiveSync software (Windows XP) must be installed on the computer downloading the data otherwise you will not be able to connect the computer with the data logger. For computers with Windows Vista or Windows 7, the necessary software is already installed and is called Windows Mobile Device Center.

7. Attach the multi-port connector to the TSCe then connect the TSCe to your computer with the USB cable. For a TSC2 or TSC3 data logger, connect the USB cable directly between the data logger and the computer. When connected with the USB cable Microsoft ActiveSync/ Windows Mobile Device Center will start. A window will appear on the data logger screen asking you to "Connect to desktop?" Select "Yes". The software will indicate your computer is connected to a mobile device and prompt you to synchronize the two devices. Do not synchronize your computer with the data logger. Select "Cancel" and you will be signed on to the data logger as a "Guest". For Mobile Device Center, click Connect without Setting up Device. This will allow you to transfer files between the two devices but not change or delete files.
8. In the ActiveSync main menu, select "Explore". Double click on "Disk" folder then double click on the "Trimble Data" folder. In Mobile Device Center, click File Management, then double click on the “Disk” folder then double click on the “Trimble Data” folder.
9. Select the file you created and copy it from the data logger to your computer.

8.6 HOW TO UPLOAD DATA TO THE TSCE

1. To upload files to the data logger you will need the data logger, a multi-port connector (if using the TSCe data logger), and a USB cable. In addition, Microsoft ActiveSync software (Windows XP) must be installed on the computer downloading the data otherwise you will not be able to connect the computer with the data logger. For computers with Windows Vista or Windows 7, the necessary software is already installed and is called Windows Mobile Device Center.
2. Types of files you can upload to the data logger are .CSV, .SHP, .DBX, etc. The most common file you will need to upload will be .CSV files, which contain point names and coordinates. Comma Delimited files (.CSV) can be created in Excel but the file must be saved as a .CSV to work properly on the data logger.
3. Attach the multi-port connector to the TSCe then connect the TSCe to your computer with the USB cable. For a TSC2 or TSC3 data logger, connect the USB cable directly between the data logger and the computer. When connected with the USB cable Microsoft ActiveSync/ Microsoft Mobile Device Center will start. A window will appear on the data logger screen asking you to "Connect to desktop?" Select "Yes". The software will indicate your computer is connected to a mobile device and prompt you to synchronize the two devices. Do not synchronize your computer with the data logger. Select "Cancel" and you will be signed on to the data logger as a "Guest". For Mobile Device Center, click Connect without Setting up Device. This will allow you to transfer files between the two devices but not change or delete files.
4. In the ActiveSync main menu, select "Explore". Double click on "Disk" folder then double click on the "Trimble Data" folder. . In Mobile Device Center, click File Management, then double click on the “Disk” folder then double click on the “Trimble Data” folder.
5. Select the file you created and copy it from your computer to the data logger’s "Trimble Data" folder.
6. Disconnect the data logger from your computer.
7. On the data logger main menu, select "Files" then "Properties of current job".
8. You will need to link the file to the current job. Select "Linked files" then select the file you want to link. When a file is linked to a job, it will have a check mark beside the file name. Multiple files can be link to a job. Linked files cannot be overwritten when linked to a job. If you are trying to export a file with the same name as a linked file, you will get a "file error" and the file will not be exported.

8.7 TROUBLESHOOTING COMMON GPS PROBLEMS

1. *Loss of radio link:* When the GPS receiver is not receiving radio corrections from the GPS base station you will not be able to measure points or stakeout points accurately. The radio indicator light on the GPS receiver will stop blinking and/or will be blinking at inconsistent intervals. Loss of radio can be caused by being too far away from the base station radio, by not having "line of sight" to the base station radio, or by another radio transmitting on the same frequency. Radio transmission can be interrupted when the signal is blocked by a being behind a mountain or when trying to use the GPS receiver when up against a steep bank or cliff.
2. *Lack of satellites:* For RTK quality, GPS the satellite icon must be receiving a minimum of five satellites in a favorable geometry. The number of satellites appears on the right side of data logger's main menu. A lack of enough satellites will cause the GPS receiver to "float". The "float" indicator is at the bottom of the screen when measuring or staking out a point. A lack of satellites can be caused by have the satellite signal blocked by objects such as overhanging tree branches or by not having enough satellites overhead. When the system begins to "float" make sure there is nothing blocking the GPS dome. If the system is not being blocked by physical objects then check the satellite indicator and wait until there are more satellites. Usually, additional satellites will appear within 15 minutes as the satellites orbit the planet.
3. *Battery power:* Battery strength for the GPS receiver is indicated on the data logger by the battery icon and displays remaining strength as a percentage. Battery power can also be checked on the front panel of the GPS receiver with blinking lights. Before a battery drains, the green light will blink rapidly with a warning from the data logger.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

This space is intentionally left blank.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The team will be equipped with the following:

- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    4. Coveralls
    5. Gloves(1)
    6. Boots/shoes
    7. Safety glasses
    8. Hard hat(1)

    Footnote (1) Optional, as applicable.
- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

12.1 EQUIPMENT FOR TRIMBLE RTK SYSTEM

12.1.1 Base GPS Station Equipment

1. Base GPS receiver (model 5800/ R8 GNSS)
2. GPS antenna tripod with leveling bubble
3. GPS/Radio power cable – "Y" cable
4. GPS/radio cable
5. Base Radio (TrimMark3)
6. Base radio tripod
7. Base radio antenna
8. Base radio antenna cable
9. Base radio 12v battery (deep discharge battery)
10. TSCE Controller cables (limo to DB9 & DB9 to DB9)
11. Serial to Serial cable

12.1.2 Rover GPS Equipment

1. Rover GPS receiver with integrated antenna and radio (model 5800/ R8 GNSS)
2. Rover Antenna range pole
3. Data logger (TSCe/ TSC2/ TSC3 with Stylus)
4. Rover radio antenna whip
5. Rover batteries
6. Rover/data logger pigtail cable (Limo to DB9)
7. Data logger/serial cable (DB9 to DB9)
8. Data logger Range Pole Bracket

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

This page is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

DIGITAL GEOPHYSICAL MAPPING

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. 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, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Geophysical System Verification (GSV) Plan
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards
- Chief of Naval Operations Instruction (OPNAVINST) 3500.39C

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

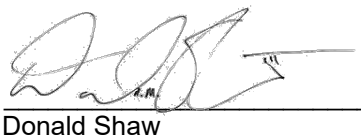
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

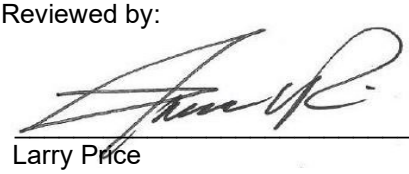
Developed by:



Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date:

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

This standard operating procedure (SOP) expires four years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

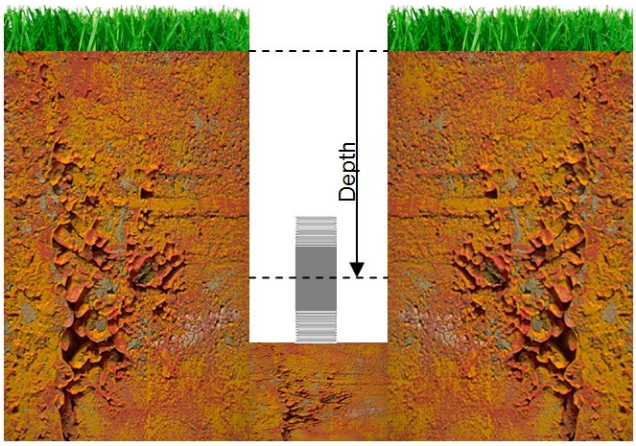
8.1 Introduction

This Standard Operating Procedure (SOP) discusses the process of performing digital geophysical mapping (DGM) work performed at the former Vieques Naval Training Range (VNTR) and the Former Naval Ammunition Support Detachment (NASD) at Vieques, Puerto Rico. This SOP includes the DGM fieldwork, data processing, and analysis procedures followed by the Prime DGM Subcontractor.

8.2 Blind Quality Control Seed Items

Prior to DGM surveys, blind QC seed items (BSIs) will be buried in the areas to be surveyed in order to perform ongoing verification that the DGM system is properly functioning and the munitions detection and positioning MQOs are being met, as described in the Geophysical System Verification (GSV) Plan. The Prime DGM Contractor will use small industry standard objects (ISOs) as seed items. BSIs will be buried vertically at a depth of 6 inches below ground surface, with the depth being measured to the center of mass of the item, as illustrated in **Exhibit 1**. Once placed, the locations of all seeded items will be surveyed using real-time kinematic (RTK) global positioning system (GPS) or conventional survey equipment, and their locations will not be shared with the personnel performing DGM surveys and data processing and interpretation until those tasks have been completed.

Exhibit 1. Blind Seed Burial Illustration



8.3 Equipment

The EM61-MK2 is a high-resolution time-domain electromagnetic instrument designed to detect, with high spatial resolution, shallow ferrous and non-ferrous metallic objects. In comparison with other metal detectors, especially magnetometers, it is much better suited for work in close proximity to man-made structures and in areas of dense subsurface metallic debris (i.e. impact ranges). The Standard EM61-MK2 system consists of two air-cored coils, a digital data recorder, batteries and processing electronics. The EM61-MK2's transmitter generates a pulsed primary magnetic field, which then induces eddy currents in nearby metallic objects. Each of the two spatially separated receiver coils measures these eddy currents. The EM61-MK2 offers the ability measure the eddy currents at three distinct time intervals in the bottom coil or four intervals if no top coil measurements are recorded (as planned for the Vieques work). Earlier time gates provide enhanced detection of smaller metallic objects. Secondary voltages induced in both coils are measured in millivolts (mV). The arrangement of coils is such that there is a vertical separation of 40 cm. The data are collected using either Geonics' EM61MK2 or Geomar's Nav61MK2 program, depending on grid conditions, and temporarily stored in an Allegro CX prior to downloading to a laptop computer.

Trimble's 5700, R7, or R8 GPS or equivalent, are a 24-36 channel dual frequency RTK receiver that use satellites that transmit on both L1 and L2 frequencies. This system operates with a base and a rover unit; the base sends corrections to the rover via radio link, thus maintaining a 3cm horizontal accuracy and a 5cm vertical accuracy. For configuration with the EM61-MK2, the rover is set to output a GGA NMEA string at 1 Hz, which is captured into the NAV61MK2 program and on the Allegro CX.

DGM instruments will be assembled and calibrated (if necessary) according to manufacturer specifications. DGM instruments and positioning systems will be set up, and surveys will be conducted as follows.

8.4 Data Acquisition

Whether the survey area is established as grids or as transect lines, the EM61-MK2 is operated at a walking pace by one or two people. Data will be collected on wheels or in tandem mode (the instrument is carried by two operators) with readings triggered at a minimum of 10 readings/second. Selection of the appropriate method is based primarily on local terrain conditions.

8.5 Instrument Setup

When the instrument is operated in wheel mode, it is setup according to Geonics EM61-MK2 Manual. For tandem mode, the EM61-MK2 coils are centered suspended on two 10ft long fiberglass poles. The instrument is attached to the poles by the top coil with zip ties and webbing. For both modes of data collection, the cables are taped to keep them from getting tangled or pulled out by brush or other impediments. If GPS is used, a three-leg tripod is attached to the top coil and the satellite antenna is fastened to the top.

8.6 Navigation

Depending on site conditions, navigation of the system is accomplished through either fiducial positioning or Real-Time Kinematic Differential Global Positioning System (RTK DGPS).

The fiducial positioning method is used in wooded areas where GPS positioning is unavailable. This method uses surveyed reference locations on evenly-spaced centers (approximately every 20 meters down line) to identify locations for the placement of fiducial marks within the recorded data.

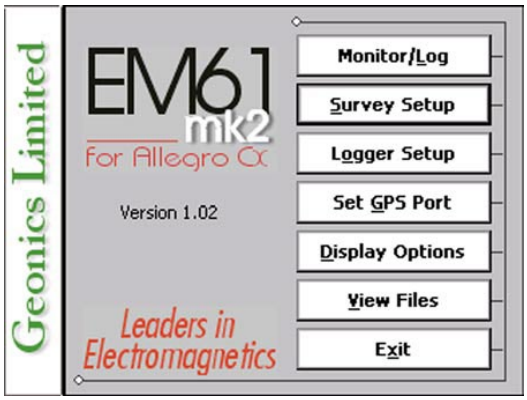
The second method of navigation is RTK GPS. A GPS base station is set up on a control point, and corrections are sent via radio link to the rover receiver. The rover GPS antenna is mounted over the center of the EM61-MK2 coil and provides real-time positional tracking capabilities, streamed into the same software program as the EM61-MK2 data.

8.7 Data Collection Steps

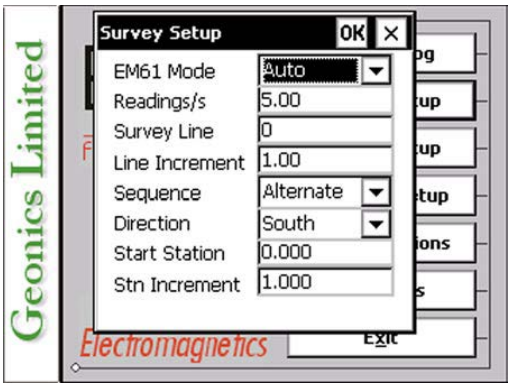
The following steps are followed to begin surveying with the **EM61-MK2 with fiducial positioning**:

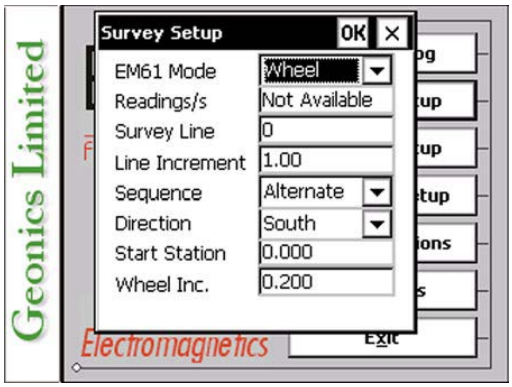
1. Turn on the EM61-MK2 by pushing in the fuse on the top of the console/electronics and or switching the Master/Slave (M/S) switch to M.
2. Allow the instrument to warm up for at least 15 minutes.

3. Turn on the Allegro CX, and open the EM61MK2 program. The screen below will be displayed.

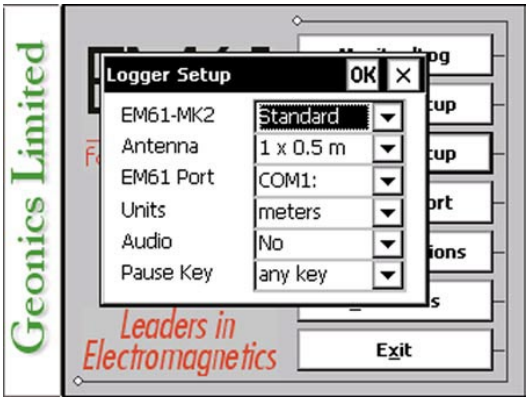


4. Click on “Survey Setup”, and specify the following options. Depending on surface conditions, the Mode is set to “Auto” and Readings/s is set to “10” or the Mode is set to “Wheel”, Readings/s to “Not Available”, and Wheel Inc. to 0.1. The remaining options become important for maintaining positioning, then click OK.



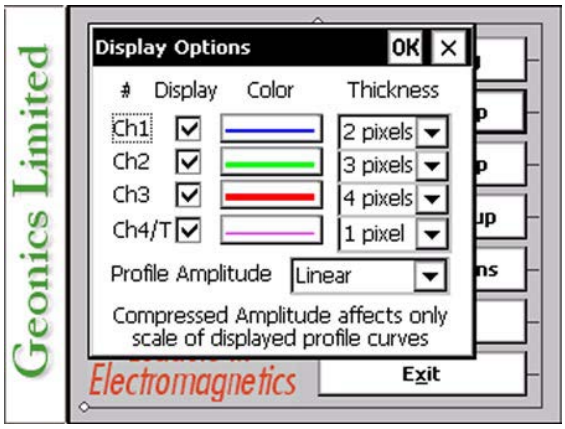


5. Click on “Logger Setup”, and specify the following options. These settings will remain as defaults throughout the project, then click OK.

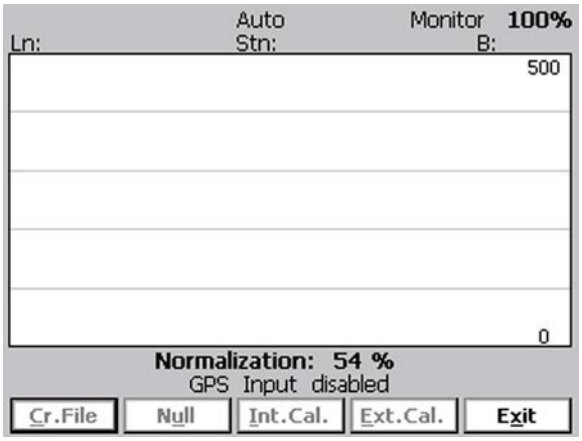


6. Click on “Set GPS Port ”, and make sure the *GPS Input* is set to “Disabled”, and all other options are grayed out, then click OK.

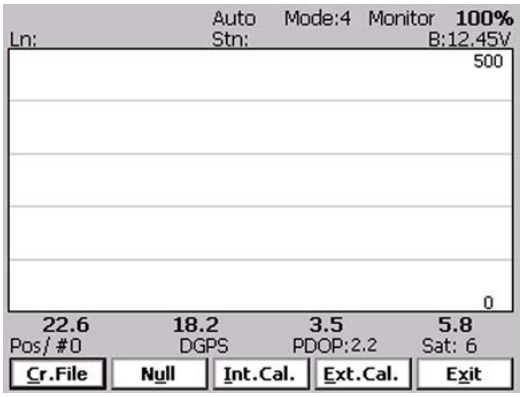
7. Click on “Display Options”, and specify the following options. These options are also operator preferences for aesthetics and do not affect the collected data, then click OK.

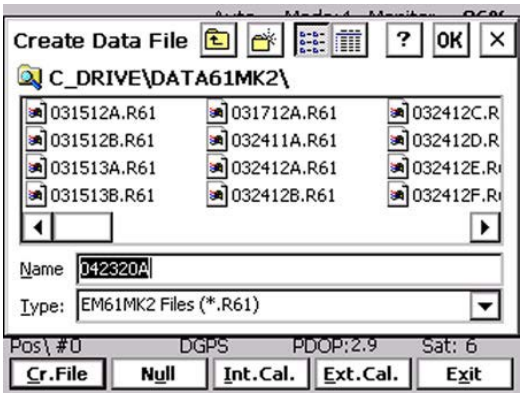


8. Once all parameters are set, click on “Monitor/Log”. The screens shown below will be displayed while the instrument is normalizing.

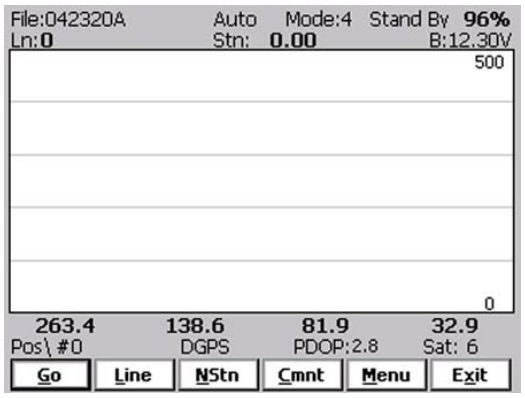


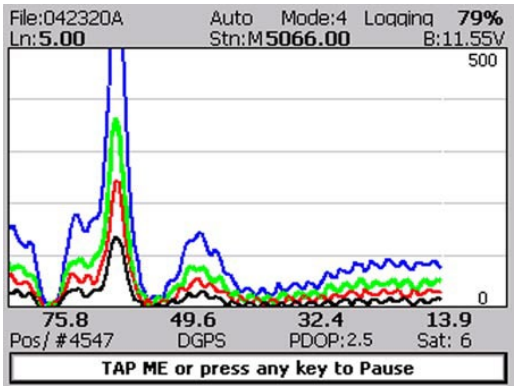
9. Once the Instrument has finished normalizing, find a quiet spot and Null the instrument. Then click on Cr. File and name and save the file.





10. Line up on the grid or transect and select Go. The software will begin logging the readings, and a Pause button will appear at the bottom of the screen. As the operator crosses over each rope (reference location) the fiducial button is hit adding a marker in the data which is later used in the editing of the data to accurately position the data. At the end of the line, tap the Pause button or hit enter on the keypad.



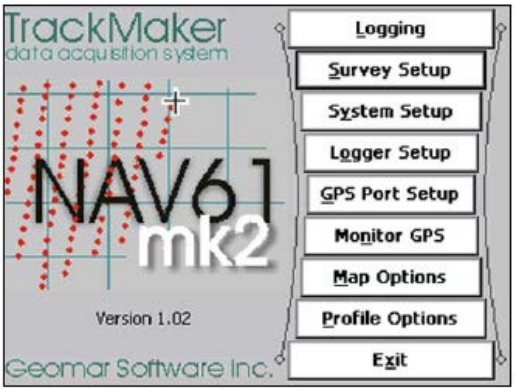


11. On the screens shown above, the EM61-MK2 data are monitored.
12. At the end of the file, select the *Exit* button. The file automatically saves every 10 seconds.

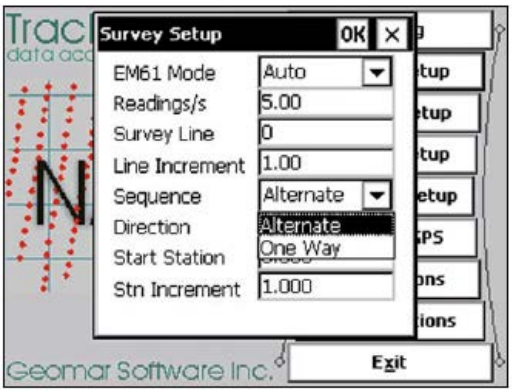
The following steps are followed to begin surveying with the **EM61-MK2 with RTK GPS positioning assuming the GPS base station and GPS QC check have already been preformed**:

1. Turn on the EM61-MK2 by pushing in the fuse on the top of the console/electronics or switching the M/S switch to M.
2. Allow the instrument to warm up for at least 15 minutes.

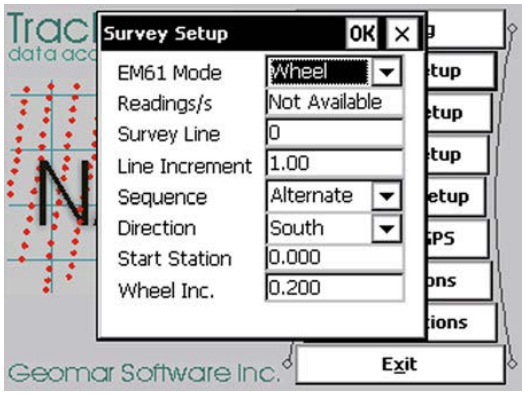
3. Turn on the Allegro CX, and open the NAV61MK2 program. The screen below will be displayed.



4. Click on “Survey Setup”, and specify the following options. The Mode is set to “Auto” and Readings/s is set a minimum of “10” and click OK.

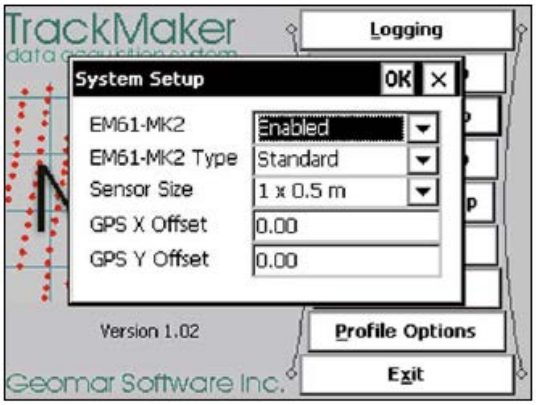


RTK GPS Method

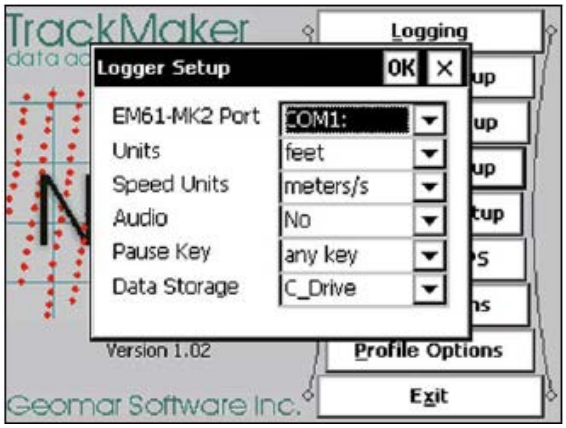


Fiducial Method

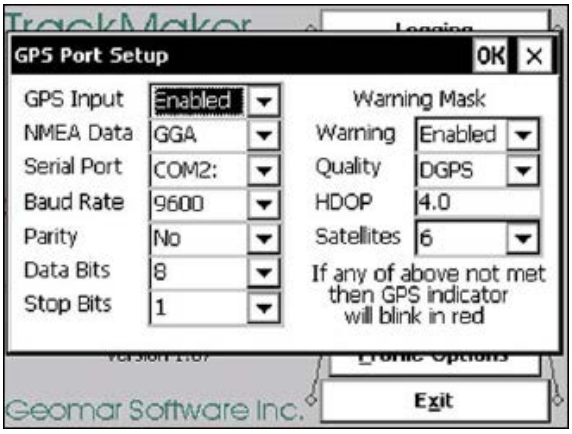
5. Click on “System Setup”, and specify the following options, then click OK. These settings will remain as defaults throughout the project.



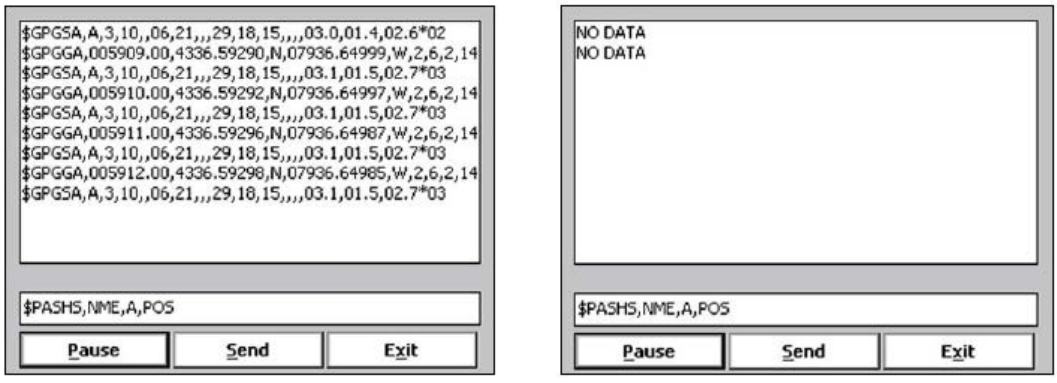
6. Click on “Logger Setup”, and specify the following options, then click OK. These settings will remain as defaults throughout the project. Note there may be an option to store data on a Storage Card instead of the C_Drive.



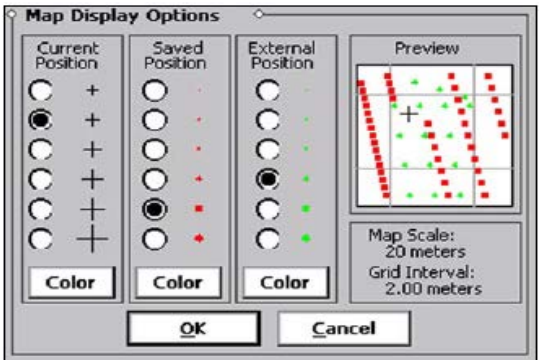
7. Click on “GPS Port Setup”, and specify the following options. This setting will be used when using RTK GPS positioning. On the left side of the screen is where parameters can be set for alerts to go off if the GPS string is inadequate, then click OK.



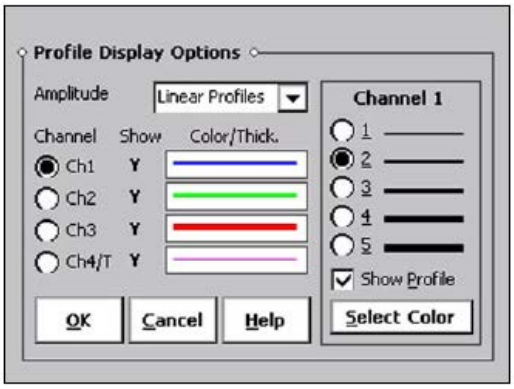
8. Click on “Monitor GPS”, and the window shown below will open. If the GPS NMEA data is streaming correctly, the screen will appear like the one on the left. If there is a problem with the baud rate or other settings, “No Data” will appear at one second intervals. If no GPS data is streaming into the data logger “No Data” will flash once every 6 seconds. Click “Exit” to return to the main menu.



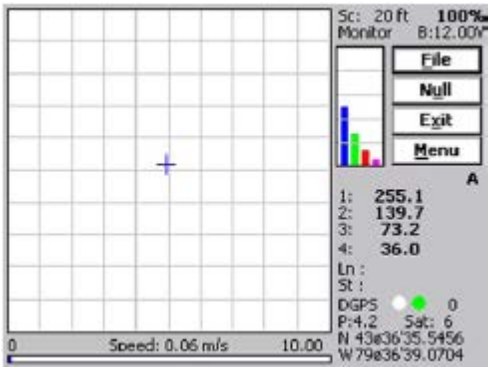
9. Click on “Map Options”, and specify the following options. These options are operator preferences for aesthetics and do not affect the collected data, then click OK.

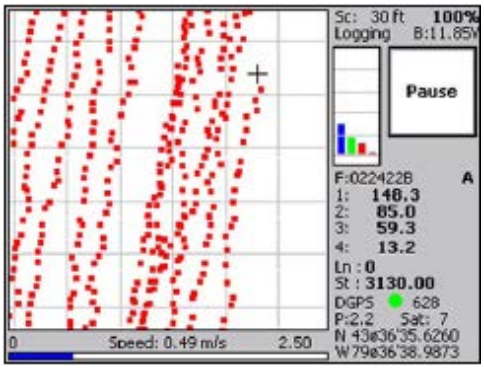


10. Click on “Profile Options”, and specify the following options. These options are also operator preferences for aesthetics and do not affect the collected data, then click OK.



11. Once all parameters are set, click on the logging screen. The screens shown below will be displayed. Find a quiet spot and *Null* the instrument, then click on *File* and name and save the file. Line up on the grid or transect, and select *Go*. The software will begin logging the readings, and a large *Pause* button will appear on the screen. At the end of the line, tap the *Pause* button or hit enter on the keypad.





12. On the screens shown above, both the EM61-MK2 data and the RTK GPS data are monitored, as well as the data coverage.
13. At the end of the file, select the *Exit* button. The file automatically saves every 10 seconds.

8.8 Quality Control

The following quality control (QC) procedures are performed and documented during the data collection process and reviewed by a qualified geophysicist on a daily basis (e.g. the Site Geophysicist in the field, the DGM Contractor's QC Geophysicist, and USA's Project Geophysicist).

- **Equipment Warm-up**: For at least 15 minutes
- **Record Sensor Positions**: Positioning accuracy of the final processed data will be demonstrated by operating the equipment over one or more known points. The accuracy of the data positioning will be assessed by calculating the difference between a known location over which a positioning instrument is held and the displayed position. The sensor position test will be conducted at the beginning of the survey operation for each workday.
- **Static Background and Static Spike**: Static tests will be performed by positioning the survey equipment within or near the survey boundaries in an area free of metallic contacts and collecting data for at least 1 minute. During this time, the instrument will be held in a fixed position without a spike (small industry standard object [ISO]) and then with a small ISO spike. The purpose of the static test is to determine whether unusual levels of instrument or ambient noise exist. The static background and static spike test will be conducted at least at the beginning and end of each day.
- **Personnel Test**: This test checks the response of instruments to personnel and their clothing/proximity to the system. On a daily basis, the instrument coils/sensors for those instruments being used that day will be checked for their response to the personnel operating the system. The response will be observed in the field for immediate corrective action and transmitted back to the processor, and analyzed and checked for spikes in the data that can possibly create false anomalies. The personnel test will be conducted at the beginning of the survey operation for each workday.
- **Cable Shake Test**: On a daily basis, the instrument coils/sensors for those instruments being used that day will be checked for their response to vibrations in the cables. The response will be observed in the field for immediate corrective action, transmitted back to the processor, analyzed, and checked for spikes in the data that can possibly create false anomalies. The vibration test will be conducted at the beginning of the survey operation for each workday.
- **Repeat Data**: This test is performed to verify repeatability of the data and will be performed after the initial survey over an area. At least 2% of the survey lines will be repeated.

All work will follow the extensive QC program laid out in the Work Plan. In addition the Contractor will demonstrate the performance of each DGM system prior to its use at an Instrument Verification Strip (IVS), as described in the GSV Plan. The continued performance of each DGM system used will also be documented daily at an IVS.

8.9 DGM Data Processing And Analysis Procedures

The prime DGM Contractor will follow data processing and analysis procedures described below. The prime DGM Contractor will use instrument-specific software for initial data processing, and the output will be imported into Geosoft Oasis Montaj™ for additional processing, graphical display, and anomaly selection. MEC-experienced data processing geophysicists will use criteria outlined in the project Work Plans, supplemented by site- and system-specific criteria for selecting and locating anomalies. The prime DGM Contractor will follow the data processing and analysis procedures described below.

8.10 Data Storage and Preliminary Processing

EM61-MK2 data are temporarily stored in the EM61-MK2 data logger via Geonics' EM61MK2 or Geomar's NAV61 software and then downloaded into a laptop computer for further on-site processing using Geonics' DAT61MK2 or Geomar's Trackmaker and Geosoft's Oasis Montaj software.

Initial data processing is performed by the field team and includes reviewing data for integrity and repeatability. In the case of traditional surveying methods, positional data are edited based on the known locations of fiducial marks.

8.11 Post Processing

After the initial editing steps have been performed, the data is posted on the project ftp site for advanced analysis, target selection, and preparation of deliverables. The data processor will perform the following steps before the final data packages are delivered.

Step 1) QC of the field forms. This QC check insures that the forms are filled out correctly with the following items

- The appropriate grid block name
- Grids/Transects associated with the block (grid cells)
- QC test file names (Static/Spike Tests, Personnel Test and Cable Shake Test)
- Block file name
- Repeat file name
- Instrument used (EM61MK2 Wheeled, EM61MK2 Tandem)
- Collection/navigation method (RTK or FID (Locals))
- Daily conditions
- Cultural features

Step 2) Preprocessing of the QC tests and block data. The QC test data is actually finalized here but the DGM block data is preprocessed. This step is to check the data for the following:

- Data quality
- Location
- Coverage
- Line path positioning
- Down line density
- Check of QC tests

First, a folder needs to be created where the Geosoft files are to be saved. Next open Geosoft and create a new project in the folder just created (File – Project – New). There are separate projects for the QC tests and DGM Block(s).

After the project is created, several script files can be used in Geosoft that help expedite the preprocessing/processing procedures. They are listed below with a brief description. Alternately, each step may be conducted manually.

- **QC_Static_QC1.gs, QC_Static_QC2_etc.gs and QC_IVS.gs**. These scripts are partially interactive. *_QC1.gs includes Static/Spike, Personnel and Cable Shake test lines. *_QC2.gs includes just the Static/Spike test lines and the *_IVS.gs contains the IVS test line(s). The scripts do the following:

- Asks you to name the new Geosoft database it is about to create.
- Asks you to locate then import the Geosoft xyz file.
- Asks for the correct import template. For this project, there are two different import templates: GPS/RTK and FID (Locals).
- Asks for the file name that was just imported.
- Set X and Y as current (Either in UTM zone 20 North or FID locals).

- Preliminary auto levels and preliminary lag (lags IVS Test ONLY) corrects channels 1, 2, 3 & 4. The leveling gx is similar to the drift correct in Geosoft except we use a median filter. Preliminary leveling for channel 1 is Low window = 0, High window = 80 and Window length = 100. Preliminary leveling for channel 2 is Low window = 0, High window = 75 and Window length = 100. Preliminary leveling for channel 3 is Low window = 0, High window = 65 and Window length = 100. Preliminary leveling for channel 4 is Low window = 0, High window = 60 and Window length = 100.
- Refine the leveling in channel 3. A larger or smaller window length if needed i.e. a larger window length may be needed over very high response features. Manual leveling if needed.
- Refine lag/latency of the data if needed (IVS test ONLY).
- Create Geosoft maps and print as PDFs.
- Add QC information to QC Analysis Spreadsheet.
- Export out completed processed Geosoft xyz file with header information.

The following are for the DGM Block Data:

- **01_Setup.gs**. This script is partially interactive. It does the following:

- Asks you to name the new Geosoft database it is about to create.
- Asks you to locate then import the Geosoft xyz file.
- Asks for the correct import template. For this project, there are two different import templates: GPS/RTK and FID (Locals).
- Asks for the file name that was just imported.

If there is more than one block xyz file then **02_Import.gs** will be needed. It goes through the same steps as the 01_Setup script except naming and creating a new database. In most cases, there is just one xyz file with an associated repeat xyz file. After all block xyz files are imported, the next script to run is:

- **03_Import_Repeat.gs**. Again this script is partially interactive and does the following:

- Asks you to locate then import the Geosoft repeat xyz file.
- Asks for the correct import template. For this project, there are two different import templates: GPS/RTK and FID (Locals).
- Asks for the file name that was just imported.

If there is more than one repeat xyz file then run this script again until all repeats are imported.

- **04_Preprocessing.gs** (different ones for GPS/RTK and FID)

- Warp FID Locals to UTM Zone 20 North Coordinates (FID Locals Preprocessing)
- Set X_UTM and Y_UTM as current in UTM zone 20 North.
- Makes x_d and y_d channels by using the differences filter by 1.
- Creates a data_density channel then runs a math expression "data_density = sqrt((x_d*x_d)+(y_d*y_d)).
- Creates and displays a data density map showing a 1.2m footprint for possible gaps and flags any readings over 0.2m.
- Creates and displays a GPS Quality map (GPS/RTK Preprocessing)
- Preliminary auto levels and preliminary lag corrects channels 1, 2, 3 & 4. The leveling gx is similar to the drift correct in Geosoft except we use a median filter. Preliminary leveling for channel 1 is Low window = 0, High window = 80 and Window length = 100. Preliminary leveling for channel 2 is Low window = 0, High window = 75 and Window length = 100. Preliminary leveling for channel 3 is Low window = 0, High window = 65 and Window length = 100. Preliminary leveling for channel 4 is Low window = 0, High window = 60 and Window length = 100.
- Grids raw, leveled and leveled lagged data using MinCurv or Kriging with a grid cell of 0.2 and a blanking distance of 0.6.
- Creates and displays preliminary contour maps of channel 3 with line paths.

- Selects the appropriate lines and asks for the combined preprocessed xyz file name to be exported with the correct export template. Exported as a Geosoft xyz file with header information.
- Selects the appropriate lines and asks for the combined preprocessed repeat xyz file name to be exported with the correct export template. Exported as a Geosoft xyz file with header information.

To finish the preprocessing, the following steps are to be taken:

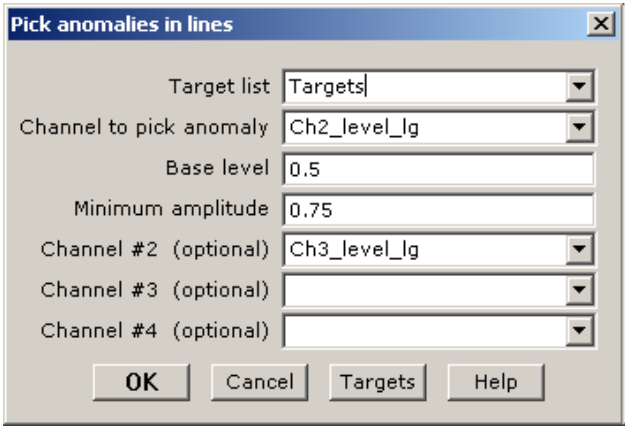
- Add appropriate culture files to the preliminary maps and any GIS/CADD information.
- Create Geosoft maps and pdf files of the preliminary repeat profiles.
- Fill out the Database (MRP Enterprise).

Step 3) QC of the preprocessing by DGM Contractor's QC Geophysicist and USA's Project Geophysicist. The QC criteria are as follows:

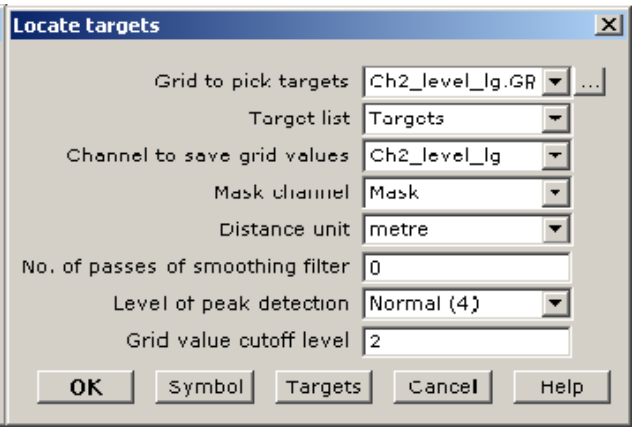
- Check Location & Coverage
- Check grid block name & corresponding grid cells
- Check that the appropriate file names are listed in the correct area in the database
- Check header information on the xyz files.
- Fill out QC of the preprocessing in the database
- Create a DGM Raw Data/Preprocessing Delivery Report
- Upload preprocessing xyz file & Raw Data Delivery Report to CH2M HILL's ftp site.

Step 4) Final processing stage. The final processor opens the Geosoft project created in Step 2 and performs the following:

- Refines the leveling in channel 3. A larger or smaller window length if needed i.e. a larger window length may be needed over very high response features. Manual leveling if needed.
- Refine lag/latency of the data if needed
- Add filters to the data if needed. Some filters you would expect to see are non-linear, low pass & high pass.
- Grid the data with MinCurv or Kriging. The parameters for both are a grid cell of 0.2 & a blanking distance of 0.6. Kriging better defines high response anomalies. MinCurv on the other hand will usually create false anomalies between lines near high response anomalies.
- Select anomalies in Geosoft's UX-Detect Module by using either "Pick Peaks Along Profile" or "Blakely Test"



Pick Peaks Along Profile



Blakely Test

- Refine target selection. Check validity and position. Targets found to be invalid or incorrectly located are adjusted or removed. Additionally, anomalies not selected by UX-Detect, yet deemed to represent a potential UXO target, are being manually selected.
- Export out completed grid block processed Geosoft xyz file with header information.
- Split target Geosoft databases into their grid cells.
- Re-sort the target database by shortest path and if needed, add any additional four point polygon targets (Data Gap Polygons or Heavily Saturated Area Polygons) to the end of the target list. Export a Geosoft xyz file with header information.
- Create and display a colored contour Geosoft map(s) of the grid cell(s) with the following; title block, color scale, index map, legend, target locations & target numbers.
- Create a pdf of the colored contoured grid cell map(s).
- Create and display final repeat profiles with line path profiles.
- Create pdfs of the final repeat profiles.
- Fill out DGM processing form in the database (MRP Enterprise).
- Export out repeat processed Geosoft xyz file with header information.
- Create a final delivery package that includes the following:

- All the Geosoft colored contour grid cell maps that are included in the grid block.
- All the pdfs for the grid cell maps that are included in the grid block.
- Repeat Geosoft maps with their pdfs. The repeat maps will go into the QC by block folder on the ftp site.
- Processed Geosoft xyz files of the grid block & repeat data. The repeat xyz files will go into the QC by block folder on the ftp site.
- Geosoft grd files for the grid block.
- Target lists in both xls & xyz formats (the xls is in MRP Enterprise format).

Step 5) QC of the processed data by DGM Contractor's QC Geophysicist and USA's Project Geophysicist. The QC criteria are as follows:

- Check to see if leveling and the lag is appropriate.
- Check anomaly selections on the maps, xyz file and xls file.
- Check maps title block, index map and legend (map & pdf).
- Check repeat data profiles (map & pdf).
- Check header information on xyz files.
- Check entries on the processing form in the database (MRP Enterprise).
- Get QC data (maps, PDF's & xyz files) for the corresponding block. Add repeat data (maps, PDF's & xyz files). Zip it. Upload to CH2M HILL ftp site.
- Fill out QC form in the database then create a "Final Data Delivery Report". Add this report to the final delivery package listed above. Zip it. Upload to CH2M HILL ftp site.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

The hazard analysis matrix (Table 1) lists the existing and potential hazards associated with conducting vegetation removal activities, 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

9.1 Hazard Control Brief

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

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.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

The following diagram describes the data collection (DGM) process steps:

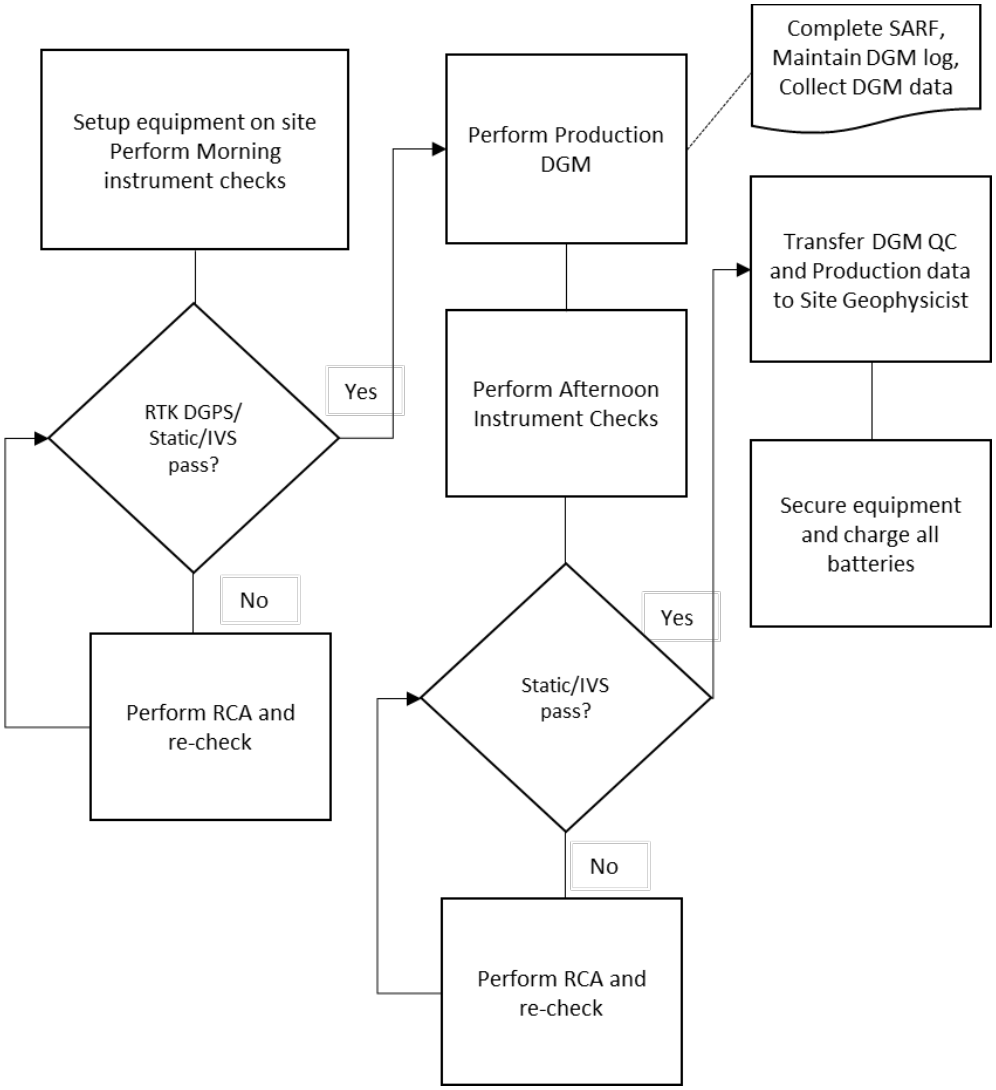


Figure 1: Diagram of Data Collection (DGM) Process

12. EQUIPMENT

The team 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,
- 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.

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

This page is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

DGM ANOMALY INVESTIGATIONS

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
10/09/2019		13	8.1 & 8.2	Added /AGC after DGM
10/09/2019		15	8.3	Clarified DGM refinement and noted AGC targets are only investigated at the flag location. Added AGC requirements for recording location measurement of sources in the hole, and whiteboard photos of all sources recovered.

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico current version
- NOSSAINST 8023.11, DON Standard Operating Procedures Development, Implementation, and Maintenance for Ammunition and Explosives
- OSHA, 29 CFR 1910, Occupational Safety and Health Standards
- Applicable sections of EPA, 40 CFR Parts 260 to 299, Protection of Environment
- EM 385-1-1, Safety and Health Requirements Manual
- NAVSEA OP 5. Ammunition and Explosives Safety Ashore,
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.09, Edition 1, Defense Explosives Safety Regulation

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

This space is intentionally left blank.

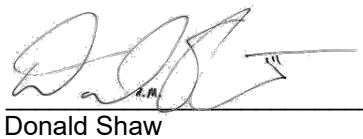
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct MPPEH management operations.

(Signature to be provided in Final SOP)

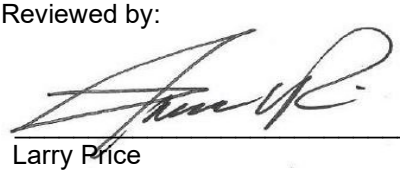
Developed by:



Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date:

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

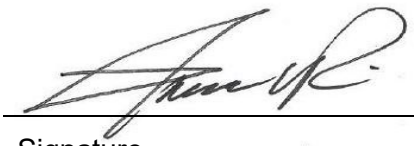
This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		05/21/2018
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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 conduct DGM/AGC Anomaly Investigation operations on sites contaminated with unexploded ordnance (UXO) or munitions and explosives of concern (MEC). These operations include, remote controlled equipment cutting and raking vegetation, relocating MEC items using a magnet in preparation for burning operations.

8.2 Scope

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in DGM/AGC Anomaly Investigation operations on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 4.0 of this SOP for additional guidance.

8.3 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 require access to the EZ, 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 the munition with the greatest fragmentation distance (MGFD), as stated in the Work 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 (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.

8.4 Reacquisition and Investigation Removal Procedures

8.4.1 Intrusive Investigation of Anomalies and Polygons

8.4.1.1 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 and polygons, following SOP for RTK DGPS and EM61-MK2 for DGM Anomaly and Polygon Resolution. 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.

8.4.1.2 Manual Excavations

Excavations for individual anomalies will be conducted using Schonstedt GA-52CX (ferrous metal) and/or White's XLT or Minelab's Explorer II (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 will not be made without prior approval of the NAVFAC QA contractor.

Any "blind" excavations in pits when individual anomalies cannot be discerned will be excavated by hand or by remote mechanical operations and excavated carefully in 1-foot lifts.

8.4.1.3 Mechanical Handling Equipment

Mechanical handling equipment (MHE) may be used to excavate large anomalies (e.g., pits) or those deeper than 4 ft below surface if required (e.g., to confirm the anomaly is not a MEC). Any decision to use mechanized equipment to excavate these anomalies will be made by the Senior UXO Supervisor (SUXOS). Excavations will proceed slowly to ensure the MHE does not broach the item. If the excavated material is considered to be an MEC, it shall be uncovered sufficiently by hand to obtain a positive identification of the item. If the item is identified as UXO/MEC, a determination will subsequently be made as to whether it is fuzed or not.

While excavating with MHE, a UXO technician will be stationed in a position that is out of the reach of the excavation equipment but affords a view of the excavation site. This observer will ensure that the next lift is visually free of UXO. The excavated material will be placed onto the ground within a screening area that has been surface swept and the boundaries recorded. The soil spoils will be spread across the screening area using the excavator bucket. The excavated material will be screened for range related debris, material potentially presenting an explosive hazard (MPPEH), munitions debris (MD), and UXO/MEC items. UXO

technicians will recover all pieces of munitions debris or range related debris and any ordnance items. After screening, the soil spoils will be stockpiled to the side of the screening area.

8.4.1.4 Disposal Pits

Excavations for disposal pits using MHE will be performed in a similar manner as specified in Section 9.1.1.2. However, because individual anomalies cannot be discerned within the disposal pits, material from the disposal pit will be excavated carefully in 2-foot lifts.

8.5 DGM/AGC Anomaly Excavation Reporting

The UXO Technician 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):

- Record anomaly reacquisition from pin flag (for DGM: refined peak response, location offset, and direction). For AGC investigations, no refining is required or allowed, investigate the flag location. Also note, for AGC target investigation, the target source location needs to be measured with an RTK DGPS, or suitable survey-grade positioning system
- Type (e.g., MD, MPPEH, MEC, and UXO)
- Description (e.g., “20mm projectile, MK105 practice bomb, 40mm grenade, base coupling, firing device”, etc.)
- Initial Condition (e.g., expended, inert, live, and to be determined [TBD])
- Approximate length
- Approximate width
- Depth
- Approximate weight
- Approximate inclination (per Figure 1)
- Approximate orientation (Azimuth per Figure 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?
- Final source location measured digitally
- Photograph with white board of all sources recovered

All data will be turned into the designated Data manager at the end of the day.

This space is intentionally left blank.

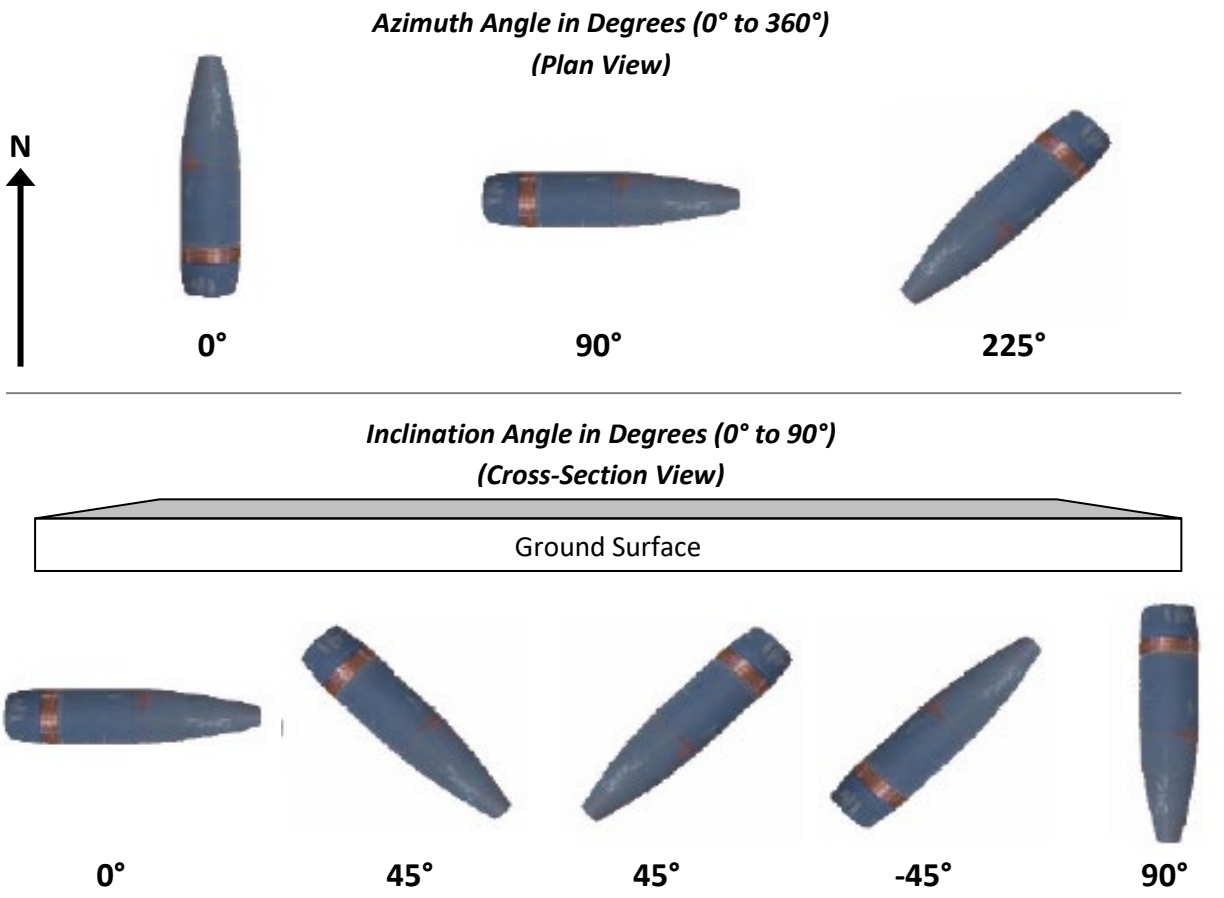


Figure 1: Azimuth and Inclination Examples

8.6 Disposal Operations

MEC disposal operations will be conducted in accordance with SOP 015, Demolition Operations.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The MDAS Management team will be equipped with the following:

- DGM and Positioning Equipment
- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    1. Coveralls
    2. Gloves(1)
    3. Boots/shoes
    4. Safety glasses
    5. Hard hat(1)

Footnote (1) Optional, as applicable.

- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

REMOTE ROBOTIC EXCAVATION OF REACQUIRED ANOMALIES

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Explosives Safety Submission (ESS) – current version
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards – current version
- Chief of Naval Operations Instruction (OPNAVINST) 3500.39 – current version
- NAVSEA OP-5 – current version
- United States Army Corps of Engineers (USACE), Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual – current version

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ATTACHMENT A. QUALITY CONTROL SURVEILLANCE CHECK SHEET

ATTACHMENT B. RFI STANDARD OPERATING PROCEDURE MANUAL

This space is intentionally left blank.

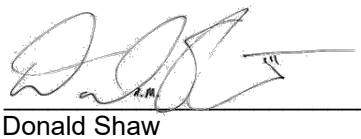
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

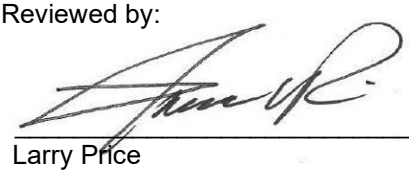
Developed by:



Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date:

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

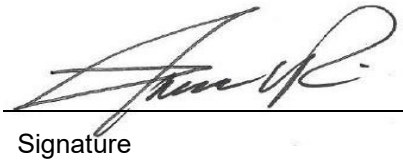
This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Worker's Signature	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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 conduct and observe Remote Robotic Excavation of Reacquired Anomaly operations on sites contaminated with unexploded ordnance (UXO) or munitions and explosives of concern (MEC). These operations include, remote controlled equipment cutting and raking vegetation, relocating MEC items using a magnet in preparation for burning operations.

8.2 Scope

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in Remote Robotic Excavation of Reacquired Anomalies on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 4.0 of this SOP for additional guidance.

8.3 Daily Operational Briefings

At the beginning of each work day, the Senior Unexploded Ordnance Supervisor (SUXOS), or his designee holds a daily briefing in accordance with the requirements of the approved WP. At a minimum, this briefing will include the following:

- Work assignments
- Site Specific Explosive Safety Quantity Distance (ESQD)
- Team separation distances (TSDs)
- Entry and control points
- Review of emergency procedures
- Review of ordnance safety
- Review of communications procedures and equipment
- Review of any site-specific hazards and the measures that will be used to mitigate those hazards
- Review of environmental concerns
- Procedures for coordination of intrusive investigation work with personnel performing non-Munitions and Explosives of Concern (MEC) activities.
- Any other remaining issues necessary to support safe and efficient operations.

8.4 Remote Robotic Equipment

The Remote Robotic Equipment consists of a piece of heavy equipment (in this case an excavator) the remote link on the equipment, several video cameras, a step van from which to operate the remote robotic piece of equipment, and the required computer and monitor program package to operate the remote robotic equipment. The computer and monitor also allow for UXO Technicians to view the equipment in operation and to capture video documentation of the operations. At least two heavy equipment and robotic trained operators are required to conduct the remote robotic operations.

8.5 Remote Robotic DGM Anomaly Reacquisition Procedures

8.5.1 Anomaly Excavation and Removal Action Safety

Remote Robotic Excavation of Reacquired Anomalies activities at MEC sites will be under the supervision of UXO qualified personnel. Non-essential personnel will not be allowed in the exclusion zone (EZ) during reacquisition and excavation operations unless directed by the SUXOS and/or UXOSO. If access is required, other than for safety observations, by non-essential personnel, all work will stop while they are in the EZ. During operations, USA personnel will strictly adhere to the Site Health and Safety Plan (SHSP) and the following general safety practices.

- The reacquisition and MEC team will be composed of a minimum of three personnel, e.g., a UXO Team Leader (TL)/UXOT III, UXOT II/EM-61 Operator, and UXOT II/I.
- Excavation operations will not be conducted until the required training (both general and site-specific) and proper equipment/vehicle checks have been completed.
- Excavation operations will not be initiated until an appropriate EZ is established based upon the munition with the greatest fragmentation distance (MGFD) in accordance with the approved ESS.
- All personnel will be provided a daily safety briefing (i.e., tailgate safety briefing) prior to entering the operating area.
- 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.
- During UXO operations, the minimum separation distance (MSD) will be established based on the proximity of essential and non-essential personnel to a MEC operation. Team Separation Distance (TSD) and Hazardous Fragmentation Distance (HFD) will be observed in accordance with the ESS.
- Access to the operating area will be controlled via traffic cones at the EZ and radio communication to the robotics team, when necessary to enter or pass through the EZ.
- UXO will be handled only by qualified UXO Technicians.
- The SUXOS will be notified of all MEC located.
- 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 disciplinary action up to and including termination of employment.

8.5.2 Anomaly Area Designation

Size and location of reacquisition areas will vary and will be defined by the SUXOS and/or UXOQCS using visual means such as flags, cones, or stakes. Each anomaly will be assigned a lot number for tracking purposes. The team will receive a map and a dig package containing the necessary information to perform the assigned work.

The SUXOS, or his designee, will provide the TL with the necessary information to support his daily activities, including a complete dig package, information on utilities that may be present in the work area, and daily briefing and safety information. The TL will brief their team on potential hazards in the area where they will be working and document the briefing in their logbook.

8.5.3 Anomaly Reacquisition Procedures

The team loads up their gear and, after being provided the operational briefing from the SUXOS, they travel down range to their work area for the day. The team sets up the Real Time Kinematic (RTK) Base Station at the designated location within the vicinity of where the team will be operating that day. Upon completion of the set-up of the RTK Base Station, the team travels back to their work area and the TL provides a tailgate safety briefing to the team and updates them for the day's operations.

The team conducts the following procedures for reacquiring anomalies:

1. Static check EM-61 and record results in logbook
2. Reacquire targets for the remote operations period with the RTK and record target number on pin flags
3. Roll EM-61 over newly acquired target and record initial value on the flag and dig sheet
4. Once the anomalies are reacquired and flagged for that remote operations period, depart the area
5. Upon leaving the area, the equipment operator turns the remote link on the excavator to "on."

8.5.4 Remote Robotic Anomaly Excavation Procedures

Based on the anomalies for the day's work, the TL has positioned the equipment so that more than one excavation can be accomplished per remote operational period. Setting up for more than one excavation per remote operation period is optimal, but not always possible.

1. Once the targets have been reacquired, the equipment has been moved into the work area, and the team is back in the safe area, the TL calls over the radio that the robotics is going "HOT" to ensure any personnel on the former VNTR are aware of the operation.
2. The remote robotic operator starts the computer program to operate the equipment and links the program to the equipment.
3. For each remote operational period, a UXO Technician is inside the step van watching the excavation for UXO.
4. Excavations within the work area are conducted to the appropriate depths, per the ESS (e.g., 2 ft bgs on roads).
5. The equipment operators spread the spoils onto the road surface outside of the dig location or other reacquired anomalies.
6. Once the excavation is complete and the spoils have been spread, the computer is unlinked from the excavator.
7. The TL calls over the radio that the robotics is going "cold."
8. The team travels back to the work area.
9. The remote link on the excavator is turned to "off" and the excavator is moved out of the vicinity of the dig site.
10. The UXO Technicians use an all metals detector to go over the spoils and the hole to locate the anomaly.
11. Once the anomaly is located, documented (on the dig sheet, in the PDA, and photographed), and then removed, the team uses the EM-61 to go back over the hole to ensure the readings are below the acceptable millivolt reading (i.e., 2.5 mV). Wood planks are used to keep the EM-61 at ground level.

12. UXOQCS verifies the millivolt reading.
13. The hole is covered back over with soil.
14. If the millivolt reading cannot be reached, the team repeats the checks with the all-metals detector and the EM-61 until gate 3 on the EM-61 is below 2.5 mV; the mV reading is verified by the UXOQCS.
15. If the anomaly is deeper than the prescribed depth and is left in place, the UXOQCS will verify the depth

The above steps will be completed until the end of the day's operations. Once excavations have been completed for the day, the team will leave the work area to break down the RTK and return to Camp Garcia to secure the equipment.

Throughout each day's operations the TL closely monitors the team's individual performance to ensure these procedures are being performed safely and correctly.

8.6 Record Keeping

The TL will maintain a field logbook which, at a minimum, will contain a record of the following information:

- Weather conditions
- Instrument details and serial number
- Team personnel
- Lots worked
- Start and stop times
- MEC/UXO items encountered
- Blind Seed Items (BSIs) recovered.
- Visits by SUXOS, UXOQCS, UXOSO, and UXOQA

The data to be recorded for each item discovered during anomaly excavation will include the following (as applicable):

- Type (e.g., MPPEH, UXO, BSI, MD, Frag, RRD, or non-MEC Scrap)
- Description (e.g., "projectile, 20-mm, practice, MK105" and "base, coupling, firing device")
- Initial Disposition (e.g., expended, inert, live, and to be determined)
- Approximate length
- Approximate width
- Depth
- Approximate weight.

8.7 MEC And MPPEH Disposition

All MEC and MPPEH are to be inspected and managed for final disposition in accordance with the ESS and WP (SOP 016 MPPEH and RRD Management). MEC that is fuzed or otherwise determined unsafe to

move by the SUXOS and UXOSO will be blown in place. MEC items that are deemed safe to move will be relocated to the designated consolidation area or temporary storage magazine.

8.8 Work Clothing and Field Sanitation

Work clothing will be appropriate for the conditions encountered. In most cases, this will be Level D personal protective equipment (PPE), which includes the following.

- Short- or long-sleeved cotton coveralls or work clothing
- Footwear consisting of sturdy work boots or rubber boots, as appropriate (i.e., lug sole and of sufficient height for ankle support). UXO personnel will not wear steel-toe safety boots when using metal detectors (composite toes are acceptable).
- Safety glasses
- Inclement weather gear, as required.

The team will be outfitted with field decontamination equipment, which will consist of containers of water, paper towels, and soap. Good housekeeping and decontamination measures will be practiced.

8.9 Quality Control

The reacquisition and excavation team will meet the quality control (QC) metrics listed on the QC Surveillance check sheet (Attachment B).

The Quality Control Specialist (UXOQCS) will verify the quality of the task through the three-phased surveillance process and will document the results on the check sheet. Any anomaly area the UXOQCS determines to not meet the quality control metrics will be considered deficient or non-conforming. Non-conformance will require re-work of the lot. If the deficiency or nonconformance cannot be resolved immediately, the UXOQCS will prepare a Deficiency Notice (DN) and submit it to the SUXOS, PM, and QC Manager. The UXOQCS will conduct a root cause analysis and recommend corrective actions, and submit his findings for review and approval. The UXOQCS will monitor the implementation of the corrective actions, document the results of the corrective actions on a supplemental QC Surveillance check sheet, and close out the DN.

This space is intentionally left blank.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

The hazard analysis matrix (Table 1) lists the existing and potential hazards associated with conducting the MEC analog detection and removal tasks along with methods to mitigate the hazards.

Table 1: Hazard Analysis Matrix

Activity	Hazard	Triggering Events	Initial Risk Index	Hazard Mitigation	Final Risk Index
Anomaly Reacquisition and Remote Robotic Excavation	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
	Hot Weather	Seasonal weather patterns.	C/III/4	Heat stress monitoring, cool drinking water, work-rest schedule, and cool shelter for breaks.	D/IV5
	Biological	Biting/stinging insects, spiders, rodents and hazardous plants.	C/III/4	Avoid biological hazards. Wear long-sleeve garments and apply repellent to clothing and exposed skin, as needed. Use barrier cream, as necessary.	D/IV/5
	MPPEH	MPPEH reacts to impact by equipment, tools or personnel.	C/II/3	Maintain the team separation distance between teams 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. UXO-qualified person will locate an anomalous-free area with the metal detector (HERO certified), prior to placing grid corner stakes or other markers.	D/III/5
	Weather or Natural Disaster Emergency	Meteorological or environmental event	C/II/3	Account for all team personnel and, if required, implement the emergency response procedures outlined in the APP.	C/IV/5

9.1 Hazard Control Brief

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

- It is recommended to wear long-sleeve clothing and apply insect repellent as warranted to mitigate the impact of biting/stinging insects.
- The potential for encountering MPPEH is high.
- Maintain the TSD (K40) as described in the ESS.
- If a munitions item with larger fragmentation distance is encountered, the work will stop in accordance with the ESS requirements.
- In the event of severe weather or a natural disaster, account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan found in the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

Remote Robotic operations areas will be established and conducted in accordance with the workflow diagram below (Figure 1).

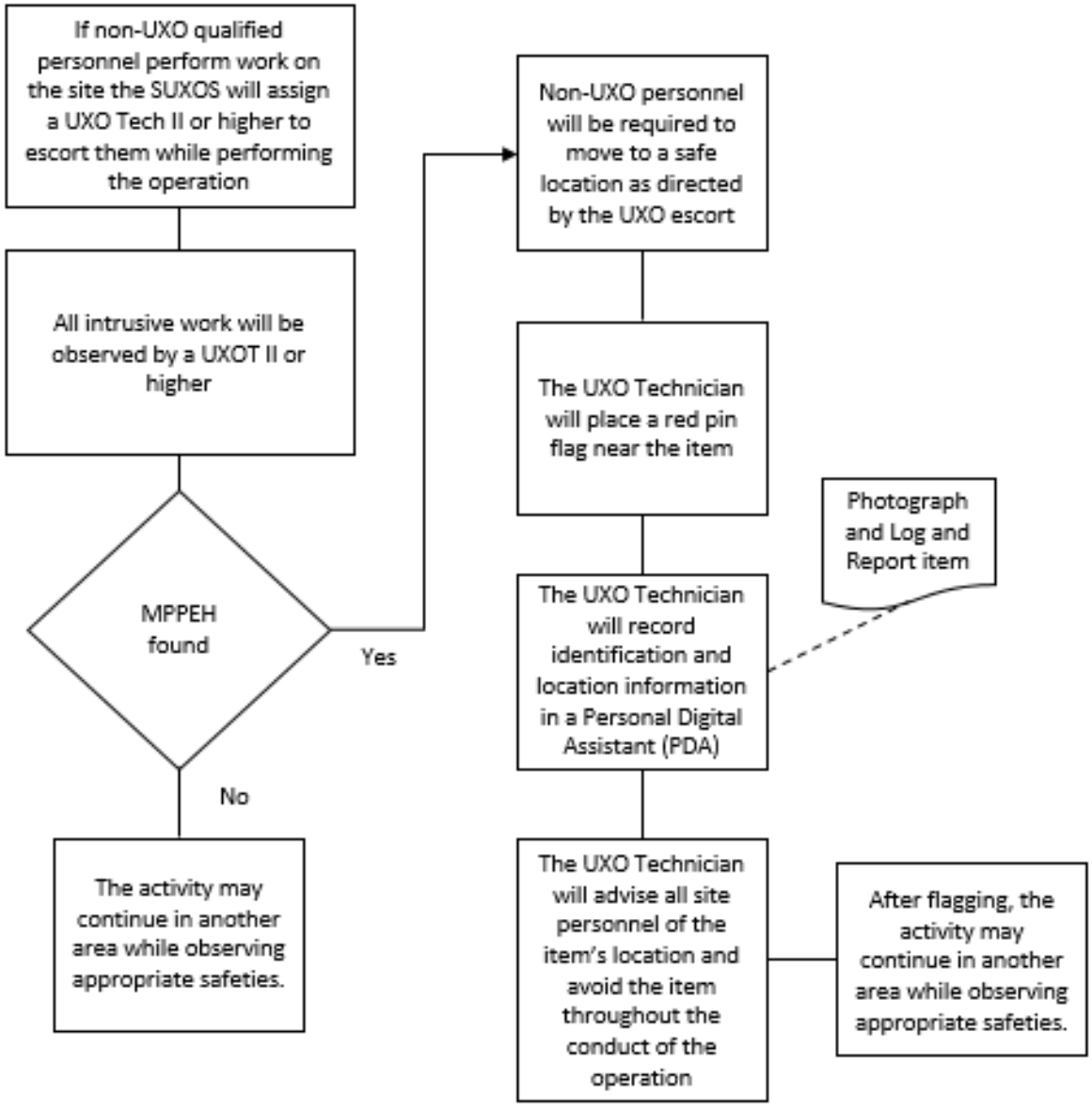


Figure 1: Diagram of Remote Robotic Workflow

12. EQUIPMENT

The UXO technician providing MEC analog detection and removal will be equipped with the following:

- EM-61
- Handheld all-metals detector
- Shovel and/or other hand tool for digging
- Blue pin flags for marking the anomalies
- Red pin flags for marking suspected MEC items
- Logbook and/or Personal Digital Assistant for recording data
- Camera
- Communications equipment

Safety equipment required includes the following:

- First-Aid kit
- Level D PPE
- Fire extinguisher
- Inclement weather gear, as needed
- Lightning Detector maintained by UXOSO

Safety equipment is in the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

ATTACHMENT A.
QUALITY CONTROL SURVEILLANCE CHECK SHEET

This page is intentionally left blank.

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM

CONTRACT/TO: N62470-17-D-8003, Task Order No. F-4023

DFW: REMOTE ROBOTIC DGM ANOMALY INVESTIGATION

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	WP Section 7.5.3	Detection Equipment Static check conducted prior to operating instrument(s)	☐	☐	☐	
2	WP Section 7.5.3	Re-acquired targets are properly flagged and recorded	☐	☐	☐	
3	WP Section 7.5.3	Excavated soil is adequately broadcast for handheld detector searches; excavation soil and pit are properly searched	☐	☐	☐	
4	WP Section 7.5.4	Excavation site is properly checked with EM-61 for below-threshold mV reading; values are properly recorded	☐	☐	☐	

FINDINGS	
Item	**Comments**

FINDINGS	

Conducted By: _____ **Reviewed By:** _____

This space is intentionally left blank.

ATTACHMENT B.
RFI STANDARD OPERATING PROCEDURE MANUAL

This page is intentionally left blank.

1.0 PURPOSE

This standard operating procedure (SOP) establishes the overall safe practices and procedures for the set up and operation of assigned remotely controlled heavy equipment. Only personnel who are properly trained and annotated on the RFI Equipment Operators List will perform these procedures.

2.0 SCOPE

This SOP applies to all Robotic Fabrications, Inc. (RFI) personnel involved in remote equipment operations.

3.0 GENERAL REQUIREMENTS

All work will be performed in a manner that is consistent with Occupational Safety and Health Administration established standards and requirements. Refer to the site- or project-specific health and safety plan for relevant health and safety requirements

Personnel who use this procedure must document evidence to the RFI Team Leader that they have read and understand this procedure by completing the SOP acknowledgement form, Attachment 1. This documentation will be retained in the project file.

Any deviations from the procedures specified in this SOP will be approved by the Senior RFI Technician and UXO Safety Manager before implementing.

Prior to daily operations, all equipment will be checked out using the Equipment Checkout Sheet, Attachment 2.

4.0 GENERAL SAFETY GUIDELINES

All personnel must remain a minimum of 35 feet from any piece of equipment during remote operations. A piece of equipment is determined to be in a remote status when the on board Remote and Actuator switches are in the ON position and the engine is running.

There are 2 ways to place the equipment in a Standby status. 1. Placing the Ready/Standby switch on the operator's controller to the Standby position. 2. Turning the equipment on board Actuator switch to the OFF position.

Prior to approaching equipment in the remote status, the operator must first lower all parts to the ground and place the controller Ready/Standby switch in the Standby position.

Only one person shall approach a piece of equipment in a remote status for the purpose of turning the Actuator switch OFF to place that piece of equipment in a Standby mode. Note: Deactivating the Actuator switch isolates hydraulic energy from the equipment.

An E-STOP button is installed on each piece of remote equipment for the purpose of stopping all equipment functions instantaneously during any emergency situation.

An E-STOP button is programmed on each operator's controller for the purpose of instantaneously stopping all equipment functions during any emergency situation.

5.0 PROCEDURES

This section deals with the set up and operation of remotely controlled heavy equipment.

5.1 SET UP

The RFI Remote System consists of an Operator Control Unit (OCU), an Esteem Radio Network, and a Vehicle Interface mounted on each piece of equipment.

5.2 OPERATOR CONTROL UNIT (OCU) SET UP

The OCU consists of the following items: Laptop Computer, Controller, POE Power Injector, Video Monitor, Esteem Base Radio w/ Antenna, and associated cables and power cords.

1. **OCU Connections:**
   a Connect the antenna to the Esteem Base Radio. The antenna must match the frequency of the radio set being used. **NOTE: If the repeater is NOT required in the network, use the repeater radio as the base radio.** Attach the radio to the mast. Connect the radio to the POE Power Injector with a suitable length Ethernet cable to allow positioning of the radio and mast assembly. The cable will be connected to the 10/100 port closest to the green 12vdc connector on the radio and the LANOUT/PWR port on the power injector. The power injector may now be

plugged in to a 120VAC outlet to power the radio. **WARNING: Never apply power to a radio without an antenna attached. Severe damage to the radio will occur.**

b. Connect the LAN IN port of the power injector to the laptop with a suitable length Ethernet cable.

c. Connect the Video Monitor to the Laptop Computer using a suitable length HDMI cable.

d. Connect the controller to the laptop computer using the attached USB cable.

e. Power up the laptop computer and video monitor, open RFI OCU program and select the piece of equipment being operated from the pulldown menu.

5.3 REPEATER RADIO STATION SET UP

The Repeater Radio Station consists of a Esteem Repeater Radio w/Antenna, a Mast Assembly, POE Power Injector, Generator and associated cables and power cords.

1. **Repeater Radio Connections:**

   a. Connect the antenna to the Esteem Repeater Radio. The antenna must match the frequency of the radio set being used. Attach the radio to a mast. Connect the POE power injector to the radio using a suitable length Ethernet cable to allow for positioning of the radio and mast assembly. The cable will be connected to the 10/100 port nearest the green 12vdc connector on the radio and the LANOUT/PWR port on the power injector. The power injector may now be plugged in to a 120vac outlet (generator) to power the radio. **WARNING: Never apply power to a radio without an antenna attached. Severe damage to the radio will occur.**

   b. Position the repeater mast/radio assembly in an area within direct line of sight of the UCU and the equipment being operated.

5.4 REMOTE EQUIPMENT SET UP

The Remote Equipment portion of the package consists of the piece of heavy equipment being operated with an installed Interface unit, Esteem Vehicle Radio w/Antenna, AXIS Video Server, Cameras (up to 4), E-STOP Switch, Actuator Switch, and Remote Switch.

1. **Remote Equipment Connections:**

   a. Connect the Antenna to the Esteem Vehicle Radio. The antenna must match the

frequency of the radio set being used. Mount the radio inside the cab of the vehicle. Connect the pre-wired power cable to the green 12vdc power connector on the radio. Connect the Radio to the SBRIO board in the installed Interface Unit using a suitable length Ethernet cable. The cable will be connected to the 10/100 port nearest the green 12vdc power connector on the radio and the Ethernet port on the SBRIO Board. Also connect the Radio to the AXIS Video Server with a suitable length Ethernet cable. The cable will connect to the second 10/100 port on the radio and the Ethernet port on the AXIS Video Server. Connect the pre-wired power cable to the Power port on the AXIS Video Server. Connect the Camera Cables (up to 4) to the Video ports on the AXIS Video Server using the BNC connectors on the camera cables. **WARNING: Never apply power to a radio without an antenna attached. Severe damage to the radio will occur.**

b. Power is applied to the Interface Unit and all installed equipment by turning on the Remote Switch and Actuator Switch installed on the outside of the piece of equipment being used.

6.0 SYSTEM START UP AND OPERATION

Only personnel who are properly trained and annotated on the RFI Equipment Operators List will perform these procedures.

1. Set up the Remote System Network and prepare the equipment IAW Chapter 5 of this SOP.

2. Locate the E-STOP, Actuator and Remote Switches on the equipment.

   a. The assistant will twist the Red Knob on the E-STOP switch CLOCKWISE to ensure the E-STOP is deactivated.

   b. The assistant will place the Remote Switch in the on (up) position. This will supply power to the SBRIO board and allow remote connection between the equipment and the OCU.

   c. Once remote communication is established at the OCU, have the operator start the equipment remotely by activating the Engine Start switch on the controller.

   d. The assistant will place the Actuator Switch to the on (up) position and move clear of the vehicle. This will allow hydraulic flow to the equipment. The equipment is now in a Remote Status.

   e. Once clear of the vehicle, have the operator place the Ready/Standby Switch on the controller to the Ready position and test the operation of all functions.

f. Upon completion of the operational functions test, the equipment may begin remote operations.

6.1 SYSTEM SHUT DOWN

At the completion of the remote operations, the system is shut down as follows:

1. Park the equipment in a clear area to allow for Preventive Maintenance and inspection.
   a. The operator will place the Ready/Standby Switch on the controller in the Standby position.
   b. The operator will stop the engine by activating the E-STOP switch on the controller.
   c. The assistant will place the Actuator and Remote Switches on the equipment to the off (down) position.
2. Inspect the equipment for any damage or repairs necessary and perform Daily Preventive Maintenance.
3. Refuel and secure the equipment.
4. Power down the OCU and Repeater Station (if used) and secure.

7.0 DAILY PREVENTIVE MAINTENANCE

Daily preventive maintenance will be performed IAW the Manufacturers Maintenance Manual for each piece of equipment.

8.0 ATTACHMENTS

Attachment 1	SOP Acknowledgement Form
Attachment 2	Equipment Checkout Sheet

ATTACHMENT 1
SOP ACKNOWLEDGEMENT FORM

By signing this form, I confirm that I have read and understand this SOP. I further confirm that I am qualified and capable to perform the tasks outlined by this SOP. In the event of any situation which I may not feel qualified or comfortable with, I will immediately stop the operations and inform my supervisor.

NAME	ORG	SIGNATURE	DATE

ATTACHMENT 2
EQUIPMENT CHECKOUT SHEET

EQUIPMENT ITEM	SERIAL NUMBER		
	SAT	UNSAT	ACTION TAKEN
Walk around /Cleanliness/Overall Cond			
Check Engine Oil Level/Leaks			
Check Coolant/Antifreeze Level/Leaks			
Check Hydraulic Oil Level/Leaks			
Check Transmission Fluid Level/Leaks			
Check Brake Fluid Level/Leaks			
Check Turret Gear Oil Level/Leaks			
Check Fuel Level/Leaks			
Check Belts for Damage/Tension/Cracks			
Check Tracks/Tires for Tension/Pressure			
Check Windows/Mirrors - Damage/Clean			
Check Hoses - Damage/Leaks/Dry Rot			
Check Lights			
Check Horn/Back Up Alarm			
Check Fire Extinguisher			
Check Fire Suppression System			
Check Conveyor Belts - Tears/Damage			

Any item found to be unsatisfactory will be repaired prior to operation of the equipment. If an item cannot be immediately repaired or needs replacement parts, notify the Senior RFI person.

OPERATOR SIGN:_____ **DATE:**_____

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

DGM ANOMALY AND POLYGON RESOLUTION

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Explosives Safety Submission (ESS) – current version
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards – current version
- Chief of Naval Operations Instruction (OPNAVINST) 3500.39 – current version
- NAVSEA OP 5 Ammunition and Explosives Safety Ashore. – current version
- United States Army Corps of Engineers (USACE), Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual – current version
- DDESB TB 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel – current version
- SOPs 007, 008 and 009

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

This space is intentionally left blank.

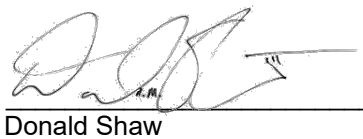
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

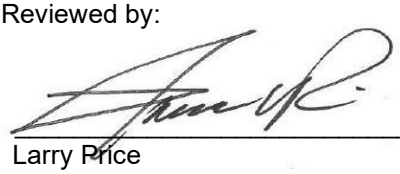
Developed by:



Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date:

Approved by:

Jason W. Wagner, CMQ/OE
Vieques Quality Manager

Date

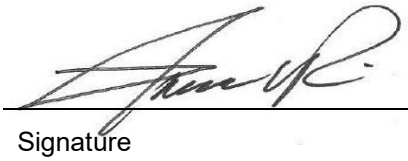
This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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 anomaly and polygon resolution operations at sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC).

8.2 SCOPE

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in anomaly and polygon resolution operations on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 3.0 of this SOP for additional guidance.

8.3 Introduction

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 anomaly and polygon resolution on the Former Vieques Naval Training Range and other project related areas contaminated with unexploded ordnance (UXO) or munitions and explosives of concern (MEC).

8.4 Rover Set Up for Reacquisition

1. Prior to leaving the office, transfer anomaly dig list file(s), formatted for RTK DGPS to the datalogger. For detailed instructions, see SOP 008 Trimble RTK System.
    a. RTK dig list file format is Excel comma delimitated CSV:
    b. Anomaly or Polygon Point ID, Northing, Easting, Elevation (approximate), Code (anomaly value)
    c. Connect computer with RTK dig list to datalogger using Active Sync or Windows Mobile Device Center
    d. Copy RTK dig list files and paste in datalogger's Trimble Data folder
        1. Put charged battery in 5800/R8 GNSS Reciever and attach whip antenna
        2. Setup Range Pole and attach Rover antenna/receiver
        3. Attach datalogger bracket to range pole and datalogger to bracket
        4. Power ON the receiver. Power on the datalogger and start Survey Controller software. (If using bluetooth connection, rover status should in upper right window). If, after several minutes, the Bluetooth connection fails, soft-reboot the datalogger by holding the power button through the five second countdown, then release and let the datalogger reboot. The rover status information should be displayed. You may have to change selected Bluetooth device. Go to Configuration – Controller-Bluetooth – Select Rover SN – Store – Escape. OR connect datalogger directly to Rover GPS using the Yellow DB9 to Limo cable
        5. Enter Survey Menu

6. Select job or project
7. Unlink unneeded RTK dig list file(s)
8. Link desired RTK dig list file(s) to the job – Note: This keeps the job file small
9. Start Survey
10. Select Stakeout for Reacquisition
11. Select points from list or from map
12. Add all points, if necessary (establishes a temporary stakeout point list)
13. Select anomaly point [e.g. RTK DGPS Check Point, Anomaly or Polygon point]
14. Follow survey controller guidance to anomaly location
15. When delta values fall below 0.1 m, mark location with flag labeled with the point name. Verify point reacquired with flag label
16. Delete point from temporary list
17. Select next point … etc.
18. When done, hit Survey menu; End Survey; Power down Receiver? – Yes
19. Turn data logger off
20. Store data logger bracket
21. Remove GPS from Range Pole
22. Store whip antenna
23. Remove Rover battery – store it upside down to indicate it needs charging
24. Store 5800/R8 GNSS Rover
25. Store Range Pole
26. Charge Rover batteries overnight

8.5 EM61-MK2 Equipment

1. EM61 Coil Assembly
2. EM61 Wheel Assemblies
3. EM61-MK2 Handle Assembly
4. GPS Tripod (if needed)
5. Custom Lower Coil GPS Tripod Mounts (if needed)
6. EM61-MK2 Back Pack or Handle Tray
7. EM61-MK2 Cables
    a. Lower coil to Upper coil cable And Shorting Plug
    b. Lower coil to Back Pack cable
    c. Back Pack to Data Logger cable
    d. Data Logger to PC cable and PCMCIA Memory Card
    e. Battery Chargers & cables

i. Back Pack Battery Charger & cable
ii. Data Logger Battery Charger & cable
iii. Power Inverter to charge from vehicle

27. EM61-MK2 Static Check Bar with Spike Target
28. EM61-MK2 Operating Manuals

a. EM61-MK2 Operating Manual
b. DAT61MK2 Computer Program Manual
c. EM61-MK2 Software
   i. Data Logger Software
      a)EM61MK2A V1.37
   ii. PC Software
      b)DAT61MK2 for Windows V1.35
      c)Backup Data Logger software

29. Tape Measures & Line Markers (line, flags, spray paint, or cones)
30. Log Book or PDA

8.6 Charge All EM61-MK2 Batteries

1. EM61-MK2 Back Pack Batteries – up to 14 hours for fully discharged battery
2. EM61-MK2 Data Logger Batteries – up to 14 hours for fully discharged battery
3. PDA Batteries

8.7 Set Up EM61-MK2

1. Assemble coil, wheel, and handle assemblies
2. Connect wheel encoder cable to lower coil – tape it in place with electrical tape (do not use duct tape)
3. Connect lower to upper coil or install shorting plug to bottom coil (usually use bottom coil only with shorting plug)
4. Connect lower coil to electronics console
5. Set a freshly charged battery into the backpack or coil center
6. Connect electronics console to Data Logger COM1 port
7. Adjust backpack shoulder and waist straps for good fit, if used
8. Tape cables to handle, leaving enough slack for turning

8.8 EM61-MK2 Operation

1. Set the EM61-MK2 Mode Switch to:
2. 4 – for logging four (4) bottom coil time gates
3. Set the Master/Slave Switch to M for single sensor operation. If circuit breaker is In (ON), you can use the Master/Slave switch to turn the system ON/OFF … (M)aster = ON, (S)lave = off.

4. Warm up for at least 5 minutes –sensor noise should start and LED should be on.
5. Push the ON/OFF button to turn on the Data Logger
6. Set Antenna Coil Size (e.g. Standard 1 x .5 m)
7. Set Up Logger
8. Date
9. Time
10. Units (e.g. feet)
11. COM port (e.g. COM1)
12. Audio
13. Pause Key: (e.g. Alt F1 or any key)
14. Display (e.g. Text or Graphic)
15. Monitor/Null Coil – After 5 minute warm-up, null EM61-MK2 – all channels should be close to 0 +/- 1
16. Static Check:
17. Look for a “quiet area” where the EM61-MK2 data doesn’t change more than 3mV on channel 1
18. Null coil = all channels should be 0 +/-1mV
19. Observe all 4 channels for about 1 minute. Values should not change by more than +/- 2.5 mV
20. Place Static Check Bar with Spike Target (screw, bolt or small ISO) on coil. Mark location so you can put it in the same place, same orientation each morning. Write the spike responses for all 4 channels in the log book and observe that they stay constant for about 1 minute.
21. Remove static check bar and observe that all 4 channels return to 0 +/- 2.5mV for about 1 minute. Note: Time Gate 1 may drift as much as 7 mV.
22. Sensor is ready for reacq. Note that you may need to null the coil periodically. Write spike response values for all 4 channels on the static check bar to compare to next day’s check. Daily responses for each channel should not vary by more than +/- 20%. If they don’t, check the location and orientation of the Static Check Bar.
23. If refining, move to first marked flag and push/pull the EM61-MK2 over the flag in at least 2 different directions while observing the displayed values. Center the coil over the peak response and log peak response and any location offset (e.g.7mV, 6” NE) in logbook or PDA and pin flag. Move flag to center of coil for intrusive team. Continue to next flag.
24. To check intrusive holes or spoils piles, push/pull the EM61-MK2 over the hole or spoils pile in at least 2 different directions while observing the displayed values. Insure that the EM61-MK2 values confirm that the project background value (e.g. <2.5mV on the EM61-MK2 channel, or channels, used to select anomalies) is not exceeded. Log peak response in logbook or PDA. Holes or spoils piles with signatures above the project background requirements will need to be reinvestigated.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The team will be equipped with the equipment described above in section 8.5 and below:

- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    1. Gloves(1)
    2. Boots/shoes
    3. Safety glasses
    4. Hard hat(1)

    Footnote (1) Optional, as applicable.
- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

ICM/SUB-MUNITIONS

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Explosives Safety Submission (ESS) – current version
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards – current version
- Chief of Naval Operations Instruction (OPNAVINST) 3500.39 – current version
- NAVSEA OP 5 Ammunition and Explosives Safety Ashore. – current version
- United States Army Corps of Engineers (USACE), Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual – current version
- NAVFAC Atlantic Time Critical Removal Action (TCRA)/Interim Measures (IM) Work Plan
- Kaho'owlawe Unexploded Ordnance ID Guide

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

This space is intentionally left blank.

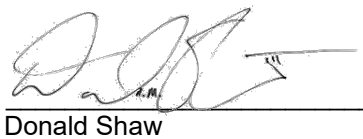
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

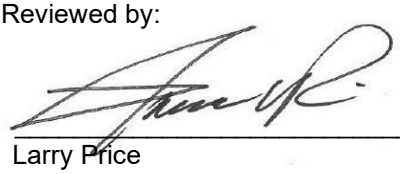
Developed by:



Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date:

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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 conduct and observe Improved Conventional Munitions (ICM)/Submunitions removal operations on sites contaminated with unexploded ordnance (UXO) or munitions and explosives of concern (MEC).

8.2 Scope

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in ICM/Submunitions removal operations on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 3.0 of this SOP for additional guidance.

8.3 Background

Based on historical documentation, past usage and confirmed presence of ICM/Sub-munitions, the following procedures will be implemented when ICM/Sub-munitions have been discovered within the grid identified to be worked or currently in the process of any vegetation removal, surface scrap removal and MEC removal efforts. Refer to those applicable SOPs for guidance on the fore mentioned efforts.

8.4 Identification Process for ICM'S

In the event that an item is discovered and suspected to be an ICM/Sub-munitions. At that time all work will stop until positive identification of the suspected item can be confirmed. At that time workers not involved in the identification process will withdraw to a designated safe area.

8.5 Procedures for ICM'S

Once a suspected ICM/Sub-munitions has been located, the item will be marked with a crossed yellow and red flag identifying the hazard as an ICM/Sub-munitions and personnel have been evacuated. No personnel will be allowed to reenter the immediate area until directed by SUXOS and UXOSO.

The SUXOS, UXOSO and/or a qualified UXO Technician III will positively identify the ICM/Sub-munitions and make notification to the on-site NAVFAC representative, the on-site Title II contractor, the NAVFAC Remedial Project Manager (RPM) and the USA PM.

8.6 High-Risk

A high-risk area is an area that is known to contain an ICM/Sub-munitions or evidence of ICM/Sub-munitions through background information or the presence of ICM/Sub-munitions components.

8.7 Follow on Procedures

Area's identified as high-risk will be reported to the NAVFAC Atlantic Remediation Project Manager and the NTR. The area will be reevaluated prior to any work in the area by the NTR, SUXOS, and UXOSO. In the event the NTR is unavailable the Title II MR personnel can perform the evaluation.

Upon completion of evaluation, options will be considered based on the degree of risk for that area. Operations may include but are not limited to identifying the area for future burn, blow in place procedures to eliminate the immediate the hazard.

8.8 Summary

In summary, each situation is unique and may dictate alternative options other than those described in paragraph 8.2. The procedures described in this SOP will be strictly adhered to.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

- It is recommended to wear long-sleeve clothing and apply insect repellent as warranted to mitigate the impact of biting/stinging insects.
- The potential for encountering MPPEH is high.
- Maintain the TSD (K40) as described in the ESS.
- If a munitions item with larger fragmentation distance is encountered, the work will stop in accordance with the ESS requirements.
- In the event of severe weather or a natural disaster, account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan found in the SHSP.

This space is intentionally left blank.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The team will be equipped with the following:

- Handheld detectors
- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    1. Coveralls
    2. Gloves(1)
    3. Boots/shoes
    4. Safety glasses

    Footnote (1) Optional, as applicable.
- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

QUALITY CONTROL SURVEILLANCE

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Explosives Safety Submission (ESS) – current version
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards – current version
- Chief of Naval Operations Instruction (OPNAVINST) 3500.39 – current version
- NAVSEA OP 5 Ammunition and Explosives Safety Ashore. – current version
- United States Army Corps of Engineers (USACE), Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual – current version
- DDESB TB 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel – current version
- DOD 6055.09-M, DOD Ammunition and Explosives Safety Standards – current version
- MIL-STD 1916, 2006. DOD Test Method Standard – current version.

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ATTACHMENT: QUALITY SURVEILLANCE FORM

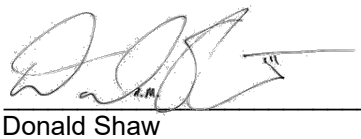
This space is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

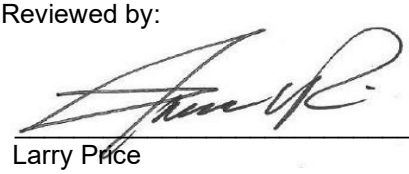
Developed by:



Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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 the Quality Control processes applicable at sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC). This SOP outlines procedures to ensure that project tasks achieve a level of quality that meets technical design specifications and conforms to the requirements of the Task Order.

8.2 Scope

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in Quality Control operations on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 3.0 of this SOP for additional guidance.

8.3 Responsibilities

8.3.1 Program QC Manager

- The Program QC Manager (PQCM) is responsible for ensuring the availability of the QC resources needed to implement Quality Control Plan (QCP) in accordance with 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. The PQCM is responsible for the development, execution, and maintenance of the QC Program and the direct supervision of assigned QC personnel. The PQCM reports directly to the Vice President of USA.

8.3.2 Project QC Manager

- The Project QC Manager (QCM) will ensure that this SOP is implemented in all operations involving the use of QC standards, inspections, and audits. The QCM will also ensure that relevant sections of this SOP are discussed in briefings, and that information related to its daily implementation is documented in the Site QC Log, reports and forms as required by this SOP and the QCP (Section 10 of the approved work plan). The QCM is responsible for the supervision of project QC personnel, monitoring and approving the quality of submittals, materials, and other work to ensure the compliance with specifications, workmanship, standards and the requirements of the contract. The QCM reports directly to the Director of Safety and Quality.

8.3.3 UXO QC Specialist

The UXO QC Specialist (UXOQCS) shall be responsible for implementing the QCP in accordance with this SOP. The UXOQCS is responsible for the direct supervision of MEC QC personnel, directing and approving the correction of any and all non-conforming or unsafe MEC work performed. The UXOQCS has ***STOP WORK AUTHORITY*** for matters relating to the assigned project.

The UXOQCS is responsible for planning and executing QC oversight of project operations, and ensuring compliance with specified QC requirements. Specifically, the UXOQCS is responsible for:

- Implementing, assessing the effectiveness of, and maintaining this SOP and related procedures.
- Reviewing and verifying the qualifications of technical staff and subcontractors.

- Planning and performing the preparatory, initial, follow-up, and completion inspections for each definable feature of work (DFW).
- Identifying quality problems and verifying that appropriate corrective actions are implemented.
- Ensuring that the requisite QC records including submittals are generated and retained as prescribed in this SOP.
- Notifying the Title II Services Contractor 48 hours prior to beginning any required action of the preparatory and initial phases. At a minimum, the UXOQCS will use weekly QC Reports for the purposes of this notification.
- The UXOQCS reports directly to the QCM.

8.3.4 Project Personnel

Project personnel are responsible for ensuring that work performed by them adheres to the requirements identified by the Work Plan, Accident Prevention Plan, Site Health and Safety Plan, and the applicable SOPs. Supervisors will also be responsible for daily inspections of site operations and conditions to ensure initial and continued compliance with the project plans, SOPs, and other guidelines are maintained. Supervisory personnel responsible for the submission of work products for QC inspection or review will strive to submit only those items or material that meets acceptance criteria.

All personnel, including contractor and subcontractor personnel, performing operations involving the use of QC standards shall be familiar with the QC requirements associated with the task or operation being performed, and with the work practices and control techniques in order to understand and comply with pass/fail criteria to be applied by QC personnel to ensure compliance with standards, procedures, practices, and contractual obligations.

8.4 UXOQCS Procedures

The UXOQCS is responsible for verifying compliance through audits and surveillance. The UXOQCS or a designee is to inspect/audit the quality of work being performed for the DFW. The UXOQCS or a designee is to verify that procedures used conform to applicable specifications stated in this Work Plan or other applicable guidance and project documents such as the ESS and contractor specific work plans. Identified deficiencies are to be communicated to the responsible individual and documented in the QC log and Weekly QC Report. Corrective actions are to be verified by the UXOQCS and recorded in the Weekly QC Report.

The specific QC audit procedures for the DFWs, including the phase during which it is performed, the frequency of performance, the pass/fail criteria and actions to take if failure occurs, are presented in Table 10-1.

The Inspection Schedule and Tracking Form are to be used by the UXOQCS for planning, scheduling and tracking the progress of audits for this project. The information on the form is to be kept up to date and reviewed by the UXOQCS for planning purposes. Audit records are to be maintained as part of the project QC file.

8.5 Definable Features of Work And the Three Phase Control Process

The quality control of work and project deliverables will be monitored by the UXOQCS through the DFWs, using the three-phase control process. The DFWs are divided into three general work activity categories:

- Planning,
- Field operations, and
- Final project reports and closeout.

8.5.1 Definable Features of Work

The DFWs that are associated with each of these activities are summarized below and are described in more detail on Table 10-1.

- **Planning**

- Pre-Mobilization Activities—System set up for geographic information system, document management and control, data management and subcontracting
- Technical Project Planning—Technical and operational approach
- Removal Contractor Site Specific Work Plan and Standard Operating Procedure's (SOP): Preparation and obtaining approval.

- **Field Operations**

- Site Preparation: Mobilization, survey, vegetation removal, surface clearance
- MEC investigation and removal
- MPPEH/MD management (inspection, demilitarization, certification, verification, disposition)
- Demilitarization of MEC
- Site Restoration and Demobilization

- **Final Project Reports and Close-Out**

- Site-Specific Final Report: Preparation and obtaining approval
- Proposed Plan and Decision Documents: Preparation and obtaining approval
- Obtain MEC Response Complete Acceptance
- Data Archiving and Project Closeout

8.5.2 Three Phases of Control

The UXOQCS is to ensure that the three-phase control process, including the Preparatory Phase, Initial Phase and Follow-Up Phase, is implemented for each DFW listed in this SOP[1]. Each control phase is important for obtaining a quality product and meeting the project objectives; however, the preparatory and initial audits are particularly valuable in preventing problems. Production work is not to be performed on a DFW until a successful preparatory and initial phase has been completed.

[1] As this is an ongoing project with multiple contract task orders (TOs), the majority of the preparatory and initial phase inspections have been conducted, but will be performed where appropriate or warranted, such as if there is a degradation of the quality of work on a DFW. The DFWs associated with the final project reports and closeout will not be covered by this SOP as work on the former VNTR will continue beyond this TO and the scope of this SOP.

8.5.2.1 Preparatory Phase

The preparatory phase culminates with the planning and design process leading up to actual field activities. Successful completion of the Preparatory Phase verifies that the project delivery, QC, and safety plans have been completed and are ready to be implemented. The following actions will be performed as applicable for each DFW:

1. Confirm that the appropriate technical procedures are incorporated into the project work plan and review procedures.
2. Confirm that adequate testing is called for to assure quality delivery.
3. Confirm definition of preliminary work required at the work site and examine the work area to confirm required preliminary work has been properly completed.
4. Confirm availability of required materials and equipment. Examine materials and equipment to confirm compliance with approved submittals and procedures. Ensure equipment testing procedures are in place, with control limits and frequency.
5. Confirm qualifications of personnel and that their roles/responsibilities are well-defined and communicated.
6. Confirm with the UXOSO that the Site Health and Safety Plan (SHSP) and activity hazard analyses (AHAs) adequately address the work operations and that applicable safety requirements have been incorporated into the plan.
7. Discuss methods to be employed during the field activities.
8. Confirm any required permits and other regulatory requirements are met.
9. Verify that lessons learned during previous similar work have been incorporated as appropriate into the project procedures to prevent recurrence of past problems.

Project staff must correct or resolve discrepancies between existing conditions and the approved plans/ procedures identified by the UXOQCS and the team during the Preparatory Phase. The UXOQCS or designee must then verify that unsatisfactory and nonconforming conditions have been corrected prior to granting approval to begin work.

Results of the activity are to be documented in the Preparatory Inspection Checklist specific for the DFW and summarized in the Weekly QC Report.

8.5.2.2 Initial Phase

The initial phase occurs at the startup of field activities that are associated with a specific DFW. The initial phase confirms that the Project QCP, other applicable work plan sections, and procedures are being effectively implemented and the desired results are being achieved. During the initial phase, the initial segment of the DFW is observed and inspected to ensure that the work complies with contract and work plan requirements. The initial phase should be repeated when acceptable levels of specified quality are not being met. The following shall be performed for each DFW:

1. Establish the quality of work required to properly deliver the TO in accordance with contract requirements. The UXOQCS ensures that supervision has made the work crews aware of expectations associated with the field methods established under the preparatory phase.
2. Resolve conflicts. Should conflicts arise in establishing the baseline quality for the DFW, the responsibility to resolve the conflict falls to the PM. Should the conflict not be resolved in a manner that satisfies the project requirements, the UXOQCS must elevate the conflict to the program level (Program QC Manager) and issue a non-conformance report. The UXOQCS may

direct a cessation of work activity, with the concurrence of the Program QC Manager, should the issue jeopardize the results of the DFW, or put the project at risk of non-compliant performance.

3. Verify with the UXOSO that the SHSP and AHAs were developed to ensure that the identified hazards adequately addressed field conditions. Confirm that applicable safety requirements are being implemented during field activities.

Upon completion of the initial phase activities, results are to be documented in the Initial Phase Inspection Checklist, the QC logbook and summarized in the Weekly QC Report. Should results be unsatisfactory, the initial phase will be rescheduled and performed again.

8.5.2.3 Follow-up Phase

Completion of the initial phase of QC activity then leads directly into the follow-up phase, which addresses the routine day-to-day activities on the field site. Inspection/audit activities associated with each DFW are addressed in Table 1. Specific concerns associated with the follow-up include:

1. Inspection of the work activity to ensure work is in compliance with the contract and work plans.
2. Evaluation and confirmation that the quality of work is being maintained at a level no less than that established during the initial phase.
3. Evaluation and confirmation that required testing is being performed in accordance with procedures established during the preparatory phase and confirmed during the initial phase.
4. Confirmation that non-conforming work is being corrected promptly and in accordance with the direction provided by the UXOQCS.

To conduct and document these inspections, the UXOQCS is to generate the Follow-up Phase Inspection Checklist. The follow-up phase inspections will be performed daily, or as otherwise identified in this QCP until the completion of each DFW.

The UXOQCS is responsible for onsite monitoring of the practices and operations taking place and verifying continued compliance with the specifications and requirements of the contract, TO, and approved project plans and procedures. He is also responsible for verifying that a daily H&S Inspection is performed and documented as prescribed in the site-specific Health and Safety Plan. Discrepancies between site practices and approved plans/procedures are to be resolved and corrective actions for unsatisfactory and nonconforming conditions or practices are to be verified by the UXOQCS or a designee prior to granting approval to continue work. Follow-up inspection results are to be documented and summarized in the Weekly QC Report.

This space is intentionally left blank.

Table 1: Definable Features of Work Audit Procedures

Activity	Definable Feature of Work with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criterion	Action if Failure Occurs
Planning	GIS Setup *(Pre-mobilization Activities)*	Verify GIS system has been set up and is ready for site data	PP	Once	GIS system has been set up and ready for site data	Do not proceed with field activities until criterion is passed
Planning	Document management and Control *(Pre-mobilization Activities)*	Verify appropriate measures are in place to manage and control project documents	PP	Once	Appropriate measures are in place to manage and control project documents	Do not proceed with field activities until criterion is passed
Planning	Data Management *(Pre-mobilization Activities)*	Verify appropriate measures are in place to manage and control project documents	PP	Once	Appropriate measures are in place to manage and control project documents	Do not proceed with field activities until criterion is passed
Planning	Subcontracting *(Pre-mobilization Activities)*	Verify Subcontractor qualifications, training and licenses	PP/IP	Once	Subcontractors' qualifications, training and licenses are up to date and acceptable	Ensure subcontractor provides the qualifications, training and licenses or change subcontractors
Planning	Technical Approach *(Technical Project Planning)*	Verify that technical approach has been agreed on by project team	PP/IP	Once	Technical approach has been agreed on by project team	Do not proceed with field activities until criterion is passed
Planning	Operational Approach *(Technical Project Planning)*	Verify that operational approach has been agreed on by project team	PP/IP	Once	Operational approach has been agreed on by project team	Do not proceed with field activities until criterion is passed
Planning	Work Plan preparation and Approval *(Technical Project Planning)*	Verify that Work Plan has been prepared and approved	PP/IP	Once	Work Plan has been prepared and approved	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	Verify all project plans are approved	PP/IP	Once	All project plans are approved	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	Verify coordination with all agencies	PP/IP	Once	Coordination with local agencies conducted	Do not proceed with field activities until criterion is passed

Activity	Definable Feature of Work with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criterion	Action if Failure Occurs
Field Operations	Site preparation (including mobilization)	Verify equipment and services are procured	PP/IP	Once	Equipment and services procured	Proceed only with activities for which equipment has been procured
Field Operations	Site preparation (including mobilization)	Verify coordination for communication and logistical support	PP/IP	Once	Coordination for communication and logistical support conducted	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	Verify coordination of Emergency Services	PP/IP	Once	Coordination of Emergency Services conducted	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	Verify operating schedules are finalized	PP/IP	Once	Operating schedules are finalized	Proceed only with those operations with finalized operating schedules
Field Operations	Site preparation (including mobilization)	Verify explosives storage and MEC debris/scrap storage areas are established	PP/IP	Once	Explosives storage and MEC debris/scrap storage areas are established	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	Verify site-specific training is performed and acknowledged	PP/IP	Once	Site-specific training is performed and acknowledged	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	Verify project plans are reviewed and acknowledged	PP/IP	Once	Project plans are reviewed and acknowledged	Do not proceed with field activities until criterion is passed
Field Operations	Site Survey	Verify surveyor qualifications	PP/IP	Once	Surveyor's qualifications are up to date and acceptable	Ensure surveyor provides qualifications or change surveyor
Field Operations	Site Survey	Verify surveyor licenses	PP/IP	Once	Surveyor's licenses are up to date and acceptable	Ensure surveyor provides licenses or change surveyor
Field Operations	Site Survey	Verify benchmarks for survey are established and documented	PP/IP	Once	Benchmarks for survey are established and documented	N/A

Activity	Definable Feature of Work with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criterion	Action if Failure Occurs
Field Operations	Site Survey	Verify site boundaries have been established	PP/IP	Once	Site boundaries have been established	Do not proceed with dependent field activities until criterion is passed
Field Operations	Site Survey	Verify proper marker type, material and placement method	PP/IP	Once	Proper marker type, material and placement method were used	Replace markers as necessary to comply with requirement
Field Operations	Site Survey	Verify surveyor notes are legible, accurate and complete	IP	Once	Surveyor notes are legible, accurate and complete	Require surveyor replaces deficient notes with legible, accurate and complete notes
Field Operations	Site Survey	Verify stake alignment and spacing intervals	IP	Once	Stake alignment and spacing intervals are as specified in Work plan	Replace stakes not aligned as specified
Field Operations	Vegetation Removal	Verify personnel qualifications and training	PP/IP	Once	Personnel qualifications and training are appropriate	Ensure all personnel qualifications and training are appropriate and replace those not properly qualified
Field Operations	Vegetation Removal	Verify environmental controls are correct and functional	IP/FP	Once	Environmental controls are correct and functional	Do not proceed with vegetation removal until proper environmental controls are in place
Field Operations	Vegetation Removal	Verify vegetation removal conducted in accordance with the Work plan	IP/FP	Daily	Vegetation removal conducted in accordance with the Work plan	Stop vegetation removal activities until full compliance can be assured and any activities not performed within compliance are reevaluated and redone if necessary
Field Operations	Surface/Subsurface Removal	Verify equipment testing	IP/FP	Once/Daily	Equipment passes daily function test in equipment check area	Repair or replace defective equipment

Activity	Definable Feature of Work with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criterion	Action if Failure Occurs
Field Operations	Surface/Subsurface Removal	Verify area/boundaries	PP/IP	Once	Area/boundaries are correct	Stop activities until area/boundaries can be verified/corrected
Field Operations	Surface/Subsurface Removal	Verify work methods	IP/FP	Daily	Work methods are being performed in accordance with the Work plan and SOPs	Stop activities until Work plan and SOPs are being followed and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Surface/Subsurface Removal	Verify team separation distance	IP/FP	Daily	Team separation distance is appropriate for work performed	Stop activities until full compliance can be assured
Field Operations	Surface/Subsurface Removal	Verify removal conducted in accordance with the Work plan and SOPs	IP/FP	Daily	Removal conducted in accordance with the Work plan and SOPs	Stop activities until full compliance can be assured and any activities not performed within compliance are reevaluated and redone if necessary
Field Operations	Surface/Subsurface Removal	Check a portion of each grid/lot in accordance with Section 8.6 to ensure Acceptance Criteria are met as defined in the Work Plan	FP	Each Occurrence	See Section 8.6	See Section 8.6
Field Operations	Inspection *(MPPEH Management)*	Verify personnel qualifications	IP/FP	Once	Personnel qualifications and training are appropriate	Replace unqualified personnel with qualified personnel
Field Operations	Certification *(MPPEH Management)*	Verify inspection conducted in accordance with MPPEH Management Plan VNTR MEC WP (2006)	IP/FP	Daily/Each Occurrence	Inspection conducted in accordance with the MPPEH Management Plan	Stop activities until full compliance can be assured and any activities not performed within compliance are reevaluated and redone if necessary

Activity	Definable Feature of Work with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criterion	Action if Failure Occurs
Field Operations	Certification *(MPPEH Management)*	Verify personnel qualifications	IP/FP	Once	Personnel qualifications and training are appropriate	Replace unqualified personnel with qualified personnel
Field Operations	Certification *(MPPEH Management)*	Verify certification is conducted in accordance with the MPPEH Management Plan	IP/FP	Each Occurrence	Certification is conducted in accordance with the MPPEH Management Plan	Stop activities until full compliance can be assured and any activities not performed within compliance are reevaluated and redone if necessary
Field Operations	Disposal *(MPPEH Management)*	Verify disposal is conducted in accordance with the MPPEH management Plan	IP/FP	Each Occurrence	Disposal is conducted in accordance with the MPPEH Management Plan	Stop activities until full compliance can be assured and any activities not performed within compliance are reevaluated and redone if necessary
Field Operations	Demilitarization of UXO	Verify personnel qualifications	IP/FP	Once	Personnel qualifications and training are appropriate	Replace unqualified personnel with qualified personnel
Field Operations	Demilitarization of UXO	Verify operations conducted in accordance with the Work plan and SOP	IP/FP	Each Occurrence	Operations conducted in accordance with the Work plan and SOP	Stop activities until full compliance can be assured and any activities not performed within compliance are reevaluated and redone if necessary
Field Operations	Demobilization	Verify that all equipment is inspected, packaged and shipped/returned to appropriate location	FP	Once	All equipment is inspected, packaged and shipped/returned to appropriate location	N/A
Field Operations	Demobilization	Verify facilities-support infrastructures are dismantled and shipped/returned to appropriate location	FP	Once	Facilities-support infrastructures are dismantled and shipped/returned to appropriate location	N/A

Activity	Definable Feature of Work with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criterion	Action if Failure Occurs
Final Project Reports and Close-out	Site Specific Final Report preparation and approval	Verify filed site is returned to original condition	FP	Once	Field site is returned to original condition	N/A
Final Project Reports and Close-out	Site Specific Final Report preparation and approval	Verify tabulation of all MEC, MD and other material recovered during the removal actions are accurate and complete	IP/FP	Daily	Tabulation of all MEC, MD and other material recovered during the removal actions are accurate and complete	Determine cause of inaccuracies and correct
Final Project Reports and Close-out	Decision Document preparation and approval	Verify reviews performed by project, technical and program teams	FP	Once	Reviews performed by project, technical and program teams	N/A
Final Project Reports and Close-out	MEC Response Completion Acceptance	Verify Final Report, Proposed Plan and Decision Document has been approved	FP	Once	Final Report, Proposed Plan and Decision Document has been approved	Take actions to ensure documents get approved
Final Project Reports and Close-out	Archiving	Verify back-up systems are in place	IP	Once	Data back-up systems are in place	Take actions to ensure back-up systems are in place
Final Project Reports and Close-out	Project Close-out	Verify purchase orders are closed out	FP	Once	Purchase orders have been closed out	Take actions to ensure purchase orders have been closed out
Final Project Reports and Close-out	Project Close-out	Verify invoices have been completed and approved	FP	Once	Invoices have been completed and approved	Take actions to ensure invoices have been completed & approved

8.6 LEVEL OF QC INSPECTION

MIL-STD 1916 will be used to determine the level of Quality Control inspection using the following criteria:

- For instrument-assisted surface removal, a lot is comprised of four 30-m x 30-m grids and is approximately 0.9 acre.
- For subsurface MEC removal, a lot is comprised of 30 prosecuted anomalies for selected roads and 30 prosecuted anomalies for selected beaches.
- The MIL-STD initial Verification Level (VL) will be "VII" for attributes sampling.
- Table 2, MIL-STD 1916 table I excerpt, will be used to determine the Code Letter (CL) for entry into the sampling table (Table 3, MLD-STD 1916 Table II).
- Table 3, MIL-STD 1916 Table II will then be used to determine the sampling size based on the CL and VL.
- The switching method will be accomplished as described in Table 3, note 2.

Table 2: MIL-STD-1916 Table I -- Code Letters (CL) for Entry into the Sampling Table

Lot or Production Interval Size	Verification Levels						
	VII	VI	V	IV	III	II	I
2-170	A	A	A	A	A	A	A
171-288	A	A	A	A	A	A	B
289-544	A	A	A	A	A	B	C
545-960	A	A	A	A	B	C	D
961-1632	A	A	A	B	C	D	E
1633-3072	A	A	B	C	D	E	E
3073-5440	A	B	C	D	E	E	E
5441-9216	B	C	D	E	E	E	E
9217-17408	C	D	E	E	E	E	E
17409-30720	D	E	E	E	E	E	E
30721 and larger	E	E	E	E	E	E	E
Note: MIL-STD-1916 DOD Test Method Standard, Table I, April 1996							

This space is intentionally left blank.

Table 3: MIL-STD-1916 Table II – Attributes Sampling Plan

Code Letter	Verification Levels								
	T	VII	VI	V	IV	III	II	I	R
Sampling Size (Ng)									
A	3072	1280	512	192	80	32	12	5	3
B	4096	1536	640	256	96	40	16	6	3
C	5120	2048	768	320	128	48	20	8	3
D	6144	2560	1024	384	160	64	24	10	4
E	8192	3072	1280	512	192	80	32	12	5
Notes:									
1 - When the lot size is less than or equal to the sample size, 100 percent attributes inspection is required.									
2 - One verification level (VL) to the left/right of the specified normal VL is the respective tightened/reduced plan. Tightened inspection of VL-VII is T, reduced inspection VL-I is R.									
3 - MIL-STD-1916 DO D Test Method Standard, Table II, April 1996									

Based on the initial lot size and assumed VL of "VII", the CL for entry into the sampling tables using Table 2 is "A." Using the CL from Table I and the assumed VL, the sampling size is 1280 (Table 3 column VII). As indicated in note 1 in Table 3, when the lot size is less than the sample size, 100 percent of the lot must be inspected.

The tightening and loosening process will be used every ten lots to reduce or tighten the QC inspections as required by changing the VL as shown in Table 3. When the sampling size becomes smaller than the lot size, a random number generator will be used to select the required number of lanes to be included in the sampling.

Inspection criteria for a given task or operation is derived from the requirements found in the Scope of Work (SOW), Performance Work Statement (PWS), Task Order Requirements, or Contract. Inspection criteria is identified for the various components of the task or operation and applied during the three phases of control.

QC personnel will review, identify, and apply the pass/fail criteria for each submitted work product (see Figure 1). Inspections will be recorded on an approved QC inspection form and will contain the following at a minimum:

- Work product information
- Person or team submitting work product
- Pass/Fail Results
- Corrective requirements and references as necessary
- Signature of QC individual

8.6.1 Documentation of Testing

Test results are to be documented by the individual performing the test. Calibration and maintenance records associated with the measuring and testing equipment (M&TE) are to be generated by the individual performing the activity. Documentation for calibration and maintenance of M&TE is to be made available to the COR upon request.

The UXOQCS is responsible for ensuring that the tests are performed and that the results are summarized in and provided with the Weekly QC Report. Any failing test will be noted on the deficiency log so it can be tracked until such time as rework and re-testing can be performed and corrective action is verified.

8.6.2 Calibration and Maintenance

Calibration and maintenance of geophysical instruments, radios, vehicles, vegetation cutting equipment, cell phones, etc., will be performed per manufacturer's specifications. Geophysical detection equipment will be tested daily. Records of these activities are to be generated by the individual performing the activity with copies provided to the UXOQCS for retention in the project QC file.

8.7 DEFICIENCY MANAGEMENT

This section includes provisions for preventing quality problems and facilitating process improvements as well as for identifying, documenting, and tracking deficiencies until corrective action has been verified. Deficiency notices and corrective action requests will be provided to USEPA, PREQB, NOSSA, and USFWS during project status meetings or in project status documentation.

8.7.1 Deficiency Identification and Resolution

While deficiency identification and resolution occurs primarily at the operational level, QC inspections provide a backup mechanism to address problems that either are not identified or cannot be resolved at the operational level. Through implementation of the inspection program, the QC staff is responsible for verifying that deficiencies are identified, documented, and corrected in a timely manner. If the UXOQCS determines that a specific action can be taken to prevent the cause or similar cause for failure, the action will be implemented. An attempt to identify additional potential causes of failure will also be made (e.g., weather event, site condition change, and other activities that would result in items being introduced to a worked grid).

8.7.2 Investigation Failure Criteria

8.7.2.1 Instrument-Assisted Surface Removals

The UXOQCS or designee will conduct an instrument-assisted surface QC inspection, using the same type of analog geophysical instrument used to clear the lanes, on the select lanes and a grid failure will occur if, during the QC inspection:

- More than two munitions items which have a shape, size, or mass greater than or equal to a 20mm and less than a 30mm projectile are not removed from the grid.
- More than one munitions item which has shape, size, or mass greater than or equal to a 30mm and less than a 40mm projectile is not removed from the grid.
- Any munitions item, which has a shape, size, or mass equal to or greater than a 40mm projectile, is not removed from the grid.

8.7.2.2 Subsurface Anomaly Investigation

The UXOQCS will conduct a QC inspection of the selected anomaly locations, using the same type of DGM instrument and procedures used to reacquire the anomaly targets, and a failure will occur if:

- A blind seed item (BSI) is not selected and included on the anomaly dig list for prosecution, or
- A BSI is not recovered during the anomaly prosecution by the UXO team

- The mV reading for the anomaly location is above the removal mV reading criteria, as established during the GSV task for this project/work area.)
- For areas inaccessible to DGM coverage (as determined by the Site Geophysicist and PM), a BSI not recovered during the analog geophysical MEC removal
- For areas inaccessible to DGM coverage the UXOQCS finding in the subsurface, at the specified depths of clearance, items in the quantities listed in Section 8.7.2.1 above.

Any failure will result in a complete re-work of the entire failed lot and will initiate a cause and effect analysis to determine the root cause of the failure and to correct the problem.

The UXOQCS will conduct and document a root cause analysis to determine if the failure is the result of the process, procedures, equipment and/or personnel and to what extent the previously performed work may have been affected by the failure. The UXOQCS will provide his findings to the PM and SUXOS with suggested or required corrective actions. Once the proposed corrective actions are approved by management, the UXO Teams will implement them. The root cause analysis and corrective actions will be attached to the weekly QC reports.

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

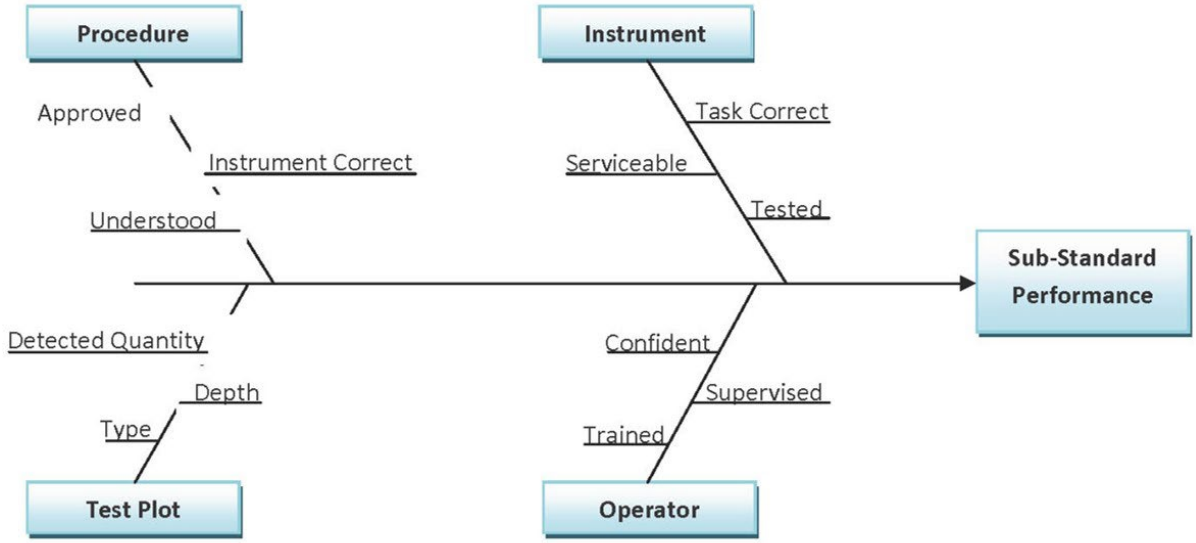


Figure 1: Cause and Effect Process

8.7.3 Corrective Action Request

A Corrective Action Request (CAR) can be issued by any member of the project staff, including the Contractor and subcontractor employees. If the individual issuing the CAR is also responsible for correcting the problem, then he or she should do so and document the results on Part B of the CAR. Otherwise, the CAR should be forwarded to the PM, who is then responsible for evaluating the validity of the request, formulating a resolution and prevention strategy, assigning personnel and resources, and specifying and

enforcing a schedule for corrective actions. Once a corrective action has been completed, the CAR and supporting information are to be forwarded to the UXOQCS for closure.

In addition to observing actual work operations, CARs are to be reviewed during follow-up QC inspections. The purposes of this review are:

- To ensure that established protocols are implemented properly;
- To verify that corrective action commitments are met; to ensure that corrective actions are effective in resolving problems;
- To identify trends within and among similar work units; and
- To facilitate system root cause analysis of larger problems.

Particular attention is to be given by the QC staff to work units that generate either an unusually large or unusually small number of CARs.

The UXOQCS will determine whether a written Corrective Action Plan (CAP) is necessary, based on whether or not the CAR priority is high; A *"high priority" is a situation that requires "expediting the corrective action plan and correction of deficient conditions noted in the CAR and extraordinary resources may be required due to the deficiency's impact on continuing operations."* The CAP is developed by a PM designee and approved and signed by the PM. The CAP is to indicate whether it is submitted for informational purposes or for review and approval. In either event, operational staff is to be encouraged to discuss the corrective action strategy with the QC staff throughout the process.

8.7.4 Deficiency and Corrective Action Tracking

Each CAR is to be given a unique identification number and tracked by the appropriate line manager until corrective actions have been taken and documented in and the CAR is submitted to the UXOQCS or a designee for verification and closure.

8.7.5 Documentation

The lessons learned through the deficiency management process are documented on CARs and CAPs. To share the lessons learned with the Title II Services Contractor and the Government, these documents are submitted to the Title II Services Contractor through the Weekly QC Report.

CARs should be cited in the Weekly QC Report. Minor deficiencies that are identified during a QC inspection but can be readily corrected and verified in the field are to be documented in the QC log and Weekly QC Report without initiating a CAR. Deficiencies identified in a QC inspection but that cannot be readily corrected are to be documented by the QC staff on a CAR and in the Weekly QC Report. Copies of CARs are to be referenced in and attached to the Weekly QC Report. CAPs will also be attached to Weekly QC Reports to document the final outcome of the deficiency. Similar or related deficiencies may be addressed on a single CAP. All CARs and CAPs will be maintained onsite with the project files and will be subject to audit.

8.8 REPORTS

The UXOQCS is responsible for the preparation and submittal of the Weekly QC Report to the Program QC Manager and providing concurrent courtesy copies to the PM. A copy of the Weekly QC Report with attachments will be submitted to the Title II Services Contractor on the first work day following the date covered by the report. All calendar days, including weekends and holidays, are to be accounted for

throughout this project. As a minimum, one report is to be prepared and submitted for every continuous 7 days of no work. All reports are available upon request to the NTR.

The Weekly QC Report is to provide an overview of QC activities performed each day, including those performed for subcontractor and supplier activities. The QC reports are to present an accurate and complete picture of QC activities. They are to report both conforming and deficient conditions, and should be precise, factual, legible, and objective. Copies of supporting documentation, such as checklists and surveillance reports, are to be attached.

A field QC log is to be maintained by the UXOQCS and assigned to each member of the QC staff for use in documenting details of field activities during QC monitoring activities. At the end of each day, copies of the log entries are to be attached to the Weekly QC Report. The information in the QC log provides Weekly QC Report and in addressing follow-up questions that may arise.

QC and H&S staff input for the Weekly QC Report is to be provided in writing to the UXOQCS at a previously agreed upon time and place, generally no later than about 1 hour before normal close of business. For the sake of simplicity and completeness, the format for QC staff input should follow the same as for the Weekly QC Report with only the relevant sections completed.

Each Weekly QC Report is to be assigned and tracked by a unique number comprised of the Delivery Order number followed by the date (week-ending date) expressed as “DDMMYY”, example DO #XXXX-090712 is the report for site work performed the week ending on 28 September 2012. In the case of “no work day” reports, the report number is to comprise the Delivery Order, the last date covered, the number of days covered, and the initials “NW”, example DO #XXXX-082212-3NW is the report for the three no work days from 18 September 2012 through 20 September 2012. Copies of Weekly QC Reports with attachments and QC logs no longer in use are to be maintained in the project QC file. Upon project closeout, all QC logs are to be included in the project QC file.

8.9 SUBMITTAL MANAGEMENT

The UXOQCS is responsible for ensuring, through detailed review, that submittals as well as the materials and the work they represent, are in full compliance with applicable contract specifications. The UXOQCS is also responsible for ensuring that a project file is established and maintained, and that accountable project documents are retained and controlled appropriately.

8.10 PROJECT RECORDS

The Removal Action Contractor PM is to establish and maintain an onsite project file in accordance with contract requirements and NAVFAC Atlantic policies for document control. The PM is responsible for controlling access to the project file to ensure that records are not lost or misplaced. The purpose of this file is to maintain a complete set of all documents, reports, certifications, and other records that provide information on project plans, contract agreements, and project activities. The initial file will be structured to include a record copy of the following documents:

- Schedule and progress reports
- Technical specifications, including addenda and modifications thereof
- Change orders and other contract modifications
- Engineer Field Orders
- Manufacturer’s certificates
- Survey Records

- Daily work activity summary reports, which may include:
  - Weekly QC Report
  - Daily H&S Report
  - Reports on any emergency response actions
  - Test records
  - Records of site work
  - Chain-of-custody records
  - Reports on any spill incidents
  - Truck load tickets and shipping papers
- Other items as required by the Contracting Officer Representative:
  - Conversation logs
  - Meeting minutes and agenda
  - Inspection logs and schedules
  - Photo documentation
  - Site maps
  - As built drawings

As the project activities progress, the Removal Action Contractor PM will monitor usefulness of the project filing system for information retrieval. If he or she finds that additional file sections are needed, he or she will expand this initial filing structure to include additional sections.

8.11 CONTINUAL IMPROVEMENT

Project staff at all levels are to be encouraged to provide recommendations for improvements in established work processes and techniques. The intent is to identify activities that are compliant but can be performed in a more efficient or cost-effective manner. Typical quality improvement recommendations include identifying an existing practice that should be improved (e.g., a bottleneck in production) and/or recommending an alternative practice that provides a benefit without compromising prescribed standards of quality. Project staff is to bring their recommendations to the attention of project management or the QC staff through verbal or written means. However, deviations from established protocols are not to be implemented without prior written approval by the PM and concurrence of the UXOQCS. Where a staff-initiated recommendation results in a tangible benefit to the project, public acknowledgment is to be given by the PM.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 Hazard Control Brief

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The UXOQCS will be equipped with the following:

- Handheld metal or all metals detector
- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    5. Gloves(1)
    6. Boots/shoes
    7. Safety glasses
    8. Hard hat(1)

    Footnote (1) Optional, as applicable.
- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

ATTACHMENT
QUALITY SURVEILLANCE FORM

This page is intentionally left blank.

USA Environmental, Inc.

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM

CONTRACT/TO: ____

DFW: ____

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

CHECKLIST						
Item	Ref.	Inspection Point	Yes	No	N/A	Comments

FINDINGS	
Item	Comments

Conducted By: _____ Reviewed By: _____

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

EXPLOSIVES TRANSPORTATION VIA OPEN WATER VESSELS

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Explosives Safety Submission (ESS) – current version
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards – current version
- Chief of Naval Operations Instruction (OPNAVINST) 3500.39 – current version
- NAVSEA OP 5 Ammunition and Explosives Safety Ashore. – current version
- United States Army Corps of Engineers (USACE), Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual – current version
- DDESB TB 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel – current version
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.09-M, DOD Ammunition and Explosives Safety Standards
- DOD 4160.21-M, Defense Reutilization and Marketing Manual
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- Local and Commonwealth laws and regulations.

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

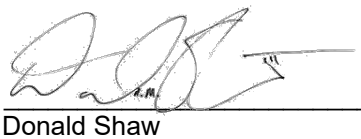
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

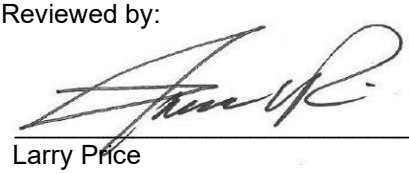
Developed by:



Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date:

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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 for the transportation, loading, storage, and unloading of explosives (demolition material) by open water vessels at sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC).

8.2 Scope

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in the transportation of explosives by open water vessel to the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 3.0 of this SOP for additional guidance.

8.3 Responsibilities

8.3.1 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 SUXOS and/or UXOQCS and reviewed by the PM.

8.3.2 Senior UXO Supervisor (SUXOS)

The SUXOS will be responsible for the overall physical movement of explosives to and on the project site. All personnel assigned to these duties will possess an Employee Possessor certificate as defined by ATF Publication 5400.7. The SUXOS these personnel are trained in the proper loading, storage/stowage, transportation, and unloading of all explosives. The SUXOS or designee will be responsible for all 1.1 – 1.4 explosives, ensuring the explosives totals on the invoice/bill of laden agree with the requisition totals. Any discrepancies in the requested amounts and the shipped amounts of explosives will be reconciled in accordance with (IAW) Section 12.2 below.

8.3.3 Unexploded Ordnance 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.

8.4 Requisition Procedures

The requisition of explosives will be IAW USA's policies. 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.

8.5 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 (Puerto Rico Blasters license).
- Transportation of explosives (Federal, state, and local vessel and vehicle requirements).
- Storage of explosives Federal, state, and local requirements).

8.5.1 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.

8.5.2 State/Local Blaster's License/Permit

As required by the common wealth of Puerto Rico, USA has obtained Puerto Rico blaster's licenses/permits. The PM, Site Manager and SUXOS will be responsible for maintaining the approved personnel to hold blaster's licenses/permits and schedule for the timely renewals when appropriate. 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 as well as physicals and/or finger printing.

8.5.3 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.

8.6 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.

8.6.1 Explosives Containers

For transport of explosives aboard an open water vessel, USA will ensure that IME-22 containers are utilized for the storage of initiators 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.

8.6.2 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.***

8.6.3 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 firefighting hazards, and the emergency notification list. Placarding of explosive containers will be IAW applicable sections of DoD 6055.09-M 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).

8.6.4 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.

8.6.5 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.

8.6.6 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 designee and the second key by the UXOTII or higher escorting the movement. This procedure ensures that access to the containers cannot be gained without obtaining the two keys and no one individual can gain access to a single container. 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.

8.7 Transportation By Vessel

Transportation of explosives by open water vessel will be accomplished in the following manner.

8.7.1 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 will be IAW DOT (49 CFR) and U.S. Coast Guard standards (33 and 46 CFR). No other cargo will be transported while the explosives container is on board and has explosive material stored inside.

8.7.2 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 6055.09-M and 49 CFR Subtitle B, Chapter 1, Subchapter C, Part 172.
- Loading and unloading of explosives into the container will be accomplished by two UXO Technicians.
- Inner packaging of explosives will be properly labeled/placarded.
- Dry chemical or foam filled fire extinguishers (two each 10B: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 13.1.5 of this SOP.

8.7.3 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.

8.8 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.

8.9 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.

8.10 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, the Corporate Quality Manager and the USA responsible person 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.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 Hazard CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The team will be equipped with the following:

- Day Box or IME Container/s
- Locks
- Puerto Rico Blasters License
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    1. Gloves(1)
    2. Boots/shoes
    3. Safety glasses
    4. Hard hat(1)

    Footnote (1) Optional, as applicable.
- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

Safety equipment required by the USCG to be on Vessel provided by subcontractor:

- Personal Floatation Devices
- Fire Extinguisher
- First Aid Kit
- Tie Down Material or Straps
- Marine Band Radio

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

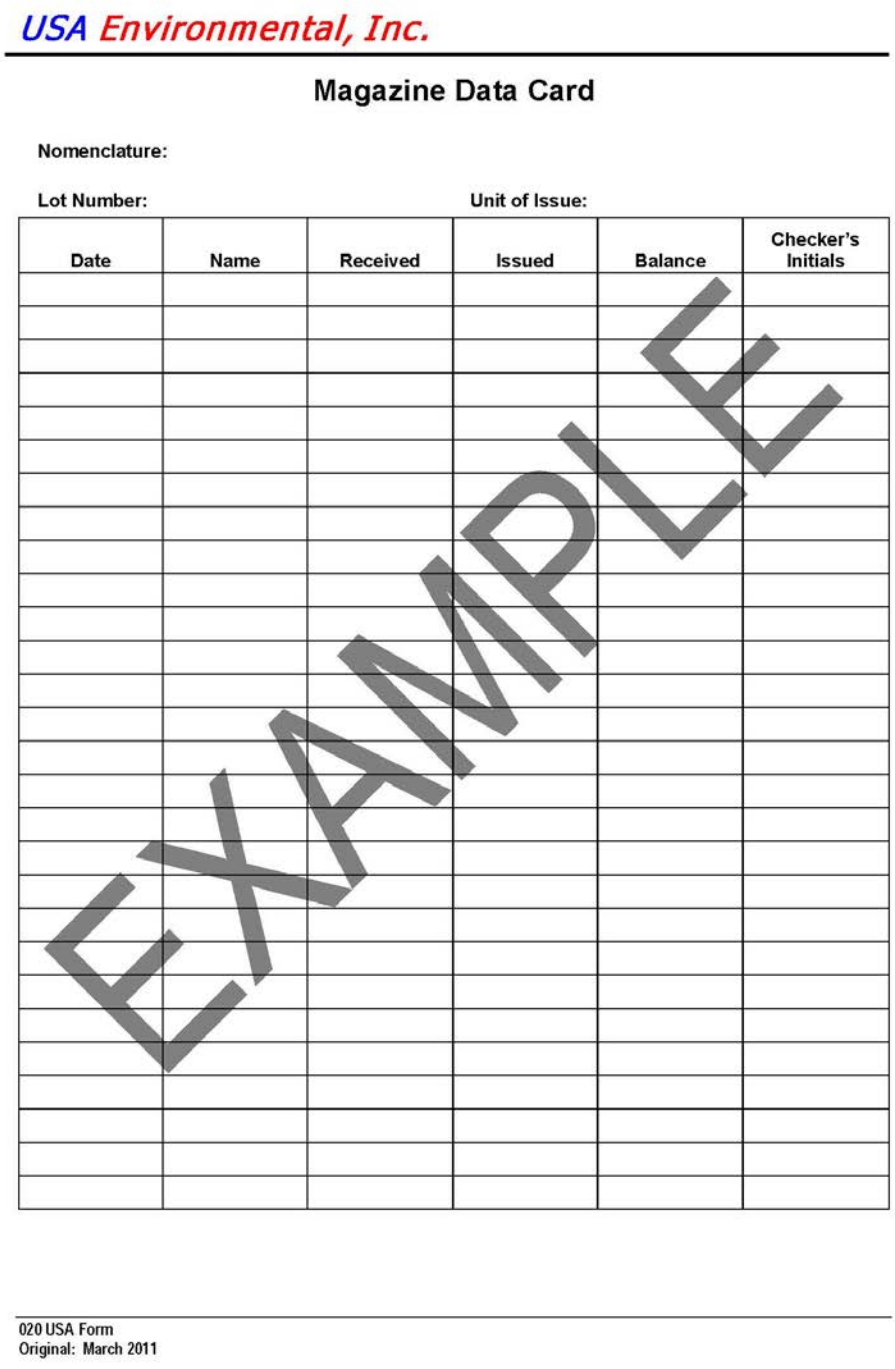
The single point of contact for incidents on site will be the UXOSO. The UXOSO will perform pre-emergency planning before starting field activities and during the mobilization and site-specific training phase of the project, and will coordinate emergency response with police/fire/rescue personnel and 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 emergency response and change procedures if necessary.



USA Environmental, Inc.

Magazine Data Card

Nomenclature:

Lot Number: **Unit of Issue:**

Date	Name	Received	Issued	Balance	Checker's Initials

EXAMPLE

020 USA Form
Original: March 2011

Figure 1: Example of Magazine Data Card

This page is intentionally left blank.

VESSEL SAFETY INSPECTION CHECKLIST (SHEET 1 of 2)

USA Environmental, Inc.

VESSEL SAFETY INSPECTION CHECKLIST

This form must be completed for any vessel carrying explosives. This form is to be completed prior to loading and transporting explosives and is for on-site use only.

Sub-Contractor:	Activity:
Name of Vessel:	Captain:
Vessel Type:	ID & Nationality:
Inspected By:	Date & Time: ☐ AM ☐ PM

Item Inspected	Yes	No	Comments
1. Is a valid Coast Guard certificate or Marine Survey available?	☐	☐	
2. Does the vessel operator have a valid Coast Guard certificate or correctly endorsed document?	☐	☐	
3. Are vessel registration number/decals affixed on Vessel?	☐	☐	
4. Is the Maximum Passenger Capacity affixed to the Vessel?	☐	☐	
5. Are there enough Personal Flotation Devices (PFDs) for each person that will be on the Vessel?	☐	☐	
6. Are there visual distress signaling devises on the Vessel and are they operational?	☐	☐	
7. Is there a distress sounding device on the Vessel and is it operational?	☐	☐	
8. Does the Vessel have navigational lights and are they operational?	☐	☐	
9. Does the Vessel have a marine radio and is it operational?	☐	☐	
10. Are there operational fire extinguishers on the Vessel?	☐	☐	
11. Is there an adequate First Aid Kit on the Vessel?	☐	☐	
12. Is there a "Bravo" flag hoisted while explosives are being loaded/unloaded?	☐	☐	
13. Are "No Smoking" signs posted or has it been verbally put out?	☐	☐	
14. Is the on-deck space clear where the IME/explosive material will be stowed?	☐	☐	

129 USA Form
Original: May 2018

Page 1 of 2

VESSEL SAFETY INSPECTION CHECKLIST (SHEET 2 of 2)

USA Environmental, Inc.

Item Inspected	Yes	No	Comments
15. Is there on-deck space where the IME/explosives material will be stowed away from fire or heat producing articles?	☐	☐	
16. Is IME secured with a lock?	☐	☐	
17. Is proper placecarding on the IME?	☐	☐	
18. Is IME secured for transit and accessible for emergency jettisoned?	☐	☐	

Remarks:	
Captain's Signature:	Date:
Inspector's Signature:	Date:

NOTES:

All safety features and items will be USCG approved.

All loading, unloading, stowage and transportation of explosives by Vessel will be in accordance with the appropriate federal standard, 49 CFR Part 176 Carriage by Vessel.

The Vessel must depart as soon as it is loaded and the explosives load is secure on the vessel.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

MAGAZINE OPERATIONS

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Explosives Safety Submission (ESS) – current version
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards – current version
- Chief of Naval Operations Instruction (OPNAVINST) 3500.39 – current version
- NAVSEA OP 5 Ammunition and Explosives Safety Ashore. – current version
- United States Army Corps of Engineers (USACE), Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual – current version
- DDESB TB 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel – current version
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.09-M, Edition 1, Defense Explosives Safety Regulation
- DOD 4160.21-M, Defense Reutilization and Marketing Manual
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives.

This space is intentionally left blank

This page is intentionally left blank.

4. TABLE OF CONTENTS

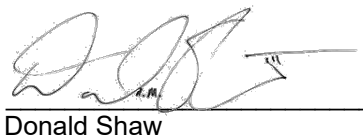
This page is intentionally left blank

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

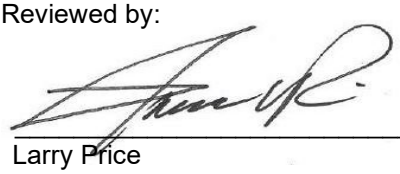
(Signature to be provided in Final SOP)

Developed by:



Donald Shaw — 01/03/2020
Project Manager — Date

Reviewed by:



Larry Price — 01/03/2020
Vieques Senior UXO Supervisor — Date

Approved by:

Jason W. Wagner, CMQ/OE — Date
Corporate Quality and Safety Manager

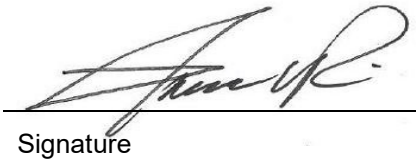
This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

8. PROCEDURES

8.1 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 operation of the magazines when explosives are stored in them in the vicinity of sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC).

8.2 Scope

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in explosives storage operations on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. Two magazines are approved for use. They are 4710A and 4710B. This SOP is intended to be used as guidance for the conduct of daily operations. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 3.0 of this SOP for additional guidance.

8.3 Operational Procedures

8.3.1 Key Control

Keys to the locks for the magazines are kept in a secure key locker inside the USA work space that is bolted to the floor. The keys are arranged on key rings in a manner that ensures no one key ring can be used to gain access into the gate or the magazine by itself, and no more than one key ring will be issued to any individual. A key log is maintained in the USA work space and this key log has the name of the individual who signed out what key to whom, the date and when the key was returned.

Personnel authorized to sign keys out and/or possess keys to the magazines are designated on the Authorization to transport and/or use list.

8.3.2 Storage

Magazine 4710A is used to store blasting caps, fuse lighters and safety fuse. These items are storage compatibility group B. This magazine has Net Explosive Weight (NEW) limit of 100lbs of Class/Division (C/D) 1.4. Magazine 4710B is used to store the donor explosives. It has an NEW limit of 2,000lbs of C/D 1.1 and is storage compatibility group D Magazine storage regulations are provided in OP 5 chapter 11.

The following procedures are for the receipt or return of explosives:

- Obtain keys from the USA SUXOS, Site Manager or UXOQCS. Access to the magazines requires a minimum of two personnel.
- Raise the bravo flag (s) prior to opening the magazines.
- **TURN MOBILE PHONES OFF PRIOR TO OPENING THE MAGAZINES AND OBSERVE HAZARDS OF ELECTRO-MAGNETIC RADIATION TO ORDNANCE (HERO) PRECAUTIONS FOR RADIOS.**
- Verify actual quantities against the receipt documents prior to signing for the explosives.
- Place material in the appropriate magazine and adjust the inventory records as appropriate.
- Ensure material is kept 6 inches from the walls to provide adequate ventilation.

- Mark any partially filled boxes as “LIGHT BOX” in the largest practical letters.
- Secure the magazines and lower the bravo flags (s).

The following procedures are to be used for issuing explosives:

- Obtain keys from the USA SUXOS, Site Manager or UXOQCS. Access to the magazines requires a minimum of two personnel.
- Raise the bravo flag (s) prior to opening the magazines.
- **TURN MOBILE PHONES OFF PRIOR TO OPENING THE MAGAZINES AND OBSERVE HERO PRECAUTIONS FOR RADIOS.**
- Remove boxes from the magazine before opening and issuing.
- Issue only the quantity of explosives necessary for the day’s operation.
- Adjust inventory records as appropriate.
- Ensure explosive material is properly packaged for transportation.
- Vehicles will be inspected using form DD 626, Motor Vehicle Inspection (Transporting Hazardous Material) for transport on public roadways (see attachment C), or the Explosive Vehicle On-Site Inspection form (see Appendix F).
- The vehicle engine will not be running during loading or unloading.
- The vehicle will be chocked during the loading and unloading of explosives.
- Secure magazines and lower the bravo flag (s).

8.3.3 Magazine Inspections

Magazines will be inspected on a monthly basis using attachment (1) as guidance. The results of the inspection will be entered into the magazine inspection log.

8.3.4 Security

After normal working hours, a Security Guard performs a security check of the magazines approximately every two hours while explosives are stored in the magazines. This check is documented in a log book. The completed log books are maintained by the Title II Contractor.

8.4 Emergency Response Procedures

- In the event of an emergency, immediately notify “Garcia Base” that you are declaring an emergency. This will alert other Teams to maintain radio silence.
- Contact the respective Unexploded Ordnance Safety Officer (UXOSO) and provide the details of the emergency.
- The UXOSO will coordinate any required response or evacuation actions with “Garcia Base”, the SUXOS and the Title II Contractors Safety Officer.

8.5 Emergency Response Procedures For Fires

- Immediately notify “Garcia Base” and the UXOSO.
- If the fire is not supplying heat to explosives, attempt to extinguish it.
- If the fire involves explosives or involvement is imminent, evacuate all personnel a minimum of 2,500 ft from the magazines.

8.6 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.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The team will be equipped with the following:

- Keys
- Locks
- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    1. Gloves(1)
    2. Boots/shoes
    3. Safety glasses

    Footnote (1) Optional, as applicable.
- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

ATTACHMENT A.
MAGAZINE INSPECTION CHECKLIST

This page is intentionally left blank.

MAGAZINE INSPECTION CHECKLIST

The Magazine inspection will address the following areas:

a. General Housekeeping. Are the magazines free of clutter such as empty boxes, trash etc? Is the magazine clean"

b. Fire Hazards. Inspect the magazines for combustible material.

c. Compatibility of Contents. Ensure the contents of the magazines are compatible.

d. Net Explosive Weight (NEW). Ensure the NEW of no magazine is exceeded.

e. Grounding System. Visually inspect the grounding system for obvious flaws such as loose grounding straps. The magazines will receive technical grounding inspection every 24 months.

f. Physical Condition. Inspect the physical conditions of the facilities for disrepair or deterioration.

g. Firebreaks and Fire Fighting Equipment. Ensure that vegetation is cut a minimum of 50 ft around the magazines. Inspect the fire extinguishers for serviceability.

h. Abnormal Odors. Note any abnormal odors present within the magazines.

i. Placards. Inspect the exterior fire symbols to ensure they are visible and in good repair. Ensure the safety information and explosive limits are posted within the magazines.

j. Tampering. Check for any evidence of tampering or of attempt to gain unauthorized entry.

This space is intentionally left blank.

This page is intentionally left blank.

ATTACHMENT B.
SAFETY REGULATIONS FOR THE HANDLING AND STORAGE OF EXPLOSIVES

This page is intentionally left blank.

THESE INSTRUCTIONS ARE NOT ALL INCLUSIVE AND OP 5 MUST BE CONSULTED FOR MORE DETAILED INSTRUCTIONS

Smoking is not permitted in magazines, vehicles or areas containing ammunition, explosives or other dangerous articles.
Minimize the number of personnel in the vicinity of ammunition/explosives.
Keep the magazines clean.
Do not carry any flame producing devices into the magazines.
Do not leave open containers in the magazine.
Only operations pertaining to storage and shipping are permitted in the magazines.
Observe HERO precautions when working in the vicinity of the magazines.
The two person rule applies for access to the magazines.
Never leave the magazine open and unattended.

This space is intentionally left blank.

This page is intentionally left blank.

ATTACHMENT C.
VEHICLE INSPECTION DD 626

This page is intentionally left blank.

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		9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*	YES / NO
b. VALID LEASE*		e. DRIVER'S VEHICLE INSPECTION REPORT*						a. TRUCK/TRACTOR	
c. ROUTE PLAN		f. COPY OF 49 CFR PART 397						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)*

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.

This page is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

DEMOLITION OPERATIONS

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- NOSSAINST 8023.11C, DON Standard Operating Procedures Development, Implementation, and Maintenance for Ammunition and Explosives
- USA Site Health and Safety Plan (SHSP)
- 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 6055.09-M, Edition 1, Defense Explosives Safety Regulation
- 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).
- USACE EM 385-1-1, Safety and Health Requirements Manual

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

This space is intentionally left blank.

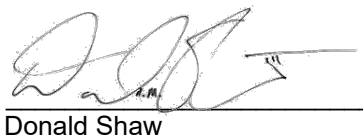
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

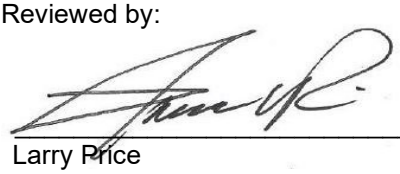
Developed by:



Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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).

8.2 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 2 of this SOP for additional compliance issues.

8.3 Responsibilities

8.3.1 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.

8.3.2 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.

8.3.3 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.

8.3.4 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 handling UXO/MEC, which has been exposed to the forces of 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.

8.4 Demolition Procedures Review

Before any disposal operations commence, all technicians assigned to or working with disposal teams will attend a site-specific orientation. The purpose of the orientation will be to review MEC disposal and emergency response procedures. The topics to be covered during the orientation will include, but are not limited to:

- SHSP
- Demolition SOP
- Demolition firing systems and components
- Disposal charge placement
- Explosives transportation
- Site ordnance briefing
- Engineering controls (protective measures for cultural features)
- Type and condition of MEC
- Emergency response equipment
- Emergency procedures
- Team assignments.

8.4.1 Weather and Environmental Considerations

- Prior to commencing disposal operations the SUXOS or UXOSO will obtain a local weather report.
- Disposal operations will not be conducted if electrical storms are within 10 miles of the disposal site or during severe weather conditions that would impact safety.
- 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 8.4).

8.4.2 Explosive Operations

Only qualified UXO technicians will dispose of MEC or MPPEH by open detonation. The following guidelines are provided.

- MEC/MPPEH items found requiring demolition/disposal that are deemed unacceptable to move will be disposed of using the blow-in-place (BIP) technique.
- MEC/MPPEH items that are deemed safe to move may be consolidated in a collection point on the site and detonated en masse.
- Explosive disposal operations will not be conducted without authorization from the SUXOS.

8.4.3 Initiation Systems

The firing system will use the Remote Firing Device (RFD) with electric blasting caps.

8.5 Pre/Post-Demolition/Disposal Procedures

8.5.1 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)
- Means of transporting and packaging MEC
- Route to the disposal site
- Equipment being used (i.e., galvanometer, RFD.)
- Misfire procedures
- Post-shot clean-up of range.

8.5.2 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.

8.5.3 Preparing Explosive Charge for Initiation

To prepare the explosive charge for initiation, the procedures listed below will be followed:

- Place demolition charge on UXO/MEC.
- Connect detonator to the RFD.
- Isolate or insulate all connections.
- Prime the demolition charge.
- Depart to firing point.
- Obtain a head count.

8.5.4 Initiation Sequence

- Announce on the radio that air-horn demolition warnings will follow.
- **Warning Signal.** Give a one minute warning signal, using the "Hornet" siren or vehicle horn, five minutes prior to detonation.
- Check the firing circuit.
- **Blast Signal.** A series of short audible signals on the "Hornet" siren or vehicle horn, (i.e. fire-in-the-hole like) one minute prior to the shot.
- Listen for the shot.
- Turn off RFD Transmitter.
- Remain in designated safe area until SUXOS announces the **"All Clear Signal."** This will occur after a post-shot waiting period of 5 minutes and the shot has been inspected by the SUXOS.

8.5.5 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.
- Make the proper notifications that the operation is complete

8.6 Engineering Controls

Engineering controls will be utilized in areas where there is a probability of encountering unauthorized personnel/trespassers. The use of engineering controls will be in accordance with the Department of Defense Explosives Safety Board (DDESB)-approved Explosives Safety Submission. The two engineering control options are soil coverage as calculated using the DDESB Buried Explosion Module, and the sandbag thickness information contained in the DDESB Fragmentation Database.

8.7 Electric Detonators

The following requirements are necessary when using electric detonators:

- 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.

  NOTE: Detonator wires will remain short circuited until time to connect them to the Remote Firing Device (RFD) Receiver.

- Prior to making connections to the RFD Transmitter, the entire firing circuit will be tested for electrical continuity and ohms resistance, or transmitting power (as applicable), to ensure the 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, IAW EM 385-1-1, Section 29.H.04 and OSHA 29 CFR 1926, Subpart U.

8.8 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. 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.
- .

8.9 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.

8.10 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 RFD transmitter, and make a second and third initiation attempt.
- If unsuccessful, commence a 30-minute wait period.
- After the maximum delay predicted for any part of the shot has passed, the SUXOS and 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 RFD, check the replacement detonator for continuity, and prime the charge without disturbing the original detonator.
- Follow normal procedures for effecting initiation of the charge.

8.11 Detonating Cord Misfire

USA uses detonating cord to tie in multiple demolition shots, and to ensure that detonators are not buried. Detonation cord initiation will be electrical. 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 8.9.
- 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.

8.12 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.

8.13 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 ESS.
- The quantity of MEC to be destroyed will be determined by the range limit, fragmentation and K-Factor distance calculations located in the approved ESS.
- In the event of an electrical storm, dust storm, or other hazardous meteorological conditions, immediate action will be taken to cease all demolition 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, the WP and the approved ESS.

- 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 located in the vehicle and be positioned outside the vehicle when loading operations are taking place, and one Class 10B:C fire extinguisher will be located inside the cab on the driver’s side.
- 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.
- 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.
- 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.
- Warning signals prior to demolition events will be completed IAW EM 385-1-1, Section 29.H.04 and OSHA 29 CFR 1926, Subpart U.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the MPPEH holding area prior to commencing any MPPEH Management or Disposal activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The team will be equipped with the following:

- Explosives, as required
- Placards, as required
- Day box, as required
- Remote Firing Device, as required
- Tarps, as required
- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    1. Coveralls(1)
    2. Gloves
    3. Boots/shoes, safety-toe and shank

4. Safety glasses
5. Hard hat(1)

Footnote (1) Optional, as applicable.

- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

This page is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

MPPEH AND MDAS MANAGEMENT

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
12/06/2019		1, 3, 7, 9, 11, 13, 14, 15, 16, 21-24	1. 2. 4. (List of Attachments) 5. 6. 8.3, Figure 1 8.3.1.2.1, 8.3.1.2.3, 8.3.2, Attachment A	Changes made based on Corrective Actions after completing the Root Cause Analysis post-incident on 08 Nov 19. Administrative change to update signatories; minor typing and mechanical/editorial corrections)

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- 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
- DDESB TP-16, Methodology for Calculation of Fragmentation Characteristics
- DoD 4160.21-M, Defense Reutilization and Marketing Manual
- DoD Directive 4145.26-M DoD Contractor Safety Manual for Ammunition and Explosives
- DoD Instruction 4140.62 Material Potentially Presenting an Explosive Hazard
- DOT, 49 CFR, Parts 100 to 199, Transportation (applicable sections)
- EPA, 40 CFR Parts 260 to 299, Protection of Environment (applicable sections)
- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Explosives Safety Submission (ESS) – current version
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards – current version
- Chief of Naval Operations Instruction (OPNAVINST) 3500.39 – current version
- NAVSEA OP 5 Ammunition and Explosives Safety Ashore. – current version
- United States Army Corps of Engineers (USACE), Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual – current version
- DDESB TB 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel – current version
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DESR 6055.09, Edition 1, Defense Explosives Safety Regulation
- DOD 4160.21-M, Defense Reutilization and Marketing Manual
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives.

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ATTACHMENTS

This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

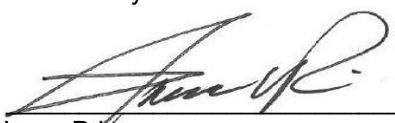
(Signature to be provided in Final SOP)

Developed by:

Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date:

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

This SOP expires 4 years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURE

8.1 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 Material Potentially Presenting an Explosive Hazard (MPPEH) Management operations at sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC).

These procedures are to 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 recycling. 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 on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD). Documentation is key to the safe management of MPPEH.

8.2 SCOPE

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in MPPEH Management operations on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 3.0 of this SOP for additional guidance.

8.3 INSPECTION PROCESS

All personnel, including contractor and subcontractor personnel involved in processing MPPEH removed from the project site, will familiarize themselves with the procedures outlined in the following paragraphs and subparagraphs.

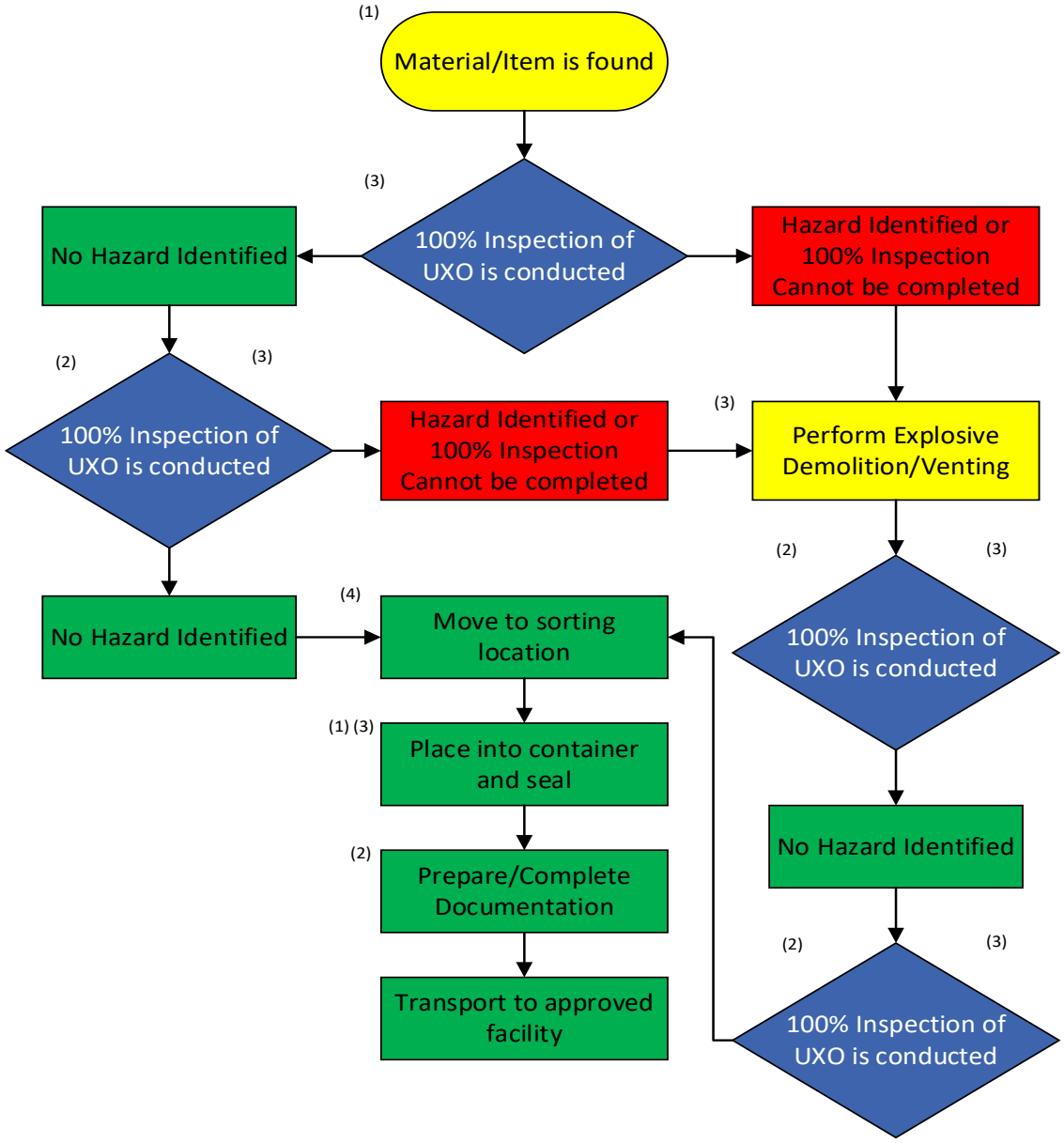
All recovered MPPEH items will undergo a 100% inspection and an independent 100% re-inspection to determine and document whether it is safe (MDAS) or whether it is known to have or is suspected of having an explosive hazard. The sequence of events in the inspection process is summarized in English in Figure 1; in addition, a Spanish copy is provided herein in Attachment A. A Material Inspection and Release Form (Attachment B) will be completed to document the two 100% inspections performed on all recovered materials.

8.3.1 Responsibilities

8.3.1.1 Unexploded Ordnance Tech II (UXOT II)

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 item is range related debris that may require draining fluids or removal of visible liquid hazardous, toxic or radiological waste (HTRW) materials.



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 results for accuracy/ completeness.
(3) The UXOSO will observe procedures to ensure compliance with the approved plans and safety measures.
(4) The UXOSO will perform random checks to ensure the munitions debris and range-related debris is from energetic/ explosive material.

Figure 1: MPPEH Inspection Process

8.3.1.2 Unexploded Ordnance Tech III (UXOT III)

A UXOTIII will:

- Conduct a 100% re-inspection of all recovered items to determine the proper classification as MDAS, or an item containing other dangerous fillers or HTRW constituents.
- Supervise the segregation of items by category to ensure no co-mingling of MDAS or HTRW items.

8.3.1.2.1 MPPEH/CPC Recovery Team

The Recovery Team will:

- Respond to MPPEH/MDAS consolidation areas, as directed by the SUXOS for collection of material
- Inspect all items not in sealed containers before placing them into transport vehicle
- Inspect all containers for seals or padlocks to ensure chain of custody has not been broken
- Determine separation requirements of material recovered. (i.e., scrap that resembles ordnance, sorting by metal types, MPPEH requiring processing, etc.)
- Deliver all scrap to appropriate CPC staging area, and secure to prevent commingling with inspected and certified scrap awaiting storage and/or shipment at the CPC.

8.3.1.2.2 UXO Quality Control Specialist (UXOQCS)

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 and HTRW items to ensure no co-mingling occurs
- Perform these random checks to satisfy that MPPEH is free from any explosive hazards, necessary for completion of the Issue Release/Receipt Document, Form DD 1348-1A (see Attachment C).

8.3.1.2.3 UXO Site Safety Officer (UXOSO)

The UXOSO will:

- Ensure that the specific procedures and responsibilities for processing MPPEH for certification as MDAS or range-related debris outlined in the WP and this SOP are being followed
- Confirm that operations are compliant with the SSHP, and are consistent with applicable regulations and guidance as outlined in the WP and this SOP
- Perform random checks of processed MPPEH to ensure that items being identified as scrap are free from any explosive hazards.

8.3.1.2.4 Senior UXO Supervisor (SUXOS)

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 C)
- 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 –

  "The material listed on this form has been inspected or processes by DDESB approved means, as required by DOD policy, and to the best of my knowledge and belief does not pose an explosive hazard."

- Ensure that inspected debris is secured in sealed and labeled containers.

8.3.2 MDAS Containerization

MDAS is placed in closed containers that will be sequentially numbered 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 D for detailed requirements for completing the label)

Cartridge and flare cases, fuzes, primers, boosters, practice ordnance, and small pieces/fragments from all types of high explosive ordnance and other similar items DO NOT require individual marking. These items will be inspected, placed in sealable containers, and have the appropriate seal or similar locking device attached. When large amounts of residue are generated, steel hoppers may be used, provided the hopper has a lid/cover that can be secured and sealed or padlocked after inspection.

Any evidence of tampering after sealing or padlocking will require that a 100% re-inspection and 100% re-certification inspection is performed.

Where quantities permit, the contents will be separated by base metal type (e.g., copper, aluminum, steel, etc.), and tagged, or marked, to identify contents. Large MDAS that cannot be containerized or palletized will be individually inspected and marked similarly. Each will be painted with the letters "MDAS" and tagged with a "railroad seal" or similar device having a serial number. Items with no markings or seals will be treated as MPPEH.

8.3.3 MDAS Certification and Verification

USA, as the contractor, will ensure that scrap metal generated from MEC or Range Clearance Activities is properly inspected IAW the procedures outlined in the WP's, this SOP and OP 5. Only personnel who are qualified UXO personnel (UXOTIII) per DDESB TP-18 will perform these inspections. Once the initial inspection has been completed by the UXOTIII, the SUXOS will verify, and the UXOQCS or the Title II QA UXOTIII will certify, that the processed material is free of explosive hazards and is classified as MDAS.

Form DD 1348-1A will be used as certification/verification documentation. All DD 1348-1A's must clearly show the signatures and typed or printed names of the SUXOS or Team Leader and the UXOQCS or Title II QA UXOTIII, their organizations, the home office addresses, and the field office telephone numbers.

- Local directives and agreements may supplement these procedures. Coordination with local concerns will identify any desired or requested supplementation to these procedures.
- In addition to the data elements required, and any locally agreed-to directives, the DD 1348-1A must clearly indicate the following for scrap metal:
  - Basic material content (type of metal, e.g., steel or mixed)
  - Estimated weight
  - Unique container identification (i.e.; drum 001 with sequential numbering as needed)

  - Installation and Contractors Name
  - Seal's unique identification number, if different from the unique identification of the sealed container
  - Names, addresses, and contact information of Certifying and Verifying individuals
- The container shall be closed and clearly labeled on the outside.
- The container will be closed in such a manner that the seal must be broken in order to re-open the container. The seal will bear the same unique identification as the container; or the container will be clearly marked with the seal's identification, if different than the container.
- The following certification/verification will be entered on each DD 1348-1A for turnover of inspected material, and will be signed by the SUXOS or Team Leader and the UXOQCS or Title II QA, UXOTIII:

8.3.4 Demilitarization

When required by DoD 4160.21-M-1, or the PWS where this directive is not applicable, MPPEH will be demilitarized before being released from USA custody, by means other than donor explosives. The purpose of demilitarization is to render the item unusable and/or unrecognizable as a military item. While explosives or mechanical means can be used at the SUXOS discretion to demilitarize an item, USA may also utilize a cutting torch as an acceptable method of demilitarization after a thorough inspection has been performed and an approval process with supporting documentation is completed. In the event that a cutting torch is utilized the procedures in the "Hot Work" SOP will be followed.

8.3.5 Maintaining 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 properly recycled.

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.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The MDAS Management team will be equipped with the following:

- MDAS containers (e.g., 55-gallon drums)
- Signs
- Locks
- Container handling equipment as required
- Individually Numbered Seals
- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    1. Gloves(1)
    2. Boots/shoes

3. Safety glasses
4. Hard hat(1)

Footnote (1) Optional, as applicable.

- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital.

A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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.

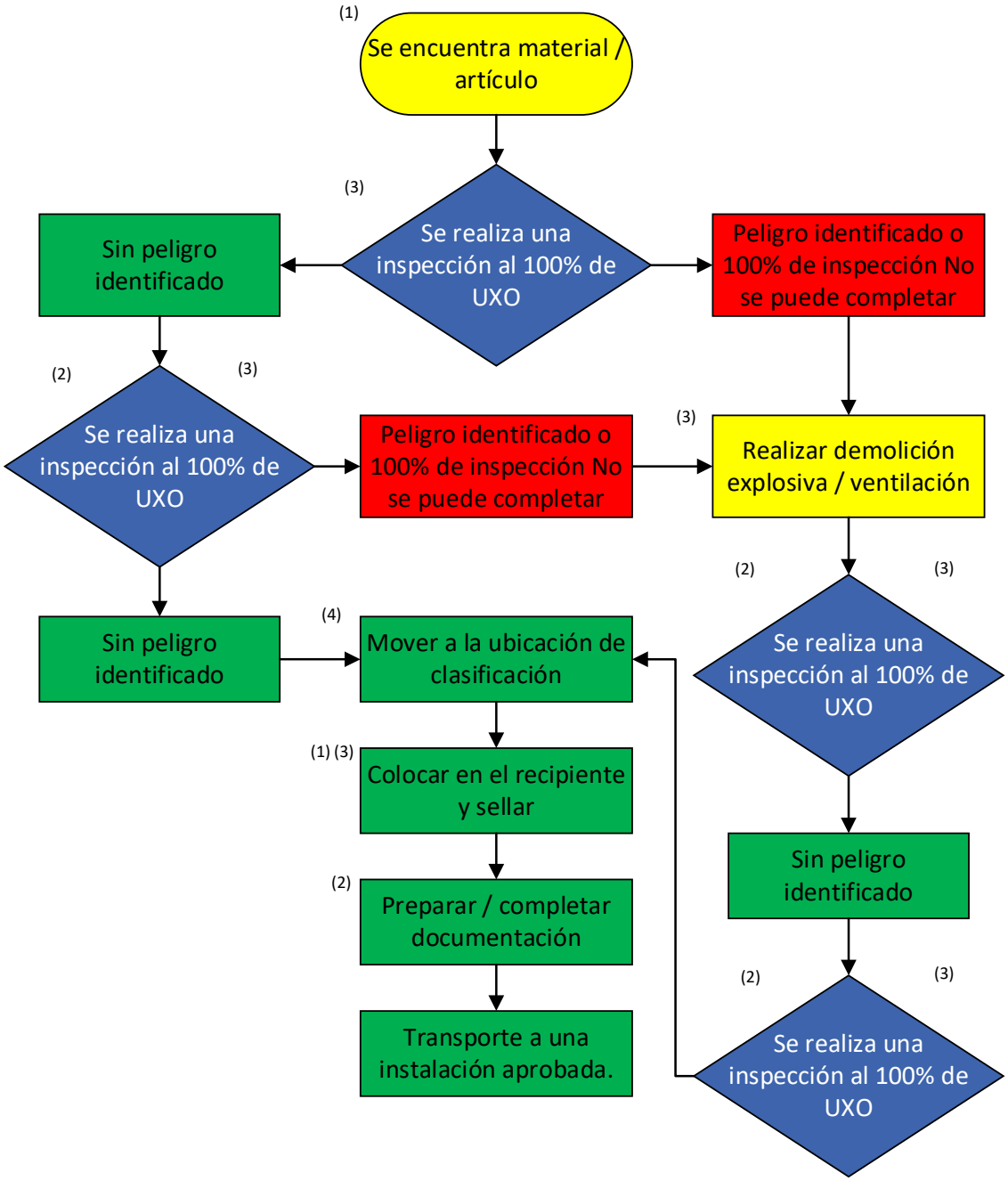
After the emergency situation has been controlled and eliminated, or has passed the Project Manager, UXOSO, and SUXOS will review the emergency response and change procedures if necessary.

This space is intentionally left blank.

This page is intentionally left blank.

ATTACHMENT A.
MATERIAL POTENTIALLY PRESENTING AN EXPLOSIVE HAZARD INSPECTION PROCESS (SPANISH)

This page is intentionally left blank.



Notas:
Durante la ejecución de los pasos dentro de MPPEH Inspection Processus, las Notas 1-4 a continuación se utilizan para garantizar que se cumplan los requisitos de supervisión y cumplimiento.
(1) El UXOQCS realizará auditorías diarias de los procedimientos utilizados por los equipos de UXO para el procesamiento de MPPEH.
(2) El UXOQCS realizará un muestreo aleatorio de los materiales / artículos recuperados y los resultados de los documentos para mayor precisión / integridad.
(3) El UXOSO observará procedimientos para garantizar el cumplimiento de los planes y medidas de seguridad aprobados.
(4) El UXOSO realizará comprobaciones aleatorias para garantizar que los restos de municiones y los restos relacionados con el alcance procedan de material energético / explosivo.

This page is intentionally left blank.

ATTACHMENT B.
MATERIAL INSPECTION AND RELEASE FORM

This page is intentionally left blank.

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: _____

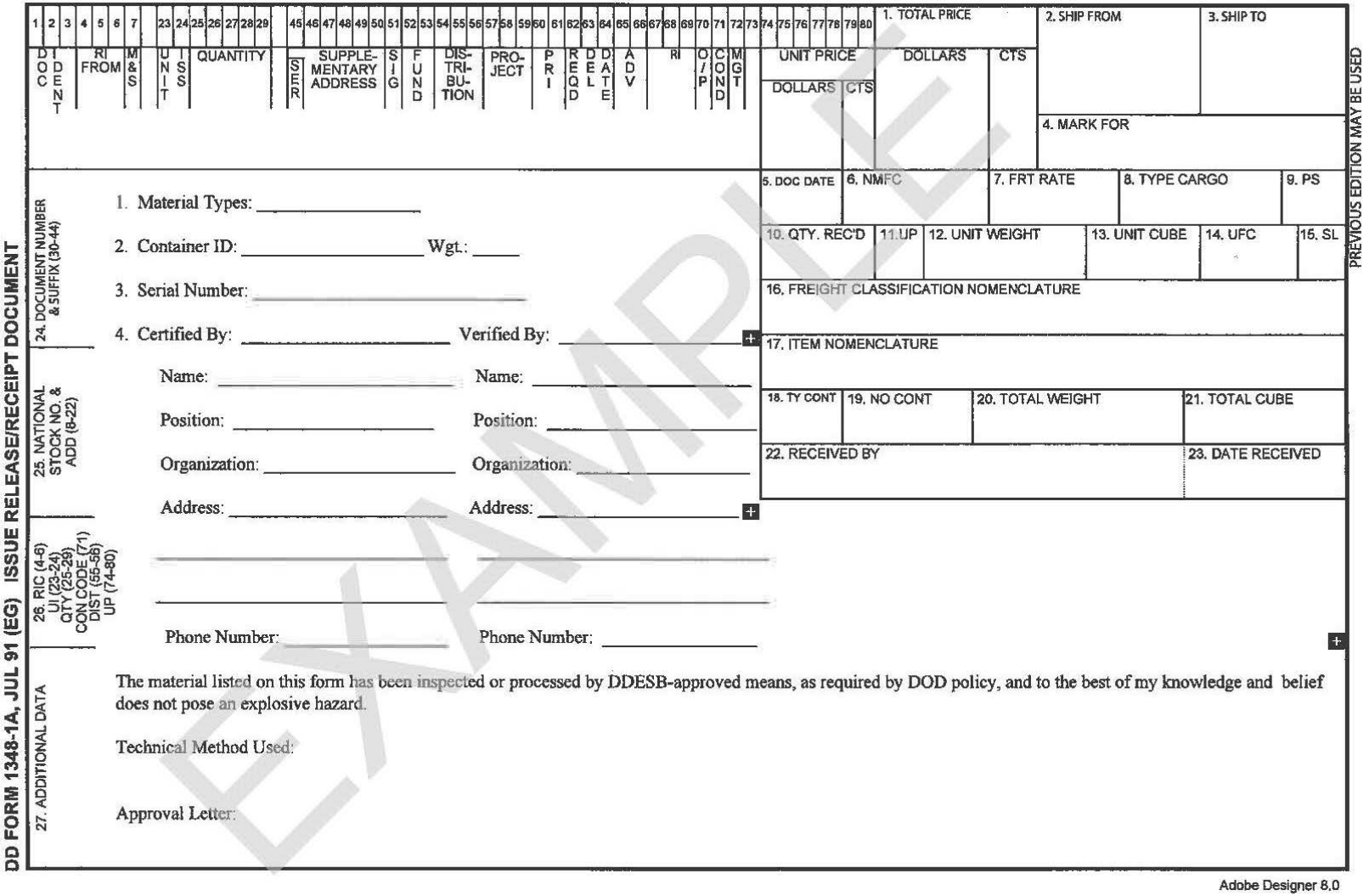
082 USA FORM
Rev. A: July 2015

MATERIAL INSPECTION AND RELEASE FORM

This page is intentionally left blank.

ATTACHMENT C.
DD FORM 1348-1A EXAMPLE

This page is intentionally left blank.


DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 2 3 | DOC IDENT | 4 5 6 RI FROM | 7 M&S | 23 24 UNIT | 25 26 27 28 29 ISS QUANTITY | 45 46 47 48 49 50 SER SUPPLEMENTARY ADDRESS | 51 SIG | 52 53 FUND | 54 55 56 DISTRIBUTION | 57 58 59 PROJECT | 60 PRI | 61 62 REQD | 63 64 DEL DATE | 65 66 ADV | 67 68 69 RI | 70 O/P | 71 72 COND | 73 MGT | 74 75 76 77 78 79 80 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)

25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

1. Material Types: _____

2. Container ID: _____ Wgt.: _____

3. Serial Number: _____

4. Certified By: _____ Verified By: _____

Name: _____ Name: _____

Position: _____ Position: _____

Organization: _____ Organization: _____

Address: _____ Address: _____

Phone Number: _____ Phone Number: _____

27. ADDITIONAL DATA

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.

Technical Method Used:

Approval Letter:

EXAMPLE

Adobe Designer 8.0

DD Form 1348-1A

This page is intentionally left blank.

ATTACHMENT D.
NON-HAZARDOUS WASTE (CONTAINER LABEL)

This page is intentionally left blank.

USA Environmental, Inc.

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:

NAVFAC IDENTIFIER / INSTALLATION NAME OR CONTRACT #:

UNIQUE CONTAINER # (i.e., 001 of 001): **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, as applicable. Check box(s) if DD Form 1348-1A and/or the 100% Inspection Form will accompany this shipment.

COMPANY CONTACT INFORMATION:

USA Environmental, Inc.
720 Brooker Creek Blvd., Suite 204
Oldsmar, FL. 34677
Office - (813) 343-6336
Fax – (813) 343-6337

096 USA Form
Original: April 2015

CONTAINER LABEL

This page is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

HOT WORK OPERATIONS

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

January 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8023.11 – current version
- Explosives Safety Submission (ESS) – current version
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards – current version
- Chief of Naval Operations Instruction (OPNAVINST) 3500.39 – current version
- NAVSEA OP 5 Ammunition and Explosives Safety Ashore. – current version
- United States Army Corps of Engineers (USACE), Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual – current version
- DDESB TB 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel – current version
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.09-M, Edition 1, Defense Explosives Safety Regulation
- DOD 4160.21-M, Defense Reutilization and Marketing Manual
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- Operations Manual(s) and Manufacturer’s Publications

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

This space is intentionally left blank.

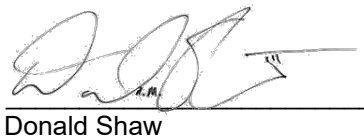
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This standard operating procedure (SOP) contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

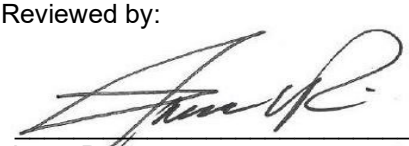
Developed by:



Donald Shaw
Project Manager

01/03/2020
Date

Reviewed by:



Larry Price
Vieques Senior UXO Supervisor

01/03/2020
Date

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

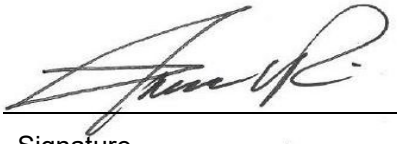
Date

This SOP expires four years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		01/03/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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 Hot Work operations at sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC).

8.2 Scope

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in Hot Work operations on the former Vieques Naval Training Range (VNTR) and former Naval Ammunition Support Detachment (NASD) project related areas. This SOP is not a stand-alone document and should be used together with Work Plans, other USA SOPs, the Site Health and Safety Plan (SHSP), the Explosives Safety Submission (ESS), applicable Federal, State, local regulations. Consult the documents listed in Section 3.0 of this SOP for additional guidance.

8.3 Responsibilities

8.3.1 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.

8.3.2 Senior UXO Supervisor

The Senior UXO Supervisor (SUXOS) will ensure that this SOP is implemented for welding, torch cutting or other hot work 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 properly recorded in appropriate site documentation.

8.3.3 UXO Technician III

The UXO Supervisor (UXOTIII) will be responsible for the field implementation of this SOP, and for implementing the safety and health requirements outlined in this SOP. In the absence of a SUXOS, the UXOTIII will be responsible for implementing the SUXOS's responsibilities, outlined in Paragraph 8.3.2.

8.3.4 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.

8.4 Procedures

8.4.1 Prepare Work Area for Hot Work Activities

Welding, torch cutting or other hot work will not take place until all safety precautions have been met. The area surrounding the operations and the actual material to be welded and/or cut will be inspected for ignition sources. One person will be designated as "fire watch" during all cutting and burning operations, and the work area will be secured with ropes or barricades prior to cutting and burning activities. All site personnel

will be notified of the location and time of hot work operations. A Hot Work permit will be completed by the USA UXOSO prior to cutting and burning of any material.

8.4.2 Equipment Inspection and Use

All equipment used for welding, torch cutting or other hot work operations will be thoroughly inspected prior to start-up. This inspection will be documented in the applicable site operational or safety log by the UXOTIII and/or UXOSO.

8.5 Safety Hazards and Operational Control Techniques

8.5.1 General Procedures

All welders/cutters and their supervisors will be trained in the safe operation of welding/cutting equipment, safe welding/cutting procedures, and respiratory and fire protection. Additionally, the following will be conducted:

- All welding/cutting equipment will be inspected prior to use
- Personnel in the affected area will be protected from welding rays, flashes, sparks, molten metal, and slag
- All welding/cutting equipment and operations will be in accordance with (IAW) the standards and recommended practices found in ANSI Z49.1
- Respiratory protection will be supplied if welding/cutting involves hazardous metals such as antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, ozone, selenium, silver, or vanadium
- Suitable fire protection and fire watch procedures will be implemented to protect the welder/cutter, property, and site personnel
- Welders/cutters will be provided with applicable PPE to ensure their protection from heat, fire, slag, molten metal, and welding ray/flash hazards.

8.6 General Requirements for Gas Cylinders

When gas cylinders are used on-site, the following general provisions will be met:

- Cylinders, whether full or empty, will not be used as rollers or supports.
- No individual other than the gas supplier will attempt to mix gases in a cylinder; no one except the owner of the cylinder will refill a cylinder; and no one will use a cylinder's contents for purposes other than those intended by the supplier.
- All cylinders used will meet the Department of Transportation requirements published in 49 CFR Part 178, Subpart C, Specification for Cylinders.
- No damaged, defective or leaking cylinders will be used.
- Only cylinders with current hydrostatic test dates will be allowed in the work area. Cylinders without current test dates will be returned to the supplier.

8.6.1 Handling and Storing Gas Cylinders

Compressed gas cylinders will be handled and stored according to the following:

- Valve protection caps will be in place and secured.
- When cylinders are hoisted, they will be secured on a cradle, sling board, or pallet.
- They will not be hoisted or transported by means of magnets or choker slings, and will never be lifted by the protective cap.

- Cylinders will be moved by tilting and rolling them on their bottom edges; they will not be intentionally dropped, struck, or permitted to strike each other violently.
- When cylinders are transported by vehicle, they will be secured in a vertical position.
- Bars will not be used under valves or valve protection caps to pry cylinders loose when frozen; very warm, not boiling, water will be used to thaw cylinders loose.
- Unless cylinders are firmly secured on a special carrier intended for this purpose, regulators will be removed and valve caps put in place before cylinders are moved.
- A suitable cylinder truck, chain, or other securing device, will be used to keep cylinders from falling or being knocked over while in use.
- When work is finished, if cylinders are moved at any time, or cylinders are empty, the cylinder valve will be closed, the cutting/welding hose/regulator assembly will be removed, and the valve cap replaced securely.
- Compressed gas cylinders will be secured in an upright position at all times except, if necessary, for short periods of time while cylinders are actually being hoisted or carried.

8.6.2 Placing Cylinders

Compressed gas cylinders will be placed in accordance with the following:

- Cylinders will be stored in a cool, dry, well protected location at least 20 feet from highly combustible materials.
- The storage area must be well marked, with “NO SMOKING” signs posted in the immediate vicinity.
- Cylinders will be kept far enough away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them or, if this is impractical, fire-resistant shields will be utilized to protect the cylinders and hose/regulator assemblies.
- Cylinders will be placed where they cannot become part of an electrical circuit, and electrodes will not be struck against a cylinder to strike an arc.
- Fuel gas cylinders will be placed with valve end up whenever they are in use. They will not be placed in a location where they would be subject to open flame, hot metal, or other sources of artificial heat.
- Cylinders containing oxygen, acetylene, or other fuel gas will not be taken into confined spaces.
- Oxygen cylinders in storage will be separated from fuel cylinders or other combustibles (especially oil and grease) by a distance of at least 20 feet, or by a non-combustible fire barrier of at least five feet in height, with a fire rating of at least one hour.

8.6.3 Fuel Gas

Before a regulator is connected to a cylinder valve, the valve will be opened slightly and closed immediately. (This action is generally termed "cracking", and is intended to clear the valve of dust or dirt that might otherwise enter the regulator.) The person cracking the valve will stand to one side of the outlet, not in front of it. The valve of a fuel gas cylinder will not be cracked where the gas would reach welding work, sparks, flame, or other possible sources of ignition.

The cylinder valve will always be opened slowly, to prevent damage to the regulator. To facilitate quick closing, valves on fuel gas cylinders will not be opened more than 12 turns. When a special wrench is required, it will be left in position on the stem of the valve while the cylinder is in use, so that the fuel gas flow can be shut off quickly in case of emergency. In the case of coupled cylinders, at least one wrench for uncoupling will always be available for immediate use. Nothing will be placed on top of a fuel gas cylinder that may damage the safety device or interfere with the quick closing of the valve.

Fuel gas will not be used through torches or other devices equipped with shutoff valves without the cylinder or manifold being attached to a pressure-reducing regulator. Before a regulator is removed from a cylinder valve, the cylinder valve will be closed and the gas released from the regulator. If a leak is found around the valve stem when the valve on a fuel gas cylinder is opened, the valve will be closed and the gland nut tightened. If this action does not stop the leak, the use of the cylinder will be discontinued, and it will be properly tagged and removed from the work area. In the event that fuel gas leaks from the valve stem and the gas cannot be shut off, the cylinder will be properly tagged and removed from the work area. If a regulator attached to a cylinder valve will effectively stop a leak through the valve seat, the cylinder need not be removed from the work area. If a leak develops at a fuse plug or other safety device, the cylinder will be removed from the work area.

8.6.4 Fuel Gas and Oxygen Manifolds

Fuel gas and oxygen manifolds will be used according to the following:

- Fuel gas and oxygen manifolds will bear the name of the substance they contain in letters at least 1-inch high which will be either painted on the manifold or put on a sign and permanently attached to it.
- Fuel gas and oxygen manifolds will be placed in safe, well-ventilated, and accessible locations, and they will not be located within enclosed spaces.
- Manifold hose connections, including both ends of the supply hose that lead to the manifold, will be such that the hose cannot be interchanged between fuel gas or oxygen manifolds and supply header connections.
- Adapters will not be used to permit the interchange of hoses.
- Hose connections will be kept free of grease and oil.
- When not in use, manifold and header hose connections will be capped.
- Nothing will be placed on top of a manifold that will damage the manifold or interfere with the quick closing of the valves.

8.6.5 Hoses

Fuel gas and oxygen hoses will be easily distinguished from each other. The contrast may be made by different colors or by surface characteristics readily distinguishable by touch. Oxygen and fuel gas hoses will not be interchangeable. A single hose having more than one gas passage will not be used. When parallel sections of oxygen and fuel gas hose are taped together, not more than 4 out of 12 inches will be covered by tape.

All hoses carrying acetylene, oxygen, natural or manufactured fuel gas, or any gas or substance which may ignite or enter into combustion, or be harmful to employees, will be inspected at the beginning of each working shift. Defective hose will be removed from service. Additionally, hose which has been subject to flashback, or which shows evidence of severe wear or damage, will be tested to twice the normal pressure to which it is subject, but in no case less than 300 psi. Defective hose, or hose in doubtful condition, will not be used.

Hose couplings will be the type that cannot be unlocked or disconnected by means of a straight pull without rotary motion. Boxes used for the storage of gas hose will be ventilated, and hoses, cables, and other equipment will be kept clear of passageways, ladders, and stairs.

8.6.6 Torches

Torches used for cutting or welding will be used and maintained in accordance with the following provisions:

- Clogged torch tip openings will be cleaned with suitable cleaning wires, drills, or other devices designed for such purpose.

- Torches in use will be inspected, at the beginning of each working shift, for leaking shutoff valves, hose couplings, and tip connections. Defective torches will not be used.
- Torches will be lighted by friction lighters or other approved devices, and not by matches or from hot work.

8.6.7 Regulators and Gauges

Oxygen and fuel gas pressure regulators, including their related gauges, will be in proper working order while in use.

8.6.8 Oil and Grease Hazards

Oxygen cylinders and fittings will be kept away from oil or grease. Cylinders, cylinder caps and valves, couplings, regulators, hose, and apparatus will be kept free from oil or greasy substances, and will not be handled with oily hands or gloves. Oxygen will not be directed at oily surfaces, greasy clothes, or within a fuel oil or other storage tank or vessel.

8.7 ARC WELDING

Personnel will be instructed in the safe operation of arc welders. Arc welders will be used and maintained in accordance with the following:

8.7.1 Operating Instructions

- When electrode holders are to be left unattended, the electrodes will be removed and the holders protected, or placed, so that they cannot make electrical contact with personnel or conducting objects.
- Hot electrode holders will not be dipped in water as this may expose the operator to electric shock.
- When the operator has occasion to leave the area or to stop work for any appreciable length of time, or when the arc welding or cutting machine is to be moved, the power supply switch to the equipment will be opened.
- Any faulty or defective equipment will be reported to the supervisor.

8.7.2 Manual Electrode Holders

- Only manual electrode holders that are specifically designed for arc welding and cutting, and are of a capacity capable of safely handling the maximum-rated current required by the electrodes, will be used.
- Any current-carrying parts passing through the handle that is held by either the welder or cutter will be ground by fully insulating against the maximum voltage encountered.

8.7.3 Welding Cables and Connectors

- All arc welding and cutting cables will be of the completely insulated, flexible type, capable of handling the maximum current requirements of the work in progress, taking into account the duty cycle under which the arc welder or cutter is working.
- Only cable free from repair or splices for a minimum distance of 10 feet from the cable end to which the electrode holder is connected will be used, except those cables with standard insulated connectors, or with splices whose insulating quality is equal to that of the cable, which are permitted.
- When it becomes necessary to connect or splice lengths of cable to one another, insulated connectors with a capacity equivalent to that of the cable will be used.

- If connections are affected by cable lugs, they will be securely fastened together to give good electrical contact, and the exposed metal parts of the lugs will be completely insulated.
- Cables in need of repair will not be used. When a cable, other than the cable lead referred to above, becomes worn to the extent of exposing bare conductors, the portion exposed will be protected by means of rubber and friction tape, or other equivalent insulation.

8.7.4 Ground Returns and Machine Grounding

- A ground return cable will have a safe current-carrying capacity equal to or exceeding the specified maximum output capacity of the arc welding or cutting unit which it services.
- When a single-ground-return cable services more than one unit, its safe current-carrying capacity will equal, or exceed, the total specified maximum output capacities of all the units that it services.
- When a structure or pipeline is employed as a ground return circuit, it will be determined that the required electrical contact exists at all joints.
- The generation of an arc, sparks, or heat at any point will cause rejection of the structures as a ground circuit.
- When a structure or pipeline is continuously employed as a ground return circuit, all joints will be bonded and periodic inspections will be conducted to ensure that no electrolysis or fire hazard condition exists.
- The frames of all arc welding and cutting machines will be grounded, either through a third wire in the cable containing the circuit conductor, or through a separate wire which is grounded at the source of the current.
- Grounding circuits, other than the structure, will be checked to ensure that the circuit between the ground and the grounded power conductor has resistance low enough to permit sufficient current flow to cause the fuse or circuit breaker to interrupt the current.,
- All ground connections will be inspected to ensure that they are mechanically strong and electrically adequate for the required current.

8.7.5 Shielding

Whenever practicable, all arc welding and cutting operations will be shielded by noncombustible or flameproof screens, which will protect personnel from the direct rays of the arc.

8.8 Fire Prevention

When practical, objects to be welded, cut, or heated will be moved to a designated safe location. If the objects cannot be readily moved, all movable fire hazards in the vicinity will be taken to a safe place, or otherwise protected. Additionally, the following safety precautions will be followed:

- If the object to be welded, cut, or heated cannot be moved, and if all the fire hazards cannot be removed, positive means will be taken to confine the heat, sparks, and slag, and to protect the immovable fire hazards from them.
- No welding, cutting, or heating will be done where the application of flammable paints, presence of other flammable compounds, or heavy dust concentration, creates a hazard.
- Suitable fire extinguishing equipment will be immediately available in the work area and will be maintained in a state of readiness for instant use.
- Fire watchers will be required whenever welding/cutting is performed in a location or under conditions where other than a minor fire could develop, or when any of the following conditions exist:
  - Appreciable combustible materials are closer than 35 feet to the welding/cutting operation

  - Appreciable combustible materials are further than 35 feet from the welding/cutting operation, but are easily ignited by sparks
  - Wall or floor openings within 35 feet of the welding/cutting operation expose combustible materials in the adjacent areas to the potential for fire
  - Combustible materials are located adjacent to metal partitions, which could be ignited by conduction or radiation of heat.
- Fire watchers will have adequate and proper firefighting equipment readily available and be trained in the use of that equipment and the fire alarm notification system.
- Fire watchers will also be required to maintain their watch for 30 minutes after welding/cutting operations have ceased.
- Since direct penetration of sparks or heat transfer may introduce a fire hazard to an adjacent area when welding, cutting, or heating is performed on walls, floors, and ceilings, the same precautions will be taken on the opposite side as are taken on the side on which the welding is being performed.
- To eliminate the potential for fire. in an enclosed space. resulting from gas escaping through leaking or improperly closed torch valves, the gas supply to the torch will be positively shut off at some point outside the enclosed space, and the hose will be removed from the space whenever;
  - The torch is not to be used,
  - The torch is left unattended for a substantial period of time, such as during the lunch period
  - At the end of the work day.
- Open-end fuel gas and oxygen hoses will be immediately removed from enclosed spaces when they are disconnected from the torch or other gas-consuming device.
- Except when the contents are being removed or transferred, drums, pails, and other containers which contain or have contained flammable liquids. will be kept closed. Empty containers will be removed to a safe area away from hot work operations or open flames.
- Drums, containers, or hollow structures which have contained toxic or flammable substances, will either be filled with water or thoroughly cleaned of such substances. They will be ventilated, and tested before welding, cutting, or heating is undertaken on them.
- Before heat is applied to a drum, container, or hollow structure, a vent or opening will be provided for the release of any built-up pressure during the application of heat.

8.9 Ventilation for Welding, Cutting And Heating

8.9.1 Mechanical Ventilation

Mechanical ventilation will be provided for welding operations when the area contains less than 10,000 cubic feet of space per welder, the ceiling height is less than 16 feet, or structural barriers significantly prevent cross-ventilation. When mechanical ventilation is required, the air flow rate will be 2,000 cubic feet per minute, per welder, or 100 linear feet per minute across each welder's breathing zone. For purposes of this section, mechanical ventilation will meet the following requirements:

- Mechanical ventilation will consist of either general mechanical ventilation systems or local exhaust systems.
- General mechanical ventilation will be of sufficient capacity and so arranged as to produce the number of air changes necessary to maintain welding fumes and smoke exposures below the limits defined in the Z-tables in 29 CFR 1910.1000.
- Local exhaust ventilation will consist of freely movable hoods placed by the operator as close as practicable to the work. This system will be of sufficient capacity and so arranged as to remove fumes and smoke at the source to keep the fume/smoke concentration within safe limits, as defined in Subpart D, 29 CFR 1926.

- Contaminated air exhausted from a working space will be discharged into the open air or, otherwise clear of the source of intake air.
- All air replacing that is withdrawn will be clean and respirable.
- Oxygen will not be used for ventilation purposes, comfort cooling, blowing dust from clothing, or for cleaning the work area.

8.9.2 Ventilation for Welding, Cutting, and Heating in Confined Spaces

Except as provided for above, either general mechanical or local exhaust ventilation meeting the requirements of this section will be provided whenever welding, cutting, or heating is performed in a confined space.

When sufficient ventilation cannot be obtained without blocking the means of egress, personnel in the confined space will be protected by air line respirators, and an individual will be stationed outside the confined space to communicate with and aid those working inside the space.

8.9.3 Ventilation for Welding, Cutting, or Heating of Metals of Toxic Significance

Welding, cutting, or heating in any enclosed spaces involving the metals specified in this subparagraph will be performed with either general mechanical or local exhaust ventilation meeting the requirements listed above.

- Zinc-bearing base or filler metals, or metals coated with zinc-bearing materials
- Lead base metals
- Cadmium-bearing filler materials
- Chromium-bearing metals, or metals coated with chromium-bearing materials

Personnel performing such operations in the open air will be protected by filter-type respirators IAW the requirements of Subpart E, 29 CFR 1926, except that employees performing such operations on beryllium-containing base or filler metals will be protected by air line respirators. Other personnel exposed to the same atmosphere as the welders or burners will be protected in the same manner as the welder or burner.

8.10 Personal Protective Equipment Requirements

The following personal protective equipment will be used in preventing or reducing exposures associated with welding and cutting operations. These requirements will be implemented, unless superseded by the site-specific requirements stated in the Site Safety and Health Plan.

- Welding hoods with appropriate shades
- Leather, composite-toed boots
- Protective clothing, such as leather welding gloves and aprons
- Hard hat
- Respiratory protection will be supplied if welding/cutting involves hazardous metals

8.11 Audit Criteria

The following items related to site compliance with this SOP will be maintained in site records and subject to audit:

- UXOTIII Daily Operational Log
- Daily Tailgate Safety Briefing
- UXOSO Daily Safety Inspection Log

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 Hazard Control Brief

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The team will be equipped with the following:

- Welding Torches
- Welding Cables and Connectors
- Gas Cylinders
- Manifolds
- Hoses
- Regulators
- Gauges

- Electrode Holders
- Shielding/Screens
- Signs
- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Communications equipment

The required safety equipment includes the following:

- First-Aid kit
- Level D PPE - A work uniform affording minimal protection: used for nuisance contamination only.
  - The following constitute Level D equipment; items may be used as appropriate:
    1. Coveralls
    2. Gloves(1)
    3. Boots/shoes, chemical-resistant safety-toe and shank
    4. Boots, outer, chemical-resistant (disposable) (1)
    5. Safety glasses or chemical splash goggles (1)
    6. Hard hat(1)
    7. Escape mask (1)
    8. Face shield (1)

    Footnote (1) Optional, as applicable.
- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

This page is intentionally left blank.

ATTACHMENT A.
USA THREE-DAY ON-SITE TRAINING LOG

This page is intentionally left blank.

USA Environmental, Inc.

Location:	
Contract No.:	Task Order No.:
SUXOS:	UXOSO:

The following site personnel have received the three-day supervised on-site training, as required by 29 CFR 1910.120. This training has included: a description of the site chain-of-command; site hazard information; use/care/maintenance of PPE; safe work practices; medical/training requirements; and emergency response and evacuation procedures.

THREE-DAY TRAINING COURSE ATTENDANTS

NAME (printed)	SIGNATURE	ORGANIZATION	DATE

This page is intentionally left blank.

ATTACHMENT B.
USA SAFETY INSPECTION AND AUDIT LOG

This page is intentionally left blank.

USA Environmental, Inc.

SAFETY INSPECTION AND AUDIT LOG

DATE:	TIME:	LOG NO.:
CONTRACT NO.:	DELIVERY ORDER NO.:	
LOCATION:		
WEATHER CONDITIONS:		

I. AREAS INSPECTED: (List by grid number, team, or task)

II. INSPECTION RESULTS

Item Description	Pass Y/N	Item Description	Pass Y/N
1. Personal Protection (PPE) per SSHP		9. MEC/UXO Detection Equipment	
2. Work Practices follow SSHP		10. MEC/UXO Detection Equipment Calibration	
3. Site Control/Decon per SSHP		11. MSDS's and Container Labeling per SSHP	
4. First Aid Kit(s)/Eyewash Station(s)		12. On- and Off-Site Communications	
5. Fire Extinguisher(s)		13. Site Housekeeping	
6. Flammable Storage Areas		14. Explosives / Ordnance Storage Areas	
7. Safety and Health Monitoring Equipment Use		15. Other: (list)	
8. Monitoring Equipment Calibration		16. Other: (list)	

III. CORRECTIVE ACTIONS RECOMMENDED (If required):

IV. REINSPECTION RESULTS (If required): _____

V. SIGNATURES:

I acknowledge that I have been briefed on the results of this inspection and will take corrective actions (if necessary).

_____ UXOSO

_____ SUXOS

Note: Safety Inspections are to be conducted each day and documented on this form. This form will also be used to document the Weekly Safety Audit conducted at the end of each work week. The weekly audit will not only indicate the present status of the site/site operations, but will also be used to note the current status of deficiencies noted during daily inspections. Daily inspection forms, where deficiencies have been noted, and the weekly audit, will be faxed to the USA Safety and Health Manager.

This page is intentionally left blank.

ATTACHMENT C.
USA WELDING/BURNING/HOT WORK PERMIT

This page is intentionally left blank.

USA Environmental, Inc.

Welding/Burning/Hot Work Permit

PERMIT NO.

WELDING/BURNING/HOT WORK PERMIT

DO NOT WELD, BURN, OR PERFORM HOT WORK UNTIL THE FOLLOWING PRECAUTIONS ARE TAKEN AND MAINTAINED. IF CONDITIONS CHANGE DURING THE COURSE OF THE WORK THIS PERMIT IS VOID AND A NEW PERMIT MUST BE ISSUED.

DATE: **PERMIT ISSUED TO:**

PROJECT TITLE/WORK ORDER NO:

WELDING/BURNING/HOTWORK ACTIVITY (DESCRIPTION):

SITE/LOCATION: **FLOOR:** **COLUMN:**

THE FOLLOWING CHECKLIST MUST BE COMPLETED BY THE UXOSO AND CONFIRMED BY THE WELDING/BURNING/HOT WORK (WBH) UXO EMPLOYEE(S) PERFORMING WORK.

	UXOSO		Employee(s)
	Yes	Not Applicable	Confirmed by Initialing
Applicable Fire Fighting Equipment Available			
All UXO Materials Removed From Hot Work Area			
_____ System Cleaned And/Or Purged			
Nearest Fire Department And Communication Access Identified			
Surrounding Area Cleared Of Burnable Debris			
Hot Work Permit And Warning Signs Posted			
Combustible Materials Protected With Noncombustible Shields if within 35 Feet			
Openings, Cracks, Holes In Material To Be Cut Protected			
No Flammable Liquids Within 50 Feet			
Provisions Made For Safe Placement Of Compressed Gas Cylinders			
Work Area Has Been Personally Inspected and All Precautions Fully Implemented			
HEALTH AND SAFETY PRECAUTIONS			
Evaluation By Health & Safety Or Fire Safety Professional Required			
Chemical Hazards Evaluated (Paint On Surfaces, Coatings, Cleaners, Metal Fumes)			
Adequate Mechanical Ventilation Or Local Exhaust Ventilation Provided			
Health Protection Requirements Met For Welding/Burning/Hot work Using Any Of The Following Toxic Materials: Stainless Steel, Lead, Cadmium, Mercury, Zinc (Galvanized Metal), Beryllium And Fluorine Compounds (Flux) Or Other Toxic Effects			
Requirements Of Confined Space Welding Met (If Welding In A Confined Space)			
Atmosphere Tested For Flammable Vapors. (%Lel__ _)			
If Required, Appropriate Respirator Protection Is Provided			

USA Environmental, Inc.

PERMIT NO.			
WELDING/BURNING/HOT WORK PERMIT			
DO NOT WELD, BURN, OR PERFORM HOT WORK UNTIL THE FOLLOWING PRECAUTIONS ARE TAKEN AND MAINTAINED. IF CONDITIONS CHANGE DURING THE COURSE OF THE WORK THIS PERMIT IS VOID AND A NEW PERMIT MUST BE ISSUED.			
Flame Resistant PPE Provided - Circle All Required [Flame Resistant Clothing, Aprons, Leggings, Gauntlets, Capes, Sleeves, Blanket, Other (List In Special Instructions On Back)}			
Appropriate PPE Provided - Circle All Required [Helmets, Shielding, Eye Protection, Shaded Lens, Gloves, Shoes, Other (List In Special Instructions On Back)].			
PERMIT MUST BE READILY VISIBLE AT THE WELDING/BURNING/HOT WORK ACTIVITY.			

	SIGNATURE	**EMP# OR SSN**	**PHONE NO.**
UXOSO (Will inspect work area prior to work each day)			
SUXOS (Signature indicates confirmation)			
USA HEALTH AND SAFETY MGR. (if required)			
FIRE SAFETY PROFESSIONAL (if required)			

All Fire Watchers Must Be Trained (their Presence Required During And 30 Minutes After Completion of Work Each Day): Supply Name, Emp # or SSN Of Fire Watchers.

NAME:	**EMP/SSN NO.**
NAME:	**EMP/SSN NO.**
NAME:	**EMP/SSN NO.**
NAME:	**EMP/SSN NO.**

SPECIAL INSTRUCTIONS:

WHEN ACTIVITY IS COMPLETED OR PERMIT VOIDED, MAIL TO THE USA SAFETY AND HEALTH MANAGER.

REF. 29CFR1910, 1926, ANSIZ49.1 AND NFPA51B

Back

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

CONTROLLED BURN

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

February 2020

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
02/14/2020		14 of 19	8.7	Added wind speed limitations.
02/14/2020		15 of 19	8.8	Added wind speed limitations.

This space intentionally left blank.

This page is intentionally left blank.

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

- USA Environmental, Inc., Work Plan, Munitions and Explosives of Concern Former Vieques Naval Training Range, Vieques Island, Puerto Rico – current version
- Occupational Safety and Health Administration (OSHA) Regulations
- USACE, Engineer Manual 385-1-1
- Operator's Manual(s) and Manufacturer's Publication
- NAVSEA OP 5.

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

This space is intentionally left blank.

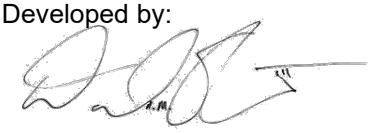
This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This standard operating procedure (SOP) contains the procedures and other information that will be needed by USA Environmental, Inc. (USA) during the operations at the Former Vieques Naval Training Range, Vieques Island, Puerto Rico. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations as described in this SOP.

(Signature to be provided in Final SOP)

Developed by:



02/18/2020

Donald Shaw
Project Manager

Date

Reviewed by:

02/18/2020

Larry Price
Vieques Senior UXO Supervisor

Date

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

This SOP expires four years from the date of approval and will require a review and approval process prior to reissue. A full review of the SOP is required annually to ensure the document remains current. Revision will be made as operational and/or guidance changes occur. The review and approval process must also be conducted prior to implementing any changes to this SOP.

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner, I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		02/18/2020
Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's Name	Date	Supervisor's Name	Date

This page is intentionally left blank.

8. PROCEDURES

8.1 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 the initiation and monitoring of controlled burns within the Live Impact Area (LIA) of the former Vieques Naval Training Range (VNTR).

8.2 Scope

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in the initiation and monitoring of a controlled burn on a site contaminated with Munitions Potentially Presenting an Explosive Hazard (MPPEH) and Munitions and Explosives of Concern (MEC). This SOP is not a stand-alone document and should be used in conjunction with Work Plan (WP), the Explosives Safety Submission (ESS), other SOPs, the Site Safety and Health Plan (SSHP), applicable Federal, State, local regulations, and contract restrictions and guidance.

8.3 Training

All training on equipment will be on-the-job (OJT) training. This training will be conducted and documented by field management personnel and subject to review for accuracy and completeness.

8.4 Personnel Protective Equipment

Level D personal protective equipment (PPE) is required for all personnel engaged in controlled burn initiation. Clothing includes, but is not limited to:

- Work clothing as prescribed
- Work gloves, leather or canvas as appropriate
- Safety Glasses.

8.5 Team Composition

Minimal personnel will be utilized during initiation of the controlled burn, and will consist of the following:

- SUXOS
- UXOSO
- UXOT III/Team Leader
- Other UXO Technicians as required.

The SUXOS will direct the all personnel during initiation and monitoring of the controlled burn, and will provide senior management oversight for the duration of the event. The UXOSO will oversee all UXO and burn operations to ensure safety precautions are observed.

The operator(s) will be familiar with the equipment being utilized 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.

8.6 Safety

Safety is paramount while during initiation and monitoring of a controlled burn, and all personnel will observe those safety precautions/warnings that apply. All operations will be conducted IAW the approved ESS with regard to a controlled burn. The precautions listed below reflect measures that must be utilized in order to safely perform the intended task:

- Controlled burns will be initiated between 8 a.m. and 12 p.m.
- Always be aware of your footing and where you are stepping.
- Vessel support on the water will ensure there are no water craft within the EZ prior to initiation of the burn.
- Radio communications will be maintained between all participants in order to direct immediate actions to stop the process and/or leave the area if any safety concerns arise.
- Ignition of the controlled burn will not be attempted if weather/site conditions result in an unacceptable risk of the fire spreading outside of the immediate area being burned.
- Ensure PPE is appropriate, serviceable, and worn/used in a proper manner.
- Tires, cork, dangerous waste, coated electrical wiring, or any other similar material will not be used to initiate or sustain a controlled burn.
- After a 24 hour wait time, the area the fire took place in will be approached by the SUXOS and UXOSO, this initial approach takes place at a safe distance (i.e. OP1 or CP 11) to ensure there is no visible flames or smoke in the area. Once the area is evaluated to have no smoke or flames present the SUXOS and UXOSO will call the all clear.

8.7 Operational Procedures

The vegetation to be burned will have been previously cut, raked into piles or wind rows, and left to dry for a duration that ensures all vegetation is dead and dry. At the time of the remote cutting and raking the parcel of land will be evaluated to make the decision as to the best area to pile the cut vegetation by the SUXOS and UXOSO. The vegetation will be burned in not more than a two acre parcel, IAW the NAVFAC Atlantic Technical Team.

Each controlled burn will be initiated using standard remote detonation equipment utilizing approved techniques, and with the use of donor explosive materials.

The following will be followed during the overall effort to initiate the controlled burn:

1. When necessary, an accelerant (e.g., diesel fuel, gasoline, straw, and/or other suitable materials) will be utilized throughout each parcel to assist in initiating and sustaining the burn.
2. Accelerant will be applied by manual means, such as sprayers or pumps and/or placed in jugs or bottles to assist in the initiation of vegetation piles.
3. No personnel will be allowed back into the LIA until 24 hours after confirming there is no visible flames or smoke in the area.

While weather conditions may result in unfavorable circumstances to initiate or sustain the controlled burn, all attempts will be made to complete the action as scheduled. However, the SUXOS may elect to cancel the initiation attempt if conditions will not support ignition of the burn, wind gusts of 20 miles per hour are frequent and excessive, sustained wind speed is over 20 miles per hour, or the wind direction is unacceptable risk to site safety.

The EZ for controlled burn will be established IAW the approved ESS for the burn location.

8.8 Environmental/Weather Conditions

On-site environmental conditions will have a significant effect on the ability and efficiency of initiating and sustaining a controlled burn. The following anticipated weather conditions and site characteristics may prohibit initiation of the controlled burn, or result in an uncontrolled spreading of the fire:

- Vieques is located in a tropical environment (regular high levels of humidity and periods of rain)
- Controlled burn planned during the seasonal "dry" weather period, when vegetation throughout the island may be susceptible to catching fire.
- Frequent or excessive wind gusts or sustained wind speeds in excess of 20 miles per hour.

The SUXOS and UXOSO will assess weather and site conditions to determine if initiation of the controlled burn can be effectively and safety accomplished.

8.9 Relative Humidity

Relative humidity is an expression of the amount of moisture in the air compared to the total amount the air is capable of holding at that temperature and pressure. Each 20 °F rise in temperature (which often occurs during the morning hours on a clear day) reduces the relative humidity by about one-half, and likewise, each 20 °F drop in temperature (which often occurs in early evening) causes relative humidity to roughly double.

The following general guidelines relate to the effect of relative humidity on controlled burns:

- Preferred relative humidity varies from **30% to 55%**
- controlled burning can become dangerous when relative humidity falls **below 30%**
  - **Fires are more intense under these conditions and spotting is much more likely; proceed only with additional precautions
- Fire may leave unburned areas within the controlled burn area or may not burn hot enough to accomplish the desired result when the relative humidity is **60% or higher**.

NOTE: The relative humidity will be checked by the EMT/Paramedic, recorded and reported to the SUXOS and UXOSO prior to attempts to initiate the controlled burn.

8.10 Fuel Moisture Content

The moisture content of dead fuel responds rapidly to changes in relative humidity. However, there is a time lag involved for fuels to achieve equilibrium with the moisture condition of the surrounding atmosphere. Also, previous drying and wetting will influence fuel moisture. Therefore, the relative humidity and fuel moisture must be assessed independently:

- Fine-fuel moisture is strongly influenced by rainfall, relative humidity, and temperature
- Areas with very heavy fuel buildups or where extensive draped fuels are burned, moisture content should be **20 to 25 %** to keep fire intensity manageable, especially if aerial ignition techniques are used
- When fuel moisture approaches **30%**, fires tend to burn slowly and irregularly, often resulting in incomplete burns that do not meet the desired objectives.

Fuel moisture sticks may be utilized one day prior to the initiation of the controlled burn in order to assess general fuel moisture content. These values will differ slightly from actual fuel moistures but are fairly representative of most fuel types.

8.11 Exclusion Zone Calculation

A controlled burn EZ will be based on the requirements in NAVSEA OP 5, 13-22.1, sections a. 1&2, siting requirements.

8.12 Summary

All personnel involved in the initiation of the controlled burn will ensure all operations are conducted in a safe, efficient, and productive manner.

Safety is everyone's responsibility, but it is the overall responsibility of the SUXOS to ensure conditions are optimal for a controlled burn and makes the final determination to conduct or terminate the initiation. The UXOSO is the responsible party for UXO and controlled burn ops safety and the SUXOS and UXOSO work together to ensure the safest operations are conducted. They evaluate the materials being burned, the accelerant and the weather to ensure optimal results in fire propagation at each controlled burn site.

Once it has been visually determined that the fire is out and the post-burn evaluation is to be conducted, it will be only by the SUXOS with the UXOSO and/or a Title II Contractor safety representative.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 Hazard Control Brief

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the area they are assigned to work prior to commencing any activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in Section 8.0 of the SHSP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan in Section 14.0 of the SHSP.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

10. DISTRIBUTION

SOP Number	Number of Copies	Organization	Building Number	Signature
	Master	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____
	Copy #	Branch Code	XXX	Print: _____ Sign: _____

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. Teams will be provided maps of the overall project site, medical care locations and evacuation routes prior to beginning site work.

12. EQUIPMENT

The team will be equipped with the following:

- Explosives or accelerants, as required
- Placards, as required
- Day box, as required
- Remote Firing Device, as required
- Tarps, as required
- Logbook and/or Personal Digital Assistant (PDA) for recording data
- Camera
- Fire extinguisher
- Inclement weather gear as needed

Safety equipment is kept in the back of the site vehicles:

- Bed (Pick-up trucks)
- Back cargo area (SUVs)

13. EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in Section 12 of the APP will be followed. The single point of contact for incidents on site will be the UXOSO.

In the event that an employee has to be taken to the hospital refer to Section D.12.1 of the APP for the route to the hospital. A map showing the hospital's location is contained in the Site-Specific Health and Safety Plan provided as Attachment 3.

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 emergency response and change procedures if necessary.

This space is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

UXO ESCORT OF SITE VISITORS

MUNITIONS AND EXPLOSIVES OF CONCERN REMOVAL
FORMER VIEQUES NAVAL TRAINING RANGE
VIEQUES ISLAND, PUERTO RICO
USA ENVIRONMENTAL, INC.

June 2021

This page is intentionally left blank.

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this Standard Operating Procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as a major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

Date	Supervisor's Signature	Page	Paragraph	Remarks
MM/DD/YYYY				

This page is intentionally left blank.

3. REFERENCES

The following Occupational Safety and Health Administration (OSHA) standards, U.S. Navy requirements and the Explosives Safety Submission (ESS) procedural 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, it may be necessary to consult other SOPs and regulatory references.

Department of the Navy. 2020. Naval Sea Systems Command Ordnance Pamphlet 5, Volume 1, Seventh Revision, "Ammunition and Explosives Safety Ashore." 25 March.

OSHA Construction Standard 29 CFR, Part 1910

OSHA General Industry Standard 29 CFR, Part 1926

Department of the Navy. 2018. Operational Risk Management. OPNAVINST 3500.39D. 29 March.

Department of the Army. 2014. Safety and Health Requirements. EM-385-1-1. 30 November.

Site Specific Explosives Safety Submission

Site Specific Accident Protection Plan (APP)

Site Specific Health and Safety Plan (SHSP)

Site Specific Work Plan.

This space is intentionally left blank.

This page is intentionally left blank.

4. TABLE OF CONTENTS

LIST OF TABLES

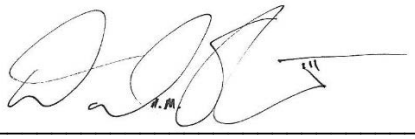
LIST OF ATTACHMENTS

This page is intentionally left blank.

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USA Environmental, Inc. (USAE) during the operations at the Former Vieques Naval Training Range/NAVFAC Atlantic. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct operations concerning Unexploded Ordnance (UXO) Escort of Visitors.

Developed by:



Donald Shaw III
Program Manager

06/16/2021
Date

Reviewed by:

Larry Price
Vieques Senior UXO Supervisor

06/16/2021
Date

Approved by:

Jason W. Wagner, CMQ/OE
Corporate Quality and Safety Manager

Date

This space is intentionally left blank.

This page is intentionally left blank.

6. SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processes described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the Worker's or Operator's Statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Larry Price		06/16/2021
Supervisor's Name	Signature	Date

7. WORKER'S STATEMENT

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Worker's or Operator's Name	Worker's or Operator's Signature	Supervisor's Name	Supervisor's Signature	Date

This page is intentionally left blank.

8. PROCEDURES

The purpose of this SOP is to provide all USAE employees and subcontractors with the minimum safety and health requirements and procedures applicable to the conduct of operations involving work areas within the project boundary. This SOP is not a standalone document and should be used together with documents listed in Section 3.

8.1 UXO PERSONNEL REQUIREMENTS

A UXO-qualified Technician will be assigned to perform the role of UXO Escort for all visitors to the site. The UXO Escort is responsible for the safety of site visitors, and site visitors are required to follow all instructions given to them by their UXO Escort. If there is a failure to follow instructions, the visitor will be escorted from the site. Munitions and Explosives of Concern (MEC) operations will be halted in areas where the site visitor must visit, and they may not commence until after the visitor has left the area. MEC avoidance will be practiced for the duration of the visit. Visitors may not disturb or handle potential MEC, and they must report the finding of MEC to their UXO Escort. The visitors are told to touch nothing, and if they did not bring it on the range, it does not leave the range. The UXO Escort will perform the following functions:

1. If non UXO qualified personnel need to perform work on the munitions response site, the Senior UXO Supervisor (SUXOS) will assign a UXO qualified person (UXO Technician) to escort them while performing their assigned duties.
2. The UXO Escort will give the visitor(s) a hazard control briefing prior to entry into the Exclusion Zone (EZ). The briefing will cover the hazards of MEC and basic safety rules, such as not touching or disturbing anything that could potentially be MEC, bringing potential MEC to the UXO Escort's attention, following the smoking policy, and abiding by emergency procedures.
3. When a visitor will be going off established/cleared roadways/paths to do work, the UXO Escort will conduct a metal detector aided survey of the area ahead to ensure that the walking path to be taken is safe and the surface contains no visible MEC items.
4. Any analog equipment (e.g., ferrous or all metals detector) used must be checked for proper function prior to use.
5. If intrusive work is required for any operation under this SOP, the UXO Technician will survey the immediate area of work with a suitable metal detector to verify that it is safe and free of anomalies before intrusive work (such as stake placement, soil sampling, etc.) begins.
6. If an anomaly is detected, the location of the intrusive work will relocate to a suitable anomaly-free location determined by the UXO Escort.
7. All intrusive work will be observed by the UXO Escort to ensure no suspected MEC is disturbed.

8.2 MEC ENCOUNTERED ACTIONS REQUIRED

If MEC items are encountered during the activities listed above, the following procedures should be conducted.

1. Non-UXO personnel will be required to move to a safe location as directed by the UXO Escort.
2. The UXO Escort will place a red pin flag (or other suitable means of marking) near the item.
3. The UXO Escort will record identification and location information in a Personal Digital Assistant (PDA) and take a photograph.
4. The UXO Escort will advise all site personnel of the item's location. Under no circumstances will suspect MEC be disturbed. After flagging, the activity may continue in another area while observing appropriate safety precautions.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD ANALYSIS/RISK ASSESSMENT

The hazard analysis matrix (Table 1) lists the existing and potential hazards associated with conducting the site visit on this project, along with methods to mitigate those hazards.

Table 1: Hazard Analysis Matrix

Activity	Hazard	Triggering Events	Initial Risk Index	Hazard Mitigation	Final Risk Index
MEC Avoidance	Unintentional Detonation or Ignition.	Disturbance of MEC. MEC reacts to movement, impact, and/or friction by equipment, tools, or personnel.	C/II/3	All personnel will receive a hazard control briefing upon arrival and a daily Tailgate Safety Briefing prior to commencing site activities each day. A UXO Technician will escort all non-UXO-qualified personnel and they must strictly adhere to the directions of the UXO Escort. Visitors will be removed from the site if they fail to follow these site safety rules. The UXO Escort must visually survey the walking path ahead and will also locate an anomaly-free area with a suitable metal detector prior to allowing any intrusive activity. MEC avoidance will be practiced. Visitors will not touch or disturb MEC in any way. MEC operations will be suspended when a visitor who is not UXO-qualified enters the work area in the Exclusion Zone (EZ) and will resume after they have left the area. No smoking except in designated areas. Initial training and periodic reinforcement.	D/III/5
	Heat stress	Seasonal weather patterns.	C/III/4	Heat stress monitoring, cool drinking water, work-rest schedule, and shelter for breaks. Suitable clothing for the conditions. Initial training and periodic reinforcement.	D/IV/5

Activity	Hazard	Triggering Events	Initial Risk Index	Hazard Mitigation	Final Risk Index
	Biological	Biting/stinging insects, spiders, rodents and hazardous plants.	C/II/4	Avoid biological hazards as able. Wear long-sleeved shirts and long pants, and apply repellent to clothing and exposed skin as needed. Use barrier cream as the hazard dictates. Initial training and periodic reinforcement.	D/IV/5
	Eye injuries due to excessive dust and flying debris, falling sticks and branches from trees and bushes.	High winds, excessively dry conditions, forested areas or thick vegetation.	C/II/4	Wear authorized eye protection. Watch for overhanging branches and also loose or protruding vegetation at eye level. Look up and around, not just down. Initial training and periodic reinforcement.	C/IV/5
	Slips, trips, and falls.	Thick vegetation, vines and logs. Rain, mud and steep surfaces.	C/III/4	Personnel will assess their surroundings prior to proceeding. Ensure firm footing at all times. Wear sturdy footwear appropriate for the conditions. Wear leather or canvas work gloves. Initial training and periodic reinforcement.	D/IV/5
	Weather or Natural Disaster Emergency	Meteorological or environmental event	C/II/3	UXO Escort will account for all site visitors, and if required, implement the emergency response procedures outlined in the APP. Monitor the radio for announcements.	C/IV/5

9.2 HAZARD CONTROL BRIEF

All team members (including site visitors) will attend a daily Tailgate Safety Briefing given by the UXO Safety Officer (UXOSO) or his/her designated team representative. Visitors to the site will attend this briefing if they are on site at the time of the briefing. If not, the site visitors will receive a separate hazard control briefing. This briefing should include, but is not limited to, the following:

- Situational awareness. Be cognizant and alert for hazards that pertain not only to you but also to all team members.
- Potential for UXO/MEC/MPPEH and proper avoidance techniques.
- Current and new hazards or hazardous conditions encountered.
- Slips, trips, and falls. Always be aware of where your feet are being placed. There is a potential for muddy, slippery, and moving/shifting working surfaces.
- Hydration and heat injury prevention; recognizing the symptoms of heat related injuries.
- Emergency procedures and emergency equipment locations.

- Hand injury prevention. Cut, scrape, puncture, and pinch point potential.
- Eye injury prevention.
- Required Personal Protective Equipment (PPE)
- Lightning precautions.

9.3 SAFETY AND HEALTH OPERATIONAL CONTROL TECHNIQUES

All non-UXO personnel requiring access to possible MEC contaminated area receive a MEC avoidance hazard control briefing by their UXO Escort.

When access to the uncleared portions of the project site(s) is necessary, a UXO Escort must conduct a magnetometer-assisted survey of the walking path ahead. All potential MEC items must be avoided.

The UXO Escort will survey the immediate area of any intrusive work (such as stake placement or soil sampling) with a suitable magnetometer to verify that it is safe and free of anomalies before intrusive work begins. Potential MEC items must not be disturbed.

All personnel will adhere to the direction of the UXO Escort at all times and will not veer outside of areas surveyed by the escort. Maintain the team separation distance in accordance with the ESS.

The UXOSO must monitor weather conditions. Site work will be suspended upon approach of an electrical storm that is within 10 miles.

The UXOSO may determine that access to the EZ is unsafe for authorized visitors based on current activities. However, every effort should be made to accommodate the authorized visitor's needs. All visitors must sign-in and receive a site-specific hazard control briefing.

9.4 PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS

Before visitors are permitted to go down range, the UXOSO or the UXO Escort will check their PPE to ensure they can safely enter the area. USAE may be able to provide certain types of PPE to the site visitor, such as safety glasses, gloves, hearing protection and hard hat, if the visitor needs it.

- All workers and visitors will wear a serviceable PPE Level "D" ensemble that is suitable for the conditions.
- Safety glasses appropriate for the lighting conditions with side shields.
- Hard hats will be worn when working in the presence of overhead hazards and when supporting heavy equipment. Hard hats will not be worn when directly investigating suspect MEC/MPPEH.
- In areas where hard hats are not required, all personnel will wear a brimmed hat for protection from the sun.
- Protective leather work gloves or equivalent protective material appropriate for the task.
- Hearing protection when visiting a noise hazard area.
- Sturdy, leather safety-toe work boots with adequate tread that is appropriate for the conditions. If a visitor does not have safety toe work boots, they will not be permitted to areas where heavy equipment operations are taking place, in close proximity to vegetation clearance operations, or any identified foot hazard.
- Inclement weather gear as appropriate for the conditions.

10. DISTRIBUTION

This section is not applicable.

11. DIAGRAMS

Maps and diagrams are located in the approved Work Plan and/or the approved ESS. The UXO Escort will have access to the maps of the overall project site, medical care locations, and evacuation routes prior to beginning site work.

12. EQUIPMENT

The UXO Escort will be equipped with the following:

- Handheld ferrous or all-metals detector (if applicable)
- Red pin flags for marking suspected MEC items
- Logbook and/or PDA for recording data
- Camera
- Communications equipment
- Site vehicles with a standard safety equipment load out.

13. EMERGENCY RESPONSE PROCEDURES

13.1 PREPARATION

The UXOSO will perform pre-emergency planning before starting field activities, during the mobilization, and also during the site set-up phase. The UXOSO will coordinate emergency response with police/security/fire/rescue/site medic personnel and emergency medical care. He/she will also verify emergency contact information, evacuation routes, and routes to emergency medical care.

All site visitors will receive a Site-Specific Safety Briefing (tailored to their assignment), and daily Tailgate Safety Briefing. They will be informed to stay with their UXO Escort, and the UXO Escort will provide instructions during an emergency situation.

13.2 EXECUTION

The initial single point of contact for incidents on site will be the UXOSO. The SUXOS/UXOSO will make further notifications as appropriate. All incidents and injuries, no matter how seemingly insignificant, will be reported in a timely manner to the individual's supervisor and the UXOSO. Any injuries to site visitors will also be reported to the UXOSO by the UXO Escort.

In the event of an ordnance-related event/emergency, all team members will be accounted for by their team leader. The team leader will assemble his/her team at their site vehicles and stand by for further instructions from the SUXOS/UXOSO.

In the event of an emergency requiring evacuation to the designated Safe Area, the evacuation signal will be given through verbal and/or radio instructions. Personnel will evacuate to a pre-determined evacuation point in the support zone identified at the Tailgate Safety Briefing. The UXOSO will account for all personnel and brief the SUXOS.

In the event of an emergency, the UXO Escort is responsible for the safety of the site visitor(s) to which he/she has been assigned. The UXO Escort will provide instructions on appropriate emergency procedures (depending of the type of emergency). In the event of an evacuation, the UXO Escort will lead the site visitor(s) to the designated Safe Area, account for all personnel, and brief the UXOSO. The UXO Escort and site visitors will remain at the Safe Area and await further instructions from the UXOSO.

The UXOSO will summon emergency response personnel, if required. The UXOSO, or his/her designee, will meet and escort emergency personnel to the response location. Emergency response personnel will receive a time-expedient hazard control briefing (depending on current situation) on immediate hazards that may be present or associated with the emergency prior to access to the EZ.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), each Team Leader will account for all team members, assemble at the team vehicles, and wait for SUXOS/UXOSO instructions.

Further specific notifications and actions are detailed in the APP.

This space is intentionally left blank.

ATTACHMENT:
PREPARATORY, INITIAL, FOLLOW-UP CHECKLIST AND QC SURVEILLANCE

This page is intentionally left blank.

PREPARATORY, INITIAL, FOLLOW-UP CHECKLIST and QC SURVEILLANCE FORM

UXO ESCORT OF SITE VISITORS

TEAM INFORMATION		
Team:	**Location:**	**Date:**
UXO Escort:		
Personnel Present:		
Phase of Inspection (Check one): ☐ ***Preparatory (P);*** ☐ ***Initial (I);*** ☐ ***Follow-Up (F)***		

CHECKLIST

Item	Ref.	Inspection Point	Yes	No	N/A	Comments
1	NSOP 019	Have all non-UXO personnel requiring access to possible MEC contaminated area received MEC avoidance hazard control brief?				
2	NSOP 019	Was MEC avoidance performed by UXO personnel during Escort Duties using visual and analog instrument implementation?				
3	NSOP 019	Was the analog instrument checked out for proper functioning and operator capabilities?				
4	NSOP 019	Was all required PPE worn by personnel entering MEC contaminated area?				
5	NSOP 019	If MEC was encountered during MEC avoidance activities, did the UXO Escort mark the item, record the location, advise personnel to avoid item, and notify appropriate authorities (SUXOS, SAFETY) of MEC item?				
6	NSOP 019	Did a qualified UXO Escort check areas with a magnetometer before any intrusive work occurred?				

FINDINGS

Item	Comments

Conducted By: _____ Reviewed By: _____

This page is intentionally left blank.

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

INSTRUMENT VERIFICATION STRIP (IVS) SETUP AND USE

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

June 2022

This page intentionally left blank

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards. (Example: name, code, or telephone number changes, spelling corrections, references or referenced document locations.)

REV.	DATE	SUMMARY OF CHANGE	REASON FOR REVISION
00	08/14/2018	N/A.	Original Release.
01	10/05/2018	Updated Reference section to current version.	External audit corrective action.
02	07/18/2019	Edited Section 2.0, GCMR QAPP to MR QAPP, and minor edits.	Update to ISO 17025:2017 and annual review.
03	4/12/2022	Edited section 8.3.3 to remove requirement of 5 meters between ISOs and 5-meter distance of background line from ISO line, deleted reference to AGC throughout, and made addition clarifying edits.	Internal review of SOP to update for current standards.

As prescribed by the industry standard object (ISO) 17025:2017, the Quality Manager and Technical Manager approve this Policy or Procedure and appropriately authorize its implementation in the USA Environmental, Inc. (USAE) Quality Management System.

This page intentionally left blank

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

ESTCP Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response Final Report, Addendum, September 24, 2015.

Department of the Navy. 2019. *United States Navy Standard Operating Procedures for Development, Implementation, and Maintenance for Ammunition and Explosives*. NOSSA Instruction 8023.11D. 29 August.

This space intentionally left blank.

This page intentionally left blank

4. TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

This space intentionally left blank

This page intentionally left blank

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USAE during the operations at the Former Vieques Naval Training Range. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct field operations.

Approved by Quality Manager:

_____ _____

Jason W. Wagner, CMQ/OE
Director – Corporate Quality and Safety

Date

Approved by Technical Manager:

_____ _____

Jeff Lewis
Technical Manager

Date

This space intentionally left blank

This page intentionally left blank

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Supervisor's Name _____ Signature _____ Date _____

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the procedures addressed in the SOP. If I identify a hazard not addressed in the SOP, or encounter an operation I cannot perform in accordance with the SOP, I will stop the process and notify my immediate supervisor.

Worker's or Operator's Name	Worker's or Operator's Signature	Supervisor's Name	Supervisor's Signature	Date

This page intentionally left blank

8. STEP-BY-STEP PROCEDURES

The purpose of this SOP is to identify the means and methods to be used when verifying the operation of a geophysical system prior to and during site surveys. The IVS is setup with a series of buried inert munitions or ISOs. During the IVS process, the geophysical system measures the response and location of each item in the IVS, and these measurements are compared to published, or calculated (Response Curve), response values, and "as built" locations, as well as day to day measurements to document proper and repeatable system functioning. This SOP applies to IVSs for projects using standard digital geophysical mapping (DGM) systems.

8.1 PERSONNEL RESPONSIBILITIES

The qualifications of the personnel implementing this SOP are documented in the work plan (WP) or Uniform Federal Policy (UFP) Quality Assurance Project Plan (QAPP) or Munitions Response (MR QAPP). Multiple Geophysicist roles may be performed by a single individual (e.g., the Site Geophysicist may also perform the role of Field Geophysicist and Data Processor).

8.1.1 Role and Responsibilities

- Project Geophysicist designs IVS and reviews IVS testing results.
- QC Geophysicist reviews IVS testing results and verifies IVS results are documented in the QC database or Tracking Spreadsheet.
- Site Geophysicist oversees IVS construction and testing.
- Field Geophysicist or Instrument Operator documents IVS item data (e.g., position, depth, and type) and operates geophysical and positioning equipment over the IVS and noise strip.
- Data Processor processes IVS data and documents results in the QC database or Tracking Spreadsheet.
- UXO Escort conducts MEC escort and anomaly avoidance activities during IVS construction and testing. Must be a qualified UXO Technician II or higher.

8.2 RELEVANT DEFINITIONS

- Geophysical System: All equipment used for geophysical data collection, including the geophysical sensor, data logger, software and positioning equipment (e.g., Real-Time Kinematic Global Positioning System [RTK GPS] or line and fiducial equipment).
- ISO: A readily available standard-sized metallic test item.
- Multi-sensor Array: A geophysical system that includes multiple sensors.

8.3 Procedure

8.3.1 Health and Safety

All elements of this procedure are 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 reviews the relevant site-specific activity hazard analyses (AHAs) prior to implementing this SOP.

8.3.2 Instrument Verification Strip Construction

Verification of the DGM system is accomplished using an IVS. Multiple IVS locations may be constructed during the project if needed (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 location.

8.3.3 Location and Configuration of the IVS

The Project Geophysicist may propose IVS locations prior to mobilization. At project startup, the DGM team visits potential locations and determines which is most appropriate for an IVS, 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 tests and equipment and for adequate spacing of the ISO items and the noise-strip to avoid ambiguities in data evaluation.
- Readily accessible to project personnel.
- Close proximity to the actual survey site (if not within the site).
- Not prone to flooding, other weather-related impacts, or local traffic.

8.3.4 IVS Objects

ISOs or inert ordnance serve as the seed objects in the IVS. ISOs, if used, should approximate the size of the MEC expected to be found on the site. See the approved project WP or QAPP for details on IVS seed items, separation distances, depths, orientations, and inclinations. Table 1 shows the specifications for the possible ISOs and Figure 1 is a photograph of the three sizes of ISO.

Table 1: Industry Standard Object Dimensions and Part Numbers

Item	Nominal Pipe Size	Outside Diameter	Length	Part Number [1]	Schedule
Small ISO40	1"	1.315" (33 mm)	4" (102 mm)	44615K466	40
Small ISO80	1"	1.315" (33 mm)	4" (102 mm)	4550K226	80
Medium ISO40	2"	2.375" (60 mm)	8" (204 mm)	44615K529	40
Large ISO40	4"	4.500" (115 mm)	12" (306 mm)	44615K137	40

[1] Part number from the McMaster-Carr catalog (http://www.mcmaster.com/).

This space intentionally left blank

Figure 1: Small, Medium and Large ISOs

Figure 2: Example Layout of Instrument Verification Strip

8.3.5 IVS Procedures

8.3.5.1 IVS Background Survey

The DGM team performs a background DGM survey of the selected IVS area. The purpose of this step is to document the appropriateness of the location (e.g., few existing anomalies), verify that IVS seed items are not placed near existing anomalies, and that a suitable background noise line has been identified. The data from this IVS background survey is processed and evaluated before any seeding is performed.

8.3.5.2 IVS Test Item Location Selection

Once the IVS area is determined suitable for use (e.g., free of significant subsurface anomalies, or containing anomalies that are clearly identified and can be avoided during seeding), IVS seed items, specified in the project WP or QAPP, are placed in holes at their designated sequence, spacing, depth, orientation, and inclination. IVS seed items are typically buried at depths below ground surface between 3 and 7 times their diameter. These depths are intended to provide adequate signal-to-noise ratio for detecting the items. The generalized diagram of the seeded IVS transect is presented as Figure 2. A list of specific item types, depths, and orientations are provided in the WP or QAPP. In this example, only one target is shown. This is the minimum requirement for an IVS. Local custom, stakeholder comfort, or other similar reasons may lead to larger number of items in the IVS. Rarely are more than three or four items required, unless the IVS is designed to accommodate a multi-sensor array. The blank space may be used for DGM sensor function. If a different DGM sensor function test location is used as part of the project, the blank space is unnecessary.

8.3.5.3 IVS Seed Item Burial and Metadata Recording

The DGM team digs the seed item holes to the appropriate depths for burial, in conjunction with the Site Geophysicist, following standard anomaly avoidance procedures. Measurements of the IVS Seed Item depths are measured from ground surface to object center of mass for each item. The IVS seed item locations are recorded in both local units, and by the Positioning System. Offset survey lines are set and marked with plastic tent stakes, or equivalent non-metallic markers, in accordance with the project WP or QAPP. For each IVS Seed Item, the Site Geophysicist records:

- IVS transect endpoints.
- Seed item description (e.g., small ISO).
- Seed item location (local coordinates, as well as Positioning System coordinates).
- Seed item depth to center of mass.
- Seed item inclination (e.g., horizontal or vertical).
- Seed item orientation (e.g., across-track or along-track).
- Digital photograph, with a whiteboard, of each IVS seed item.
- Offset transect line endpoints at the WP or QAPP specified lane spacing, and half line spacing.

Holes are backfilled once the appropriate data has been recorded, and traveling lines are run between each IVS transect endpoint. Plastic pin flags may be used to mark seed item locations.

8.3.5.4 Seeded IVS Data Collection

Once the IVS is seeded, the DGM team collects data over the seeded IVS, in accordance with the project WP or QAPP. The initial data likely includes collecting data along the simulated grid line spacing, half line spacing, the background noise line, and several passes over the IVS. Subsequent daily dynamic IVS data collection is along the IVS and background noise lines.

8.3.6 IVS Data Processing Procedures

Prior to collecting production data, and each morning before beginning DGM field operations, a dynamic IVS survey is collected over the IVS and Background noise lines. This data is downloaded and passed to the data processor who performs the following steps for each IVS test:

- Import and level the data.
- Apply any necessary latency correction.
- Examine the response profiles to verify that all data is valid/comparable to published or calculated response values and that responses and background measurements are similar from test to test.
- Identify the location of peak response measured over each IVS seed item is within project metrics, specified in the project WP or QAPP, from “as-built” locations.
- Grid the initial and daily IVS data, with a map showing survey line path, known IVS seed locations, and measured IVS target locations.

8.3.7 Evaluate the IVS MPCs/MQOs

The results of each IVS seed item are evaluated against the measurement performance criteria (MPCs) or measurement quality objectives (MQOs) specified in the project WP or QAPP. The DGM team is notified if the morning IVS data meets project requirements. If the MPCs or MQOs have not been met, the Project or QC Geophysicist initiates 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/MQOs can be met, these modifications are made. If the MPCs/MQOs cannot be met, the Project and QC Geophysicists discuss potential resolutions with the project team.

Once the initial (or modified) MPCs/MQOs have been met, the IVS survey is complete and the DGM system is verified for field use.

8.4 QUALITY CONTROL

This definable feature of work (DFW) is performed throughout the project DGM task. Performance of the required QC checks are documented by the Site or Project Geophysicist in the IVS tracking spreadsheet or project database, updated daily, and delivered weekly. A comprehensive root cause analysis is performed and a corrective action determined for any data failing the applicable MPCs/MQOs. The Project and/or QC Geophysicist is notified of any sudden changes identified in the IVS data, even if the results still meet the MPCs/MQOs. Any such changes receive a thorough examination of the IVS data with the intent to resolve potential equipment/procedure issues before a failure occurs.

8.5 DATA MANAGEMENT

Input data for this SOP are the ongoing, twice daily dynamic IVS and background noise line checks, and copies the DGM team leader's logbook. Performance and acceptability of the initial IVS data is documented in an IVS Memorandum. The results of the ongoing IVS testing are tracked in the IVS tracking spreadsheet, or the project database.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD ANALYSIS/RISK ASSESSMENT

This section is not applicable.

9.2 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the munitions potentially presenting an explosive hazard (MPPEH) holding area prior to commencing any MPPEH Management or Disposal activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in the Site Safety and Health Plan (SSHP), and be able to recognize the onset of heat stress disorders in themselves and their team members.

The potential for encountering MDEH comingled with MPPEH or MDAS is very low. Should MDEH be discovered, it will be left in place, the Senior Unexploded Ordnance Supervisor (SUXOS) and the UXO Quality Control Specialist will be notified to investigate the occurrence and determine the corrective actions. The grid will have to undergo re-inspection.

In the event of severe weather or a natural disaster (e.g., earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXO Safety Officer (UXOSO), SUXOS, or Site Manager for instructions, and follow the Emergency Response Plan of the SSHP.

10. DISTRIBUTION

This section is not applicable.

11. DIAGRAMS

The project locations and site maps are located in the WP. Teams will be provided maps of the overall project site and evacuation routes.

12. EQUIPMENT

The following is a list of required equipment and materials.

- Geophysical Sensor: Instrument used to detect surface and/or subsurface anomalies indicating potential MEC. Typically, instruments used are analog but may also be digital instruments (e.g., EM61-MK2A).
- Positioning System: Used to record the location of IVS items and geophysical data (not required if using line/fiducial positioning).
- Excavation Tools: Picks, shovels, or a mini-excavator are used to dig a hole for the IVS test items and to backfill the hole.
- Measuring Tape: A measuring tape or ruler is used to measure the depth of each IVS test item, and their local locations along the IVS.
- Analog Instrument: A handheld metal detector such as a Schonstedt GA-52/Cx or White's or Minelab EM sensor that emits an audio tone used to search for buried metal or confirm there are no significant metallic items in a specific location.
- Battery chargers for geophysical sensor, data logger, and positioning system.
- Digital camera.
- Field Computer.
- Communications equipment.
- First-Aid Kit.
- Fire extinguisher.
- Inclement weather gear, as needed.

12.1 MATERIALS

- Survey line marking (plastic tent stakes, high visibility line, plastic pin flags).
- IVS Seed Items (inert ordnance or ISOs) in accordance with WP or UFP QAPP.
- RTK DGPS range pole with leveling bubble and survey controller clamp.
- DGM team leader's Logbook.

13. EMERGENCY RESPONSE PROCEDURES

13.1 PREPARATION

The UXOSO will perform pre-emergency planning before starting field activities, during the mobilization, and also during the site set-up phase. The UXOSO will coordinate emergency response with police/security/fire/rescue personnel and emergency medical care. He/she will also verify emergency contact information, evacuation routes, and routes to emergency medical care.

All site personnel will receive an initial site-specific Safety Briefing, Ordnance Safety Briefing (tailored to their assignment), and a daily Tailgate Safety Briefing.

13.2 EXECUTION

The initial single point of contact for incidents on site will be the UXOSO. The SUXOS/UXOSO will make further notifications as appropriate. All incidents and injuries, no matter how seemingly insignificant, will be reported in a timely manner to the individual's supervisor and the UXOSO.

In the event of an ordnance-related event/emergency, all team members will be accounted for by their team leader. The team leader will assemble his/her team at their site vehicles and stand by for further instructions from the SUXOS/UXOSO.

In the event of an emergency requiring evacuation to the designated Safe Area, the evacuation signal will be given through verbal and/or radio instructions. Personnel will evacuate to a pre-determined evacuation

point in the support zone identified at the Tailgate Safety Briefing. The UXOSO will account for all personnel and brief the SUXOS.

The UXOSO will summon emergency response personnel, if required. The UXOSO, or his/her designee, will meet and escort emergency personnel to the response location. Emergency response personnel will receive a time-expedient hazard control briefing (depending on the current situation) on immediate hazards that may be present or associated with the emergency prior to access to the Exclusion Zone.

In the event of severe weather or a natural disaster (e.g., earthquake, tsunami, or very high winds, etc.), each Team Leader will account for all team members, assemble at the team vehicles, and wait for SUXOS/UXOSO instructions.

Further specific notifications and actions are detailed in the Accident Prevention Plan.

This space intentionally left blank

This page intentionally left blank

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

DIGITAL GEOPHYSICAL MAPPING – BLIND SEEDING

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

June 2022

This page intentionally left blank

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards (example: name, code, or telephone number changes, spelling corrections, references or referenced document locations).

REV.	DATE	SUMMARY OF CHANGE	REASON FOR REVISION
00	08/14/2018	N/A.	Original Release.
01	10/05/2018	Removal of multiple instances of IVS. Section 4.2 revised for repeat sentence. Section 5.2 spelling of “recording” fixed.	External audit corrective action.
02	07/18/2019	Section 2.0 Edited GCMR QAPP to MR QAPP. Section 5.2, edited Analog Test Strip to Instrument Test Strip. minor edits for spelling.	Update to ISO 17025:2017 and annual review.
03	4/13/2022	Deleted reference to AGC, removed BSI orientation.	Internal review of SOP to update for current standards.

As prescribed by the industry standard object (ISO) 17025:2017, the Quality Manager and Technical Manager approve this Policy or Procedure and appropriately authorize its implementation in the USA Environmental, Inc. (USAE) Quality Management System.

This page intentionally left blank

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

Department of the Navy. 2019. *United States Navy Standard Operating Procedures for Development, Implementation, and Maintenance for Ammunition and Explosives*. NOSSA Instruction 8023.11D. 29 August.

This space intentionally left blank

This page intentionally left blank

4. TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

This space intentionally left blank

This page intentionally left blank

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USAE during the operations at the Former Vieques Naval Training Range. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct materials potentially presenting an explosive hazard (MPPEH) management operations.

Approved by Quality Manager:

_____ _____

Jason W. Wagner, CMQ/OE
Director – Corporate Quality and Safety

Date

Approved by Technical Manager:

_____ _____

Jeff Lewis
Technical Manager

Date

This space intentionally left blank

This page intentionally left blank

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the Worker's or Operator's Statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the procedures addressed in the SOP. If I identify a hazard not addressed in the SOP, or encounter an operation I cannot perform in accordance with the SOP, I will stop the process and notify my immediate supervisor.

Worker's or Operator's Name	Worker's or Operator's Signature	Supervisor's Name	Supervisor's Signature	Date

This page intentionally left blank

8. STEP-BY-STEP PROCEDURES

The purpose of this SOP is to provide the minimum procedures applicable to the burial and tracking of blind seed items (BSIs) for digital geophysical mapping (DGM).

8.1 PERSONNEL RESPONSIBILITIES

The qualifications of the personnel implementing this SOP are documented in the work plan (WP) or Uniform Federal Policy Quality Assurance Project Plan (UFP QAPP) or Munitions Response (MR QAPP). Multiple Geophysicist roles may be performed by a single individual (e.g., the QC Geophysicist may also perform the role of Seed Team Leader).

Prior to the initiation of geophysical survey data collection, all geophysical survey team personnel receive training on BSI installation methodology and field note protocol. The training includes an overall discussion of the survey approach and how the BSI, data collection, and field documentation tasks integrate into the overall program. Training also includes review of the internal QC procedures listed in this SOP. The QC Geophysicist is responsible for this training and any follow-up training deemed necessary.

8.1.1 Role and Responsibilities

- QC Geophysicist prepares the QC Seed Plan defining the seed types, depths, and frequency. Implements or delegates the seeding portion of the project. Designates and coordinates with the Seed Team, and tracks the geophysical results.
- Seed Team Leader buries blind seed items, records position and inclination, and completes Production Area QC Seeding Checklist.
- UXO Escort conducts UXO escort and anomaly avoidance activities for non-UXO qualified personnel during seed burial in potential MEC hazard areas. Must be a qualified UXO Technician II or higher.

8.1.2 Relevant Definitions

- Cued Classification: The method of collecting data for geophysical classification that involves placing the classification sensor directly over the source and recording data while stationary.
- Geophysical Classification: The use of geophysical data to classify anomalies as related to targets of interest or other source categories.
- Geophysical System: All equipment used for geophysical data collection, including the geophysical sensor, data logger, software and positioning equipment (e.g., Real-Time Kinematic Global Positioning System [RTK GPS] or line and fiducial equipment).
- ISO: a readily available standard-sized metallic test item.
- Multi-sensor Array: A geophysical system that includes multiple sensors.

8.2 PROCEDURE

8.3 HEALTH AND SAFETY

All elements of this procedure are to be conducted in accordance with the approved site safety and health plan (SSHP), including but not limited to specified requirements for training, personal protective equipment, exposure monitoring, air sampling, etc. The Unexploded Ordnance (UXO) Safety Officer (UXOSO) or designated representative reviews the relevant site-specific activity hazard analyses, prior to implementing this SOP.

8.3.1 QC Checks

If using a GPS, the Seed Team Leader performs the GPS functionality test (at least once per day) by placing the sensor directly over a known point, and recording the measured position either in the GPS controller or in the field team's logbook. The calculated distance between the measured and known point should meet the measurement performance criteria (MPC)/measurement quality objective for positioning listed in the WP or QAPP. The UXO escort checks their analog instrument at least once a day at the IVS or Instrument Test Strip (ITS). The analog instrument check results are documented in the Seed Team Leader's logbook.

8.3.2 Seeding Team

The QC Geophysicist or their designee leads the seeding team. A UXO Escort accompanies the Seed Team Leader to perform anomaly avoidance and excavations. ***No member of the seeding team is involved with DGM data acquisition or anomaly selection in the area(s) where they bury seed items.***

8.3.3 Seed Items

ISOs or inert munitions serve as the seed items. If inert munitions are used, they are painted blue prior to seeding to clearly indicate that they are inert. Table 1 shows the specifications for the possible ISOs and Figure 1 is a photograph of the three sizes of ISOs.

Table 1: INDUSTRY STANDARD OBJECT DIMENSIONS AND PART NUMBERS

Item	Nominal Pipe Size	Outside Diameter	Length	Part Number (1)	Schedule
Small ISO40	1"	1.315" (33 mm)	4" (102 mm)	44615K466	40
Small ISO80	1"	1.315" (33 mm)	4" (102 mm)	4550K226	80
Medium ISO40	2"	2.375" (60 mm)	8" (204 mm)	44615K529	40
Large ISO40	4"	4.500" (115 mm)	12" (306 mm)	44615K137	40

(1) Part number from the McMaster-Carr catalog (http://www.mcmaster.com/).

Figure 1: Examples of Small, Medium and Large ISOs

8.4 SEEDING PROCEDURES

8.4.1 Seed Location

The QC geophysicist prepares a list of proposed seed item locations, descriptions, depths, and inclinations and provides the list to the Seed Team Leader. The list will comply with the seeding requirements in the WP or QAPP. The seed items shall be placed at depths and inclinations for which the minimum expected response is known and can be compared with the responses measured during DGM.

The Seed team uses the Positioning System, or other navigational method, to find the proposed BSI location. The UXO escort uses anomaly avoidance procedures with the analog instrument to ensure no background metallic object is detectable within a 1-m radius. The seeding team modifies the seed item locations as needed to avoid pre-existing geophysical anomalies.

8.4.2 Seed Emplacement and Data Recording

The UXO escort digs a hole to the appropriate depth to bury the BSI as described on the list provided by the QC Geophysicist. While the BSI team has the latitude to change the BSI location to avoid preexisting metallic objects, they bury each BSI at the described depth (to the center of mass) and inclination. If the depth (to the center of mass), inclination, or type of seed item differs from the proposed seed item list the Seed Team Leader notes the differences and informs the QC Geophysicist. After the BSI has been placed in the hole, the BSI team eader records the location of the center of the BSI. An RTK GPS is used in areas with a sufficient view of the sky to achieve an RTK fixed position quality. Other positioning systems, such as a Robotic Total Station, or tape measures from established grid corners may be used in areas where RTK GPS is not effective. For each BSI, the BSI Team Leader records the following BSI data in their logbook or Tablet and forwards to the QC Geophysicist:

- Item ID
- Location (general description e.g., Grid ID)
- Description
- Depth
- Inclination
- Photo #/Name
- X
- Y
- Comments.

8.4.3 BSI Burial

After placing the BSI at the correct depth and inclination and measuring its location, the UXO escort replaces the dirt in the hole as completely as possible, without disturbing the BSI. The backfilled hole is leveled and any removed grass is replaced.

8.4.4 BSI Documentation

The QC Geophysicist records the BSI data in a separate BSI QC spreadsheet or database that is provided to the client's QA Geophysicist only. No DGM team member, Data Processor, or Intrusive Team member has access to the BSI documentation. The QC Geophysicist may release certain BSI documentation, if necessary to resolve a BSI detection or recovery failure, during a root cause analysis.

8.4.5 BSI Tracking

After the Data Processor completes DGM target selection and the Project Geophysicist has completed their review, the QC Geophysicist compares the BSI locations with the DGM target locations to determine if a DGM target meets the BSI location offset, and expected response MPCs. The BSI detection metrics are recorded in the separate BSI QC spreadsheet or database.

The QC Geophysicist notifies the Project Geophysicist and Project Manager immediately if a DGM dataset fails to meet the BSI MPCs. The Project Geophysicist performs a root cause analysis to determine why a BSI failed to meet the MPCs.

8.5 DATA MANAGEMENT

Blind Seed data are carefully managed to ensure it remains behind the firewall.

8.6 QUALITY CONTROL

This definable feature of work is performed during site preparation, and may continue throughout the project DGM task. Performance of the required QC checks are documented by the Site or Project Geophysicist in the project tracking spreadsheet or database, updated daily, and delivered weekly.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD ANALYSIS/RISK ASSESSMENT

This section is not applicable.

9.2 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the MPPEH holding area prior to commencing any MPPEH Management or Disposal activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in the SSHP, and be able to recognize the onset of heat stress disorders in themselves and their team members.

The potential for encountering MDEH comingled with MPPEH or MDAS is very low. Should MDEH be discovered, it will be left in place, the Senior UXO Supervisor (SUXOS) and the UXO Quality Control Specialist will be notified to investigate the occurrence and determine the corrective actions. The grid will have to undergo re-inspection.

In the event of severe weather or a natural disaster (e.g., earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan of the SSHP.

10. DISTRIBUTION

This section is not applicable.

11. DIAGRAMS

The project locations and site maps are located in the WP. Teams will be provided maps of the overall project site and evacuation routes.

12. REQUIRED EQUIPMENT AND MATERIALS

The following is a list of required equipment and materials.

12.1 EQUIPMENT

- RTK GPS unit to record the location of seed items (not required if using line/fiducial positioning).
- Excavation Tools: Picks, shovels, or a mini-excavator are used to dig a hole for the BSIs and to backfill the hole.
- Measuring Tape: A measuring tape or ruler is used to measure the depth of each BSI.
- Analog geophysical instrument with batteries.
- Range pole with level bubble and survey controller bracket.
- Digital Camera and white board.
- Communications equipment.

12.2 MATERIALS

- ISOs or inert munitions, as required in the WP or QAPP, are buried across the site as test items to confirm that the geophysics system is functioning correctly.
- Seed Team Leader's logbook.

13. EMERGENCY RESPONSE PROCEDURES

13.1 PREPARATION

The UXOSO will perform pre-emergency planning before starting field activities, during the mobilization, and also during the site set-up phase. The UXOSO will coordinate emergency response with police/security/fire/rescue personnel and emergency medical care. He/she will also verify emergency contact information, evacuation routes, and routes to emergency medical care.

All site personnel will receive an initial site-specific Safety Briefing, Ordnance Safety Briefing (tailored to their assignment), and a daily Tailgate Safety Briefing.

13.2 EXECUTION

The initial single point of contact for incidents on site will be the UXOSO. The SUXOS/UXOSO will make further notifications as appropriate. All incidents and injuries, no matter how seemingly insignificant, will be reported in a timely manner to the individual's supervisor and the UXOSO.

In the event of an ordnance-related event/emergency, all team members will be accounted for by their team leader. The team leader will assemble his/her team at their site vehicles and stand by for further instructions from the SUXOS/UXOSO.

In the event of an emergency requiring evacuation to the designated Safe Area, the evacuation signal will be given through verbal and/or radio instructions. Personnel will evacuate to a pre-determined evacuation point in the support zone identified at the Tailgate Safety Briefing. The UXOSO will account for all personnel and brief the SUXOS.

The UXOSO will summon emergency response personnel, if required. The UXOSO, or his/her designee, will meet and escort emergency personnel to the response location. Emergency response personnel will receive a time-expedient hazard control briefing (depending on current situation) on immediate hazards that may be present or associated with the emergency prior to access to the Exclusion Zone.

In the event of severe weather or a natural disaster (e.g., earthquake, tsunami, or very high winds, etc.), each team leader will account for all team members, assemble at the team vehicles, and wait for SUXOS/UXOSO instructions.

Further specific notifications and actions are detailed in the Accident Prevention Plan.

This space intentionally left blank

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

DIGITAL GEOPHYSICAL MAPPING

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

June 2022

This page intentionally left blank

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards (example: name, code, or telephone number changes, spelling corrections, references or referenced document locations).

REV.	DATE	SUMMARY OF CHANGE	REASON FOR REVISION
00	08/14/2018	N/A	Original Release
01	07/18/2019	Edited GCMR QAPP to MR QAPP, and minor edits.	Update to ISO 17025:2017 and annual review
02	04/14/2022	Added optional positioning systems, edited SOP names, included DGM field logbook and SARF to DGM team responsibilities, renamed Static Response Test to Sensor Function Test, added excessive sample separation to data gap causes, and made minor editing and formatting.	Internal review of SOP to update for current standards.

As prescribed by the industry standard object (ISO) 17025:2017, the Quality Manager and Technical Manager approve this Policy or Procedure and appropriately authorize its implementation in the USA Environmental, Inc. (USAE) Quality Management System.

This space intentionally left blank

This page intentionally left blank

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

Department of the Navy. 2019. *United States Navy Standard Operating Procedures for Development, Implementation, and Maintenance for Ammunition and Explosives*. NOSSA Instruction 8023.11D. 29 August.

This space intentionally left blank

This page intentionally left blank

4. TABLE OF CONTENTS

LIST OF ATTACHMENTS

This space intentionally left blank

This page intentionally left blank

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USAE during the operations at the Former Vieques Naval Training Range. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct site management operations.

Approved by Quality Manager:

_____ _____

Jason W. Wagner, CMQ/OE
Director – Corporate Quality and Safety

Date

Approved by Technical Manager:

_____ _____

Jeff Lewis
Technical Manager

Date

This space intentionally left blank

This page intentionally left blank

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the Worker's or Operator's Statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Supervisor's Name _____ Signature _____ Date _____

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the procedures addressed in the SOP. If I identify a hazard not addressed in the SOP, or encounter an operation I cannot perform in accordance with the SOP, I will stop the process and notify my immediate supervisor.

Worker's or Operator's Name	Worker's or Operator's Signature	Supervisor's Name	Supervisor's Signature	Date

This page intentionally left blank

8. STEP-BY-STEP PROCEDURES

8.1 PURPOSE AND SCOPE

The purpose of this SOP is to provide procedures and technical guidance in performing digital geophysical mapping (DGM) using a Geonics EM61-MK2 or EM61-MK2A (EM61), high-resolution time domain electromagnetic induction sensor, or other DGM sensor, positioned with a Real Time Kinematic Differential Global Positioning System (RTK DGPS) or another positioning system that outputs the required NMEA GGA location string (e.g., Robotic Total Station [RTS] or Simultaneous Localization and Mapping [SLAM] or line/station/fiducials [L/S/F]) for identifying both ferrous and non-ferrous metallic objects for anomaly detection.

This SOP outlines personnel qualifications and responsibilities, training requirements, preparatory activities, set-up and use of essential equipment, 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).

DGM data collection parameters are designed to meet project objectives as defined in the work plan (WP) or Quality Assurance Project Plan (QAPP).

To ensure that the instrumentation can attain an acceptable measure of performance, a Geophysical System Verification (GSV) Instrument Verification Strip (IVS) is installed and the results evaluated prior to the start of DGM field activities (see *SOP DGM 01 Instrument Verification System [IVS] Setup and Use*). The primary objectives of the GSV are to validate the use of the EM61 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.

DGM data collection involves navigating the sensor along transects at a transect spacing designed to meet the project objectives with respect to detection performance of suspected targets of interest (TOI) in the subsurface. The detection objectives and resultant transect spacing are identified in the WP or QAPP.

The observed signals measured by the DGM sensor are composed of 1) the response of potential buried targets, 2) the self-signature of the sensor system, and 3) any response from the ambient environment in which the target is buried. To isolate responses associated with buried discrete metal objects, a background model comprised of the latter two contributing signals must be derived and removed from the raw data. The resulting 'leveled' signal data, (raw data – background model) are used as inputs into a detection algorithm where anomalous responses due to potential targets of interest are mapped and selected for further investigation. Details of the data processing and analysis of dynamic data are covered in USAE *SOP DGM 04.00 Digital Geophysical Processing and Interpretation*.

8.2 PERSONNEL RESPONSIBILITIES

The qualifications of the personnel implementing this SOP are documented in the WP or Uniform Federal Policy QAPP (UFP QAPP) or Munitions Response (MR QAPP). Multiple Geophysicist roles may be performed by a single individual (e.g., the Site Geophysicist may also perform the role of Field Geophysicist and Data Processor). Each team member must demonstrate the ability to perform their assigned task associated with the geophysical investigation equipment at the IVS.

Prior to the initiation of geophysical survey data collection, all geophysical survey team personnel receive training on survey methodology, data requirements, and field note protocol. The training includes an overall discussion of the survey approach and how the data collection and field documentation tasks integrate into the overall program. Training also includes review of the internal QC procedures listed in this SOP. The Site Geophysicist is responsible for this training and any follow-up training deemed necessary.

8.2.1 Roles and Responsibilities

The following personnel are involved in DGM.

- Project Geophysicist: designs the geophysical approach for the project and monitors the data acquisition.
- Site Geophysicist: oversees IVS construction and testing and manages the DGM data collection.
- UXO Escort: conducts MEC escort and anomaly avoidance activities during DGM. Must be a qualified UXO Technician II or higher.
- DGM team: maintains the field DGM log book, completes the Attachment 1 Survey Area Report Form (SARF), collects DGM data and transfers each day's QC and production data, scanned log book and SARF, to the Data Processor.
- Data Processor: processes the DGM QC and production data and forwards the results in the QC Geophysicist.
- QC Geophysicist: reviews all processed DGM data, evaluates DGM QC and production metrics, and delivers approved processed data to the QA Geophysicist.

Note: Multiple geophysicist roles may be performed by a single individual (e.g., the Site Geophysicist may also perform the roles of Field Geophysicist and Data Processor).

8.3 PROCEDURE

8.3.1 Health and Safety

All elements of this procedure are conducted in accordance with the approved site safety and health plan, including but not limited to specified requirements for training, personal protective equipment, exposure monitoring and air sampling, etc. The UXOSO or designated representative reviews the relevant site-specific activity hazard analyses, prior to implementing this SOP.

8.3.2 DGM Data Acquisition Team

The Field Geophysicist leads the DGM team. A UXO Escort accompanies the team leader if the work area has not previously been surface swept. If no UXO Escort is required, at least one additional person works with the Field Geophysicist. At some sites with rough terrain or difficult conditions, there may be a third or fourth team member.

8.4 DGM DATA ACQUISITION PROCEDURES

8.4.1 Production Area Layout and Methods

Prior to collecting DGM data, the site is prepared in accordance with the WP or QAPP. This may include vegetation removal, surface clearance, establishing site survey control, and blind seeding. Because there is a potential that ordnance could have been disposed of in these areas, the UXO Technician II also identifies any suspect ordnance item, flags it, records the location, and directs the DGM survey team to avoid the location. If LSF positioning is to be used, each survey area needs to be set up with marked survey lines and fiducial points.

8.4.2 Data Collection Parameters

Final data collection parameters are determined based on the evaluation of the initial IVS data, and documented in the IVS Memorandum. These parameters include:

- Lane spacing
- Sensor height
- Data collection speed (sample separation).

8.5 DGM DATA COLLECTION

The following set of procedures is subdivided into procedures for the RTK DGPS and procedures followed for geophysical surveys.

8.5.1 Geophysical Data Collection

- Mount the Positioning System rover antenna on the DGM sensor using the antenna mount (single sensor or towed array). The antenna should be mounted and centered directly above the particular geophysical sensor for optimum positioning and the position recorded. Skip this step if using LSF positioning.
- Turn on the DGM sensor and Positioning System rover, if used. Perform morning daily QC tests.
- Proceed with the geophysical survey. Daily survey procedures include:
  - Sensor warm-up, for at least 15 minutes.
  - Inspect system and perform any required preventative maintenance (e.g., check cables/connectors, tighten fasteners).
  - Sensor nulling and positioning input check (operator at typical handle distance from the coil).
  - Input and record file name for survey.
  - Acquire survey data along the longest area survey line.
  - One team member marks the sensor wheel periodically along the survey line and moves the survey line markers on each pass.
  - 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.
- Inspect system and perform any required preventative maintenance (e.g., check cables/connectors, tighten fasteners).
- Secure the DGM sensor and positioning equipment.
- Charge all batteries overnight.
- Photocopy/scan the day’s field logbook pages and SARF 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 the next day's activities.
- One member of the team is responsible for maintaining the logbook and completing the SARF. 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 is dated, sequentially numbered, and identified by the logbook number; all entries are signed. The assigned DGM team member provides photocopies of the logbook pages to the Site Geophysicist at the end of each DGM work day.

8.5.2 Daily QC Tests

The DGM team performs all of the daily QC tests described below that are listed in the WP or QAPP. The Site Geophysicist/Data Processor reviews the QC test results and documents those results in the project QC database or QC tracking spreadsheet.

Daily Positioning System Check: The Positioning System base station is set up at the established site survey control point. The rover is used to measure a second site survey control point to ensure that the base station is set up and operating properly.

Sensor Function Test: The DGM team performs the static response test at least once each day of the DGM data acquisition. This test involves collecting background data with the instrument in a static (stationary) mode for approximately one minute, collecting data using a test item for approximately one minute, and then collecting background data again for approximately one minute. The test item is constructed to position the metallic test item in a consistent position. The Data Processor reviews the response (e.g., for each individual EM61 time gate) and compares it to expected responses for this item. The Data Processor documents the measured responses in the project QC database or QC tracking spreadsheet and notifies the Project Geophysicist if the Static Response Test MPC is not met. The response measured by each sensor is dependent on both the type of system being used (towed array vs. man-portable) and, in the case of the towed array, the location of the sensor in the array. Therefore, expected responses for each sensor are developed based on the results of testing performed at the beginning of data collection.

IVS Data Collection: The DGM team collects data over the IVS as described in USAE *SOP DGM 01, Instrument Verification Strip (IVS) Setup and Use.*

8.5.3 Dynamic EM61-MK2 Data Acquisition

The DGM team 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) are documented in the positioned sensor data maps and may be used for subsequent characterization/clearance following traditional analog and dig techniques. Data gaps that are the result of line spacing or excessive sample separation over the defined acceptable spacing and sample separation are determined by the Data Processor and provided to the Field Geophysicist for recollection as necessary. Data acquisition is performed using the following steps:

1. The instrument operator confirms that the geophysical and positioning equipment is functioning and the data logger is recording data.
2. Beginning along one edge of the survey area, the instrument operator tows or carries the equipment to the far side of the investigation area.
3. One member of the DGM team marks the inner edge of the survey line.
4. The instrument operator reverses direction and tows or carries the equipment back across the investigation area along the marked line parallel to the previous line.
5. The instrument operator repeats steps 1 through 4 until survey is completed.

Positioning: Positioning in the data is captured through the use of the Positioning system or L/S/F identifiers in the data. RTK GPS is used to position all data collected in areas where it is expected that RTK DGPS initialization can be maintained (i.e., no overhead canopy to block GPS signal), hand-held GPS positioning may be used for density transect data collection under canopy, and L/S/F positioning is used for data collection under canopy. RTS or SLAM equipment may be used for positioning data under canopy in some site conditions. DGM data collected with RTK GPS, RTS. SLAM or L/S/F positioning are considered usable for the reacquisition and intrusive investigation of anomalies identified in the data. Data positioned using hand-held GPS are only considered acceptable for determining across-site anomaly densities.

Data Quality Monitoring: During data acquisition, the DGM team monitors the integrity and quality of the data by inspecting the DGM data collection screen to ensure that the sensor and position data are being recorded on the data logger and that the responses measured by each sensor appear reasonable (i.e., not 'flat-lined' or excessively variable).

Documenting Inaccessible Areas: Some portions of the investigation area may be inaccessible due to rough terrain, obstructions or vegetation. The field team documents the inaccessible areas on the SARF and by one of the following methods:

- Collecting a line of data outlining the inaccessible area and using the line name to indicate the type of obstruction;
- Collecting Positioning System points defining the inaccessible area; or
- Outlining the inaccessible area on a map of the investigation area.
- The DGM team leader may also take a digital photograph of each obstruction.

8.6 RELEVANT DEFINITIONS

- Geophysical System – All equipment used for geophysical data collection, including the geophysical sensor, data logger, software and positioning equipment (e.g., RTK GPS or line and fiducial equipment).
- ISO: A readily available standard-sized metallic test item.
- Multi-sensor Array – A geophysical system that includes multiple sensors.
- Grid – Areas where DGM data acquisition is performed with the intent of fully covering all accessible areas along parallel paths set at a predetermined line spacing.
- Transects – DGM data collection mode that involves traversing the investigation area along parallel lines.
- L/S/F – Method for positioning DGM data without the use of GPS by linearly interpolating positions along parallel paths set at a predetermined line spacing.

8.7 DATA MANAGEMENT

Input data for this SOP are the ongoing, daily Positioning System checks, twice daily dynamic IVS and background noise line checks, any daily Static Spike checks, and copies of the DGM team leader's logbook. Performance and acceptability of the initial IVS data is documented in an IVS Memorandum. The results of the ongoing IVS and Static testing are tracked in the IVS spreadsheet, or the project database. The Position System checks are recorded in the Positioning System tracking spreadsheet or project database.

8.8 QUALITY CONTROL

The DGM teams conduct and document the daily quality control test listed above, and meet the QC metrics specified in the WP or UFP QAPP.

The UXOQCS verifies the quality of the task through the three-phased surveillance process and documents the results on the check sheet. Any DGM tasks the UXOQCS determines to not meet the QC metrics are considered deficient or non-conforming. If the deficiency or nonconformance cannot be resolved

immediately, the UXOQCS prepares a nonconformance report and submits it to the Senior UXO Supervisor (SUXOS). The UXOQCS conducts an analysis of the cause of the deficiency or nonconformance and prepares and submits a response to the project manager within 48 hours.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD ANALYSIS/RISK ASSESSMENT

This section is not applicable.

9.2 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the material potentially presenting an explosive hazard (MPPEH) holding area prior to commencing any MPPEH Management or Disposal activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in the mSite Safety and Health Program (SSHP), and be able to recognize the onset of heat stress disorders in themselves and their team members.

The potential for encountering material documented as an explosive hazard (MDEH) comingled with MPPEH or material documented as safe is very low. Should MDEH be discovered, it will be left in place, and the SUXOS and the UXOQCS will be notified to investigate the occurrence and determine the corrective actions. The grid will have to undergo re-inspection.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS or Site Manager for instructions, and follow the Emergency Response Plan of the SSHP.

10. DISTRIBUTION

This section is not applicable.

11. DIAGRAMS

The project locations and site maps are located in the WP. Teams will be provided maps of the overall project site and evacuation routes.

12. REQUIRED EQUIPMENT AND MATERIALS

The following is a list of required equipment and materials.

12.1 EQUIPMENT

The following is a list of required equipment and materials for EM61 DGM:

- EM61 with all cables, battery, data logger, and RTK DGPS rover mount
  - Standard wheel mount configuration,
  - Stretcher Mode configuration, or
  - Towed Array.
- RTK DPS base and rover, at a minimum, exporting the NMEA GGA string at 1 Hz.
- Battery chargers for EM61, data logger, and rover.
- Data Logger.
- Digital Camera.
- Field Computer.

- Measuring Tape.
- Communications equipment.
- First-Aid Kit.
- Fire extinguisher.
- Inclement weather gear, as needed.

12.2 MATERIALS

- Standard Test Item (e.g., small ISO).
- Survey line marking (bucket of sand bags and gripper).
- DGM team leader's logbook.
- Spare sensor and positioning system batteries.

13. EMERGENCY RESPONSE PROCEDURES

13.1 PREPARATION

The UXOSO will perform pre-emergency planning before starting field activities, during the mobilization, and also during the site set-up phase. The UXOSO will coordinate emergency response with police/security/fire/rescue personnel and emergency medical care. He/she will also verify emergency contact information, evacuation routes, and routes to emergency medical care.

All site personnel will receive an initial site-specific Safety Briefing, Ordnance Safety Briefing (tailored to their assignment), and a daily Tailgate Safety Briefing.

13.2 EXECUTION

The initial single point of contact for incidents on site will be the UXOSO. The SUXOS/UXOSO will make further notifications as appropriate. All incidents and injuries, no matter how seemingly insignificant, will be reported in a timely manner to the individual's supervisor and the UXOSO.

In the event of an ordnance-related event/emergency, all team members will be accounted for by their team leader. The team leader will assemble his/her team at their site vehicles and stand by for further instructions from the SUXOS/UXOSO.

In the event of an emergency requiring evacuation to the designated Safe Area, the evacuation signal will be given through verbal and/or radio instructions. Personnel will evacuate to a pre-determined evacuation point in the support zone identified at the Tailgate Safety Briefing. The UXOSO will account for all personnel and brief the SUXOS.

The UXOSO will summon emergency response personnel, if required. The UXOSO, or his/her designee, will meet and escort emergency personnel to the response location. Emergency response personnel will receive a time-expedient hazard control briefing (depending on the current situation) on immediate hazards that may be present or associated with the emergency prior to access to the Exclusion Zone.

In the event of severe weather or a natural disaster (earthquake, tsunami, or very high winds, etc.), each Team Leader will account for all team members, assemble at the team vehicles, and wait for SUXOS/UXOSO instructions.

Further specific notifications and actions are detailed in the Accident Prevention Plan.

This page intentionally left blank

ATTACHMENT 1.
SURVEY AREA REPORT FORM (SARF)

This page is intentionally left blank.

SURVEY AREA REPORT FORM

Project Name: _____ **Project Location:** _____

Geophysical Contractor: USA Environmental **Field Team:** _____

Coordinate System (w/ units): _____ **Survey Type:** _____

Survey Area ID: _____ **Date:** _____

Data File Name: _____

Geophysical Instrumentation: _____ **Serial Number:** _____

Navigation Method: RTK DGPS **Serial Number:** _____

Battery: Trans 1 _____ **Trans 2** _____ **Trans 3** _____ **Trans 4** _____

Data Collection: Start Time: _____ **End Time:** _____

Terrain:

☐ Level ☐ Moderate Slope ☐ Steep
☐ Rolling ☐ Ruts ☐ Gullies
☐ Rocky ☐ Swampy ☐ Dangerous

Tree Cover: Tree Height: _____
☐ None ☐ Light ☐ Medium ☐ Thick

Weather:

☐ Sunny ☐ Cloudy ☐ Drizzle
☐ Rain ☐ Thunderstorms ☐ Hail
☐ Fog ☐ Humid ☐ Snow

Brush:

☐ None ☐ Light ☐ Medium ☐ Thick

Sketch of Survey Area- include North arrow, approximate scale, brief description of terrain, site conditions, and any surface features potentially affecting the data quality or coverage.

Additional Comments

This page intentionally left blank

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

DIGITAL GEOPHYSICAL PROCESSING AND INTERPRETATION

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

June 2022

This page intentionally left blank

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards (example: name, code, or telephone number changes, spelling corrections, references or referenced document locations).

REV.	DATE	SUMMARY OF CHANGE	REASON FOR REVISION
00	08/14/2018	N/A	Original Release
01	10/05/2018	Section 5.1.2 rewritten. Section 5.1.5 rewritten to include discussion of NRL curves. Section 6 references added.	External audit corrective action
02	07/18/2019	Edited GCMR QAPP to MR QAPP, deleted Data Processor's seed check in section 5.1.6.2, and minor edits	Update to ISO 17025:2017 and annual review
03	4/14/2022	General edits and formatting, added RTS and SLAM positioning systems, added the standard preprocessing export of *.m61 files, included calculated response curves, edited Static Test to Sensor Function Test, added polygon boundary and centroid to dig list, edited daily Quality Control (QC) checks for completeness, and edited the QC Geophysicist deliveries.	Internal review of SOP to update for current standards.

As prescribed by the industry standard object (ISO) 17025:2017, the Quality Manager and Technical Manager approve this Policy or Procedure and appropriately authorize its implementation in the USA Environmental, Inc. (USAE) Quality Management System.

This page intentionally left blank

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

Geonics Limited, Inc., DAT61MK2 Software User Manual, Version 2.50, 2013

Geomar Software, Inc., TrackMakerMK2 Software User Manual

Geomar Software, Inc., ML61MK2xpn Software User Manual

Department of the Navy. 2019. *United States Navy Standard Operating Procedures for Development, Implementation, and Maintenance for Ammunition and Explosives*. NOSSA Instruction 8023.11D. 29 August.

This space intentionally left blank

This page intentionally left blank

4. TABLE OF CONTENTS

This space intentionally left blank

This page intentionally left blank

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USAE during the operations at the Former Vieques Naval Training Range. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct site management operations.

Approved by Quality Manager:

_____ _____

Jason W. Wagner, CMQ/OE
Director – Corporate Quality and Safety

Date

Approved by Technical Manager:

_____ _____

Jeff Lewis
Technical Manager

Date

This space intentionally left blank

This page intentionally left blank

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Supervisor's Name _____ Signature _____ Date _____

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the procedures addressed in the SOP. If I identify a hazard not addressed in the SOP, or encounter an operation I cannot perform in accordance with the SOP, I will stop the process and notify my immediate supervisor.

Worker's or Operator's Name	Worker's or Operator's Signature	Supervisor's Name	Supervisor's Signature	Date

This page intentionally left blank

8. PROCEDURE

8.1 DIGITAL GEOPHYSICAL MAPPING (DGM) DATA PROCESSING

The processing of DGM data is achieved in the following steps:

- Data import and initial QC
- Leveling (e.g., background removal)
- Latency correction
- Gridding
- Target selection.

8.1.1 Data Import and Initial QC

For line/station/fiducial (L/S/F)-positioned data, DAT61MK2, or similar software is used to locate the start and end points for each line as well as any mid-line fiducial point recorded. For data collected with Real Time Kinematic Differential Global Positioning System (RTK DGPS), Robotic Total Station (RTS), or Simultaneous Localization and Mapping (SLAM) positioning, the Data Processor uses DAT61MK2, Trackmaker61MK2, or Multi61MK2 to merge collected position data with the collected DGM sensor response data. Once data have been positioned, the Data Processor exports ASCII format *.m61, or *.xyz files. For Digitally-positioned *.xyz data, the following export parameters are used:

- 5 second time gap
- Output file format: Geosoft
- Amplitude: linear
- Geodetic coordinate system: UTM format (or other system described in the Work Plan (WP)/Quality Assurance Project Plan (QAPP)
- Export Time, Quality Indicator and DGM data.

The Data Processor imports the ASCII *.m61 or *.xyz files into to a Geosoft Database (*.gdb) using a purpose-built utility in Oasis Montaj.

8.1.2 Leveling

The data processor applies a median filter to the raw data to derive an estimate of the background model, then subtracts that model from the raw data to provide a background removed or ‘leveled’ data set. Correctly leveled data should not contain large areas with negative readings, significant numbers of negative spikes, or long lines of elevated response that cannot be reasonably explained by changes in geology or potential subsurface metal.

8.1.3 Latency Correction

After the data have been leveled, the Data Processor examines either the profiles or a map of the gridded data to determine the appropriate latency correction. The Data Processor applies a range of latency corrections and determines the correction that best aligns profile peaks collected in opposite directions, or reduces the chevron shapes around large anomalies in the gridded data. The correct application of latency time results in anomalies with straight edges, unbiased by line direction.

8.1.4 Gridding

The Data Processor uses a standard Geosoft Oasis Montaj tool to grid the leveled and latency corrected data into a fine grid, typically at a 10-centimeter resolution for visualization and map making.

8.1.5 Target Selection

The initial anomaly selection threshold is based on a combination of the IVS dynamic background root mean square noise levels, derived from IVS survey background line, multiplied by 5 or 6, or as specified in the WP or QAPP, and the published or calculated response curves for the smallest anticipated target of interest. Other anomaly characteristics identified as useful in target selection (such as footprint size, decay constant, signal to noise ratio) may be used to add or remove targets, as appropriate. The Data Processor may also mask anomalies associated with known site features or obstacles (e.g., manhole cover, or fire hydrant), as well as add anomalies not automatically picked by the software, typically along data edges. If the dataset includes large anomalies that cannot be adequately investigated with a single anomaly, the Data Processor either selects multiple anomalies to cover the anomaly footprint, or defines a polygon covering the entire anomaly footprint. If a polygon is established, the boundary points are included on the dig list for reacquisition, along with a polygon centroid location for intrusive results recording.

The QC Geophysicist, or their designee, reviews the anomaly selections and manually makes additions or deletions (masks) to the Data Processor's target list. All targets above the response threshold, as well as manual additions are exported to the Excel dig list or Access database anomaly table, with all pertinent response and secondary characteristic information.

8.1.6 Assessment of Quality Control of Dynamic DGM data

8.1.6.1 Standard QC Checks

During the course of the dynamic DGM survey, the field team collects QC checks on a daily basis to verify consistent operation of the sensor and associated components. The Data Processor evaluates these QC datasets to confirm that the geophysical system was functioning correctly to help validate the production DGM data collected that day.

The Data Processor records the static background and response values in the project QC Tracking Spreadsheet or database and confirms that they meet the Sensor Function Test Measurement Performance Criteria (MPC). The process for evaluating the IVS tests is described in *SOP DGM 01, Instrument Verification Strip (IVS) Setup and Use.* The Data Processor also assesses other MPCs specified in the WP/QAPP (e.g. along line sample separation, velocity, and coverage, as necessary), and records the results in the project QC Tracking Spreadsheet or database. The Data Processor notifies the Project and QC Geophysicists of any results that do not pass the MPCs. The Project or QC Geophysicist takes the appropriate action specified in the WP/QAPP. Depending upon the findings of the root cause analysis, the survey data associated with the MPC failure may need to be re-collected.

8.1.6.2 Blind Seed Item (BSI) QC

The QC Geophysicist assesses each day's production DGM data for BSI detection (anomaly is placed on the target list), and that the BSI response value and location accuracy are within the project MPCs for each BSI. The QC Geophysicist maintains a separate QC Seed Tracking Spreadsheet or database BSI table to document the BSI results, and periodically delivers the QC Seed results to QA. The Project Geophysicist is notified of any BSI MPC failure, and an RCA is initiated. Depending on the results of the RCA, the production DGM data associated with the BSI MPC failure may need to be recollected.

8.1.7 Data Outputs

The Data Processor produces the following data products:

- Daily QC Tracking Spreadsheet or database updates with QC measurement results (*.xlsx or *.accdb)
- Final response data in Geosoft formats (*.gdb)
- Final grids of sensor data in Geosoft format (*.grd)

- DGM data maps containing picked targets in Geosoft format (*.map) and image format (*.tif, *.pdf, or *.jpg)
- Selected Target list in Excel format (*.csv) and in the project database Anomaly Table (*.accdb).

8.2 PERSONNEL RESPONSIBILITIES

The qualifications of the personnel implementing this SOP are documented in the WP or Uniform Federal Policy Quality Assurance Project Plan (UFP QAPP) or Munitions Response (MR QAPP). Multiple Geophysicist roles may be performed by a single individual (e.g., the Site Geophysicist may also perform the role of Field Geophysicist and Data Processor). Each team member must demonstrate the ability to perform their assigned task associated with the geophysical investigation equipment at the initial IVS.

Prior to the initiation of geophysical survey data collection, all geophysical survey team personnel receive training on survey methodology, data requirements, and field note protocol. The training includes an overall discussion of the survey approach and how the data collection and field documentation tasks integrate into the overall program. Training also includes review of the internal QC procedures listed in this SOP. The Site Geophysicist is responsible for this training and any follow-up training deemed necessary.

8.2.1 Role and Responsibilities

The following personnel are involved in DGM:

- Project Geophysicist designs geophysical approach for the project, monitors EM61-MK2 data processing, and regularly reviews project QC database.
- QC Geophysicist reviews the daily Sensor Function Test and IVS testing results and verifies IVS and production DGM results are documented in the QC tracking spreadsheet or database, and makes delivery of DGM data, and QC Seed Tracking to the Client.
- Site Geophysicist oversees IVS construction and testing, and manages daily DGM production.
- Data Processor processes IVS and production DGM data and documents results in the tracking spreadsheet or QC database.

8.3 DATA MANAGEMENT

Input data for this SOP are the ongoing, daily position system checks, twice daily sensor function tests and dynamic IVS and background noise line checks, copies the DGM team leader's logbook and Survey Area Report Form, and production DGM data. Performance and acceptability of the initial IVS data is documented in an IVS Memorandum. The results of the ongoing position system checks, sensor function tests, IVS testing and production data are tracked in the Tracking spreadsheet or project database.

8.4 QUALITY CONTROL

This definable feature of work is performed throughout the project DGM task. Performance of the required QC checks are documented by the Data Processor or QC Geophysicist in the Tracking Spreadsheet or project database, updated daily, and delivered weekly. A comprehensive root cause analysis is performed and a corrective action determined for any data failing the applicable MPCs/measurement quality objectives (MQOs). The Project and/or QC Geophysicist are notified of any sudden changes identified in the IVS or production data, even if the results still meet the MPCs/MQOs. Any such changes receive a thorough examination of the data with the intent to resolve potential equipment/procedure issues before a failure occurs.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD ANALYSIS/RISK ASSESSMENT

This section is not applicable.

9.2 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the material potentially presenting an explosive hazard (MPPEH) holding area prior to commencing any MPPEH Management or Disposal activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in the Site Specific Health Plan (SSHP), and be able to recognize the onset of heat stress disorders in themselves and their team members.

The potential for encountering material documented as an explosive hazard (MDEH) comingled with MPPEH or material documented as safe is very low. Should MDEH be discovered, it will be left in place, the Senior Unexploded Ordnance Supervisor (SUXOS) and the UXO Quality Control Specialist will be notified to investigate the occurrence and determine the corrective actions. The grid will have to undergo re-inspection.

In the event of severe weather or a natural disaster (e.g., earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXO Safety Officer (UXOSO), SUXOS or Site Manager for instructions, and follow the Emergency Response Plan of the SSHP.

10. DISTRIBUTION

This section is not applicable.

11. DIAGRAMS

The project locations and site maps are located in the WP. Teams will be provided maps of the overall project site and evacuation routes.

Site maps are located in the WP or QAPP.

12. REQUIRED EQUIPMENT AND MATERIALS

The following is a list of required equipment and materials:

12.1 EQUIPMENT

- Computer with:
  - Licensed Geosoft Oasis montaj – software for geophysical data processing and anomaly selection.
  - DGM data collection software – software to merge sensor and positioning data or assign positions to sensor data using line/station/fiducials, and for converting positioned raw data files to ASCII format.
  - Magmap or Multi61MK2– software for collecting and positioning towed array data and exporting positioned data to ASCII file format.

12.2 MATERIALS

- Scan of DGM team leader’s Logbook and Survey Area Report Form

13. EMERGENCY RESPONSE PROCEDURES

13.1 PREPARATION

The UXOSO will perform pre-emergency planning before starting field activities, during the mobilization, and also during the site set-up phase. The UXOSO will coordinate emergency response with

police/security/fire/rescue personnel and emergency medical care. He/she will also verify emergency contact information, evacuation routes, and routes to emergency medical care.

All site personnel will receive an initial site-specific Safety Briefing, Ordnance Safety Briefing (tailored to their assignment), and a daily Tailgate Safety Briefing.

13.2 EXECUTION

The initial single point of contact for incidents on site will be the UXOSO. The SUXOS/UXOSO will make further notifications as appropriate. All incidents and injuries, no matter how seemingly insignificant, will be reported in a timely manner to the individual's supervisor and the UXOSO.

In the event of an ordnance-related event/emergency, all team members will be accounted for by their team leader. The team leader will assemble his/her team at their site vehicles and stand by for further instructions from the SUXOS/UXOSO.

In the event of an emergency requiring evacuation to the designated Safe Area, the evacuation signal will be given through verbal and/or radio instructions. Personnel will evacuate to a pre-determined evacuation point in the support zone identified at the Tailgate Safety Briefing. The UXOSO will account for all personnel and brief the SUXOS.

The UXOSO will summon emergency response personnel, if required. The UXOSO, or his/her designee, will meet and escort emergency personnel to the response location. Emergency response personnel will receive a time-expedient hazard control briefing (depending on current situation) on immediate hazards that may be present or associated with the emergency prior to access to the Exclusion Zone.

This space intentionally left blank

This page intentionally left blank

1. TITLE PAGE

STANDARD OPERATING PROCEDURE

REACQUISITION OF DGM TARGETS

Munitions and Explosives of Concern Removal
Former Vieques Naval Training Range
Vieques Island, Puerto Rico

USA ENVIRONMENTAL, INC.

June 2022

This page intentionally left blank

2. RECORD OF CHANGES

The following section identifies any major or minor changes to this standard operating procedure (SOP).

- Major change: Change to SOP that adds operational hazards, or new hazardous items. Change to or revision of supplemental documents could be classified as major change, if the change or revision modifies the operational procedures to the point that safety is affected, or the change or revision introduces new hazards.
- Minor change: Change to an SOP that does not provide additional hazards, additions of new hazardous items, or changes in methods used to eliminate or mitigate hazards (example: name, code, or telephone number changes, spelling corrections, references or referenced document locations).

REV.	DATE	SUMMARY OF CHANGE	REASON FOR REVISION
00	08/14/2018	N/A	Original Release
01	10/05/2018	Changes made to clarify AGC reacquisition versus DGM.	Internal Audit
02	07/18/2018	Edited GCMR QAPP to MR QAPP, Analog Test Strip to Instrument Test Strip (ITS), and minor edit.	Update to ISO 17025:2017 and annual review
03	4/14/2022	General edits and formatting, added SLAM positioning and made digital positioning more generic, edited Static Test to Sensor Function Test, deleted advance classification text, clarifies transect definition, with spacing defined in Work Plan (WP) or QAPP.	Internal review of SOP for update for current standards.

As prescribed by the industry standard object (ISO) 17025:2017, the Quality Manager and Technical Manager approve this Policy or Procedure and appropriately authorize its implementation in the USA Environmental, Inc. (USAE) Quality Management System.

This page intentionally left blank

3. REFERENCES

The following references apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, it may be necessary to consult other SOPs and regulatory references.

Department of the Navy. 2019. *United States Navy Standard Operating Procedures for Development, Implementation, and Maintenance for Ammunition and Explosives*. NOSSA Instruction 8023.11D. 29 August.

This space intentionally left blank

This page intentionally left blank

4. TABLE OF CONTENTS

This space intentionally left blank

This page intentionally left blank

5. RECORD OF DEVELOPMENT, REVIEW, VALIDATION AND APPROVAL

This SOP contains the procedures and other information that will be needed by USAE during the operations at the Former Vieques Naval Training Range. By signature, the undersigned certifies that this SOP is approved for implementation at the project site and will be used to direct site management operations.

Approved by Quality Manager:

_____ _____

Jason W. Wagner, CMQ/OE
Director – Corporate Quality and Safety

Date

Approved by Technical Manager:

_____ _____

Jeff Lewis
Technical Manager

Date

This space intentionally left blank

This page intentionally left blank

6. SUPERVISOR'S STATEMENT OR PROCESS SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the Worker's or Operator's Statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Supervisor's Name	Signature	Date

7. WORKER'S OR OPERATOR'S STATEMENT

I have read this SOP and I have received adequate training to perform the procedures addressed in the SOP. If I identify a hazard not addressed in the SOP, or encounter an operation I cannot perform in accordance with the SOP, I will stop the process and notify my immediate supervisor.

Worker's or Operator's Name	Worker's or Operator's Signature	Supervisor's Name	Supervisor's Signature	Date

This page intentionally left blank

8. PURPOSE AND SCOPE

The purpose of this SOP is to provide the minimum procedures applicable to Digital Geophysical Mapping (DGM) target reacquisition.

8.1 PERSONNEL RESPONSIBILITIES

The qualifications of the personnel implementing this SOP are documented in the WP or Uniform Federal Policy Quality Assurance Project Plan (UFP QAPP) or Munitions Response (MR QAPP). Prior to the initiation of reacquisition of DGM anomalies, all reacquisition team personnel receive training on stakeout methodology, data requirements, and field note protocol. The training includes an overall discussion of the reacquisition approach and how the data collection and field documentation tasks integrate into the overall program. Training also includes review of the internal Quality Control (QC) procedures listed in this SOP. The Field Geophysicist is responsible for this training and any follow-up training deemed necessary.

8.1.1 Role and Responsibilities

The following personnel are involved in the Reacquisition of DGM targets:

- Data Processor– Exports final formatted DGM dig list
- Senior Unexploded Ordnance Supervisor (SUXOS) or Reacquisition Team Leader – Schedules and manages Reacquisition with Intrusive operations.
- Reacquisition Team Leader – Records the results of daily reacquisition QC tests in their logbook and reacquires geophysical anomalies.
- Trained Geophysical Instrument Operators – Operates positioning system and DGM sensor, if required.

8.2 PROCEDURE

The Reacquisition Team Leader is supplied with a dig list (*.csv) containing the IDs and locations of selected DGM anomalies. This dig list is loaded onto the positioning system's survey controller (Real-time Kinematic [RTK] Differential Global Positioning System [DGPS], Robotic Total Station [RTS], Simultaneous Localization and Mapping [SLAM]), and is linked to the current positioning system job.

8.3 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, exposure monitoring and air sampling, etc. The UXO Safety Officer (UXOSO) or designated representative will review the relevant site-specific activity hazard analyses prior to implementing this SOP.

8.3.1 Function Tests

The Field Team Leader will perform the RTK DGPS/RTS/SLAM back check, at least once per day, by placing the sensor directly over a known point, and recording the measured position either in the positioning system's controller or in the field team's logbook. The calculated distance between the measured and known point should meet the Measurement Performance Criteria (MPC) for positions listed in the WP/QAPP.

The Field Team Leader will perform a DGM sensor function test at least once per day according to the instructions in *SOP DGM-03, Digital Geophysical Mapping*. The Field Team Leader will record the results of these tests in their logbook and provide these data to the QC Geophysicist, who will enter the results in the project QC database or tracking spreadsheet. Note: This function test is not required if the Intrusive Team is responsible for refining each anomaly. Also, if an Analog Detector is used, the team leader records the daily instrument check results at the ITS in their logbook, and provides the data to the QC Geophysicist

8.3.2 Anomaly Reacquisition in Grids

Prior to beginning intrusive activities, the Field Team Leader will use a RTK DGPS unit, robotic total station, SLAM or tape measures to navigate to the location of each anomaly to be investigated intrusively. Once the anomaly location has been reacquired, field team members perform a survey in multiple directions in a 1-meter (m) radius (or search radius defined in the WP/QAPP) around the flagged location using the DGM or Analog metal detector. The team will then flag for excavation the location of the highest response value within the search radius. If the location of the highest response is more than 0.5m from the selected location the Team Leader will record the offset distance and direction. The flagged location is recorded with the positioning system or by noting the offset from the initial measured location.

If no single point within the search radius can be determined to be an anomaly location (i.e., if all readings remain below the anomaly selection threshold), the reacquisition result will be recorded as a "no contact."

In the case of polygonal anomalies, the reacquisition team flags the identified boundary points of the polygon.

8.3.3 Anomaly Reacquisition for Transects

As described above for grid-based data, the Field Team Leader uses the positioning system to navigate to the location of each anomaly to be investigated intrusively. If it is determined that RTK GPS is effective along a transect (i.e., canopy does not prevent initialization), the Field Team Leader will reacquire anomalies as described for grid-based data. If a handheld GPS is used for transect data collection, the reacquisition team will identify the anomaly nearest the indicated position that has a response at least as high as the picked value from the dynamic survey. Because these anomaly investigations are only being used to determine the presence/absence of munitions-related debris, the excavation of exact anomalies is not necessary.

8.4 ANOMALY RESOLUTION

After the intrusive team has excavated at the reacquired location and removed the source of the geophysical anomaly, the anomaly resolution team rechecks the location with a DGM or Analog sensor to confirm that the anomaly has been adequately resolved. Resolved is defined as:

1. There is no geophysical signal remaining at the flagged/selected location;
2. A signal remains but is below the anomaly selection threshold or is less than 25 percent of the initial value measured at that location;
3. A signal remains but is associated with surface material which when moved results in low, or no, signal at the interpreted location; or
4. A signal remains and a complete rationale for its presence exists. If the anomaly has not been adequately resolved, the intrusive team will resume investigation until the source has been resolved.

In the case of polygonal anomalies, the Field Team Leader rechecks the entire polygon with a DGM or Analog sensor to confirm that all anomalies within the area have been adequately resolved.

8.5 DATA OUTPUTS

The reacquisition team leader records the following information:

- Offset distance and direction from the selected to refined reacquired point.
- Peak DGM or Analog response prior to investigation (if applicable).
- "No Contact" reacquisition results.
- Peak DGM or Analog response after intrusive investigation (if applicable).

- Comments describing visible causes or explanations for a DGM or Analog response remaining after investigation.

The Field Team Leader or their designee transfers the information above to the Data Processor or QC Geophysicist for updating the project QC Database or tracking spreadsheet.

8.6 RELEVANT DEFINITIONS

- Grids – Areas where DGM data acquisition is performed with the intent of fully covering all accessible areas along parallel paths set at a predetermined line spacing.
- Transects – DGM data collection mode that involves traversing the investigation area along parallel lines spaced according to the WP or QAPP.

8.7 DATA MANAGEMENT

Input data for this SOP are the final dig list, daily positioning system back check results, daily DGM or Analog sensor check results, and copies the Reacquisition team leader's logbook. The results of the ongoing checks and reacquisition data are documented in the tracking spreadsheet or project database.

8.8 QUALITY CONTROL

This definable feature of work is performed after the DGM task. Performance of the required QC checks are documented by the QC Geophysicist in the tracking spreadsheet or project database, updated daily, and delivered weekly. A comprehensive root cause analysis is performed and a corrective action determined for any data failing the applicable MPCs/Measurement Quality Objectives.

9. HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

9.1 HAZARD ANALYSIS/RISK ASSESSMENT

This section is not applicable.

9.2 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the UXO Technician III or above team member, on the existing and potential hazards within the materials potentially presenting an explosive hazard (MPPEH) holding area prior to commencing any MPPEH Management or Disposal activities.

Personnel will be cognizant of the surroundings and remain observant of their footing at all times. All personnel will be aware of the signs of heat stress, as described in the Site Specific Health Plan (SSHP), and be able to recognize the onset of heat stress disorders in themselves and their team members.

The potential for encountering materials document as an explosive hazard (MDEH) comingled with MPPEH or materials documented as safe is very low. Should MDEH be discovered, it will be left in place, the SUXOS and the UXO Quality Control Specialist will be notified to investigate the occurrence and determine the corrective actions. The grid will have to undergo re-inspection.

In the event of severe weather or a natural disaster (e.g., earthquake, tsunami, or very high winds, etc.), account for all team personnel, contact the UXOSO, SUXOS, or Site Manager for instructions, and follow the Emergency Response Plan of the SSHP.

This space intentionally left blank

10. DISTRIBUTION

This section is not applicable.

11. DIAGRAMS

The project locations and site maps are located in the WP. Teams will be provided maps of the overall project site and evacuation routes.

Site maps are located in the WP or QAPP.

12. REQUIRED EQUIPMENT AND MATERIALS

The following is a list of required equipment and materials:

12.1 EQUIPMENT

The following is a list of required equipment and materials:

- DGM or Analog Sensor – Sensor used to detect subsurface metallic items (N/A for AGC).
- Positioning System –RTK) DGPS or RTS. Measures precise position of the antenna.
- Measuring Tapes – A measuring tape is used to measure the distance from markers at known locations in areas where Line/Station/Fiducials were used to position the DGM data.
- Battery chargers for sensor and positioning system.
- Field Computer.
- Communications equipment.
- First-Aid Kit.
- Fire extinguisher.
- Inclement weather gear, as needed.

12.2 MATERIALS

- Static spike test item (e.g., small ISO).
- Plastic pin flags.
- Permanent marker for labeling flags with unique target ID.
- Reacquisition team leader's logbook.
- Spare Sensor and Positioning System batteries.

13. EMERGENCY RESPONSE PROCEDURES

13.1 PREPARATION

The UXOSO will perform pre-emergency planning before starting field activities, during the mobilization, and also during the site set-up phase. The UXOSO will coordinate emergency response with police/security/fire/rescue personnel and emergency medical care. He/she will also verify emergency contact information, evacuation routes, and routes to emergency medical care.

All site personnel will receive an initial site-specific Safety Briefing, Ordnance Safety Briefing (tailored to their assignment), and a daily Tailgate Safety Briefing.

13.2 EXECUTION

The initial single point of contact for incidents on site will be the UXOSO. The SUXOS/UXOSO will make further notifications as appropriate. All incidents and injuries, no matter how seemingly insignificant, will be reported in a timely manner to the individual's supervisor and the UXOSO.

In the event of an ordnance-related event/emergency, all team members will be accounted for by their team leader. The team leader will assemble his/her team at their site vehicles and stand by for further instructions from the SUXOS/UXOSO.

In the event of an emergency requiring evacuation to the designated Safe Area, the evacuation signal will be given through verbal and/or radio instructions. Personnel will evacuate to a pre-determined evacuation point in the support zone identified at the Tailgate Safety Briefing. The UXOSO will account for all personnel and brief the SUXOS.

The UXOSO will summon emergency response personnel, if required. The UXOSO, or his/her designee, will meet and escort emergency personnel to the response location. Emergency response personnel will receive a time-expedient hazard control briefing (depending on the current situation) on immediate hazards that may be present or associated with the emergency prior to access to the Exclusion Zone.

In the event of severe weather or a natural disaster (e.g., earthquake, tsunami, or very high winds, etc.), each team leader will account for all team members, assemble at the team vehicles, and wait for the SUXOS/UXOSO's instructions.

Further specific notifications and actions are detailed in the Accident Prevention Plan.

This space intentionally left blank

This page intentionally left blank

Attachment B
QA Contractor Standard Operating Procedures

Standard Operating Procedure
Munitions and Explosives of Concern
Anomaly Avoidance

Document No: JE-SOP-01

Effective Date: February 24, 2023

Revision: 006

Contents

Rev No.	Effective Date	Revision Description	Procedure Owner Approval
001	11.21.18	Original issue	George DeMetropolis
002	11.29.18	Revised SOP #	George DeMetropolis
003	07.19.19	Added QC of analog instruments	George DeMetropolis
004	01.01.21	Updated references and completed review	George DeMetropolis
005	08.01.22	Annual review	Jeff McCauley
006	02.24.23	Annual review and update	Jeff McCauley

Attachments

None.

1.0 Scope and Application

This standard operating procedure (SOP) establishes the overall practices for the performance of munitions and explosives of concern (MEC) avoidance. This SOP provides procedures to avoid MEC during visitor/personnel escort, land survey, vegetation reduction, sediment sampling, soil boring drilling, direct-push technology (DPT) core sampling, or other environmental or construction activities conducted in an environment where the presence of MEC is suspected.

This SOP provides guidance for avoiding surface MEC (for example, unexploded ordnance [UXO], discarded military munitions [DMM]), material potentially presenting an explosive hazard (MPPEH), munitions constituents (MC), hazardous, toxic or radioactive waste (HTRW), and/or above ground surface obscured, or subsurface detected anomalies.

2.0 Equipment

- Cellular telephone and radios
- Down-hole (only) Magnetometer/Gradiometer capable of down-hole operations to 30 feet
- Magnetometer capable of monitoring to a depth of 2 feet below ground surface (bgs) for ferrous items
- All metals detector capable of monitoring to a depth of 6 inches bgs for nonferrous items
- Marking flags, ribbon, and tape (various, multiple colors)
- Batteries (various as required)
- First-aid kit (25 person)
- Water
- Camera, tape measure, ruler, calipers, paper, and pencil
- Hand tools (such as a hammer and general-purpose tools)

3.0 Responsibilities

The Munitions Response (MR) quality control (QC) manager will be responsible for ensuring this SOP is effectively implemented. Surveillances and/or inspections will be conducted to ensure SOP compliance.

- Unexploded Ordnance Quality Control (UXOQC) personnel will document nonconforming materials, items or activities in a nonconformance report (NCR) based on surveillances and/or inspections

3.1 Project Responsibility

Contractor employees performing this task, or any portion thereof, are responsible for meeting the requirements of this SOP. Jacobs / CH2M employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

The Senior UXO Supervisor (SUXOS) or assigned UXO Technician is responsible for ensuring that activities are conducted in accordance with (IAW) this and other appropriate SOPs. Project participants are responsible for documenting information in sufficient detail to provide objective documentation that the requirements of this SOP have been met. Such documentation will be retained as project records.

4.0 MEC Safety

4.1 Warning

- UXO Technician(s) will not make physical contact with MEC, MPPEH, or commercial explosives during the use of avoidance techniques.
- Should MEC be suspected or identified, to include UXO, DMM, or MPPEH, the UXO Technician will respond IAW 3R (recognize, retreat, report) training, avoid such items, and notify the project manager.

5.0 Explosive Ordnance Reconnaissance

- General Explosive Ordnance Disposal (EOD) safety precautions should be used during explosive ordnance reconnaissance, until munition type, fuzing, condition, and filler are identified.
- Upon identification, of type by function, fuzing, and condition use general EOD safety precautions for the category of munition (for example, rocket); avoid approach from the front or rear of an item.
- Approach UXO 45 degrees to center or side.
- Do not cast shadows over fuze(s) or fuzed items.
- Remain cognizant to avoid dispensed wires, filaments, or other items that could initiate munition movement.
- Remain cognizant for hazards of electromagnetic radiation to ordnance (HERO).

6.0 MEC Escort/Anomaly Avoidance

A UXO-qualified Technician (II or III) will escort non-UXO-qualified site personnel conducting access to a munitions response site (MRS) or munitions response area (MRA).

Note: A UXO Technician I may escort non-UXO-qualified personnel when authorized by United States Army Corps of Engineers (USACE) project manager on a project-specific basis.

- When escorting non-UXO-qualified personnel, a UXO Technician III or II will lead and non-UXO-qualified personnel will follow along a path identified by the UXO Technician.
- The UXO Technician will identify or mark boundaries/limits for ingress/egress access from a safe area (for example, a road) to the work activity location to provide individual escort to and from the work activity location.

6.1 MEC Escort Procedure

A minimum of one UXO-qualified Technician (II) will escort non-UXO-qualified site personnel conducting access to a MRS or MRA.

UXO-qualified person(s) will visually search the surface of walking paths, roads, and parking areas to locate, mark, and avoid MEC prior to nonessential personnel walking, driving, or setting-up equipment.

Note: Non-UXO-qualified (nonessential) personnel will not approach and will avoid marked suspect or known MEC/MPPEH.

Personnel Limits - A ratio of a minimum of one UXO-qualified Technician II or above, to no more than six nonqualified persons will be maintained.

The UXO Technician will:

- Identify or establish a flag, wind streamer, or tape/ribbon within/near the project site to observe wind direction.
- Visually search the surface area for MEC/HTRW to avoid and mark such items. The UXO Technician may augment a visual search with the addition of a geophysical instrument (metal detector) to detect surface/subsurface ferrous and/or nonferrous anomaly sources for the purpose of anomaly avoidance.
- Identify and communicate surface hazards (MPPEH) and avoid such hazards. The UXO Technician will communicate the location to personnel for avoidance around the item.
- Communicate verbally or with hand signals (pointing), or marking with flags, tape, ribbon, paint, stakes, or other means identified from plans during a safety briefing.

7.0 MEC Avoidance Support

7.1 Land Survey, Sediment Sampling, Groundwater Collection, Endangered Species Sampling/Monitoring

Subsurface intrusive acts could initiate MEC, through physical contact, movement, or shock. Anomaly avoidance techniques with a metal detection or digital geophysical mapping or advanced geophysical classification should be used.

Note: For land survey and sampling activities where prior detection and marking of a subsurface anomaly occurs, an alternative location free of ferrous and nonferrous anomalies is required to proceed with intrusive activities.

- A UXO Technician will search (as required for previously digital geophysical mapping [DGM] areas or Advanced Geophysical Classification [AGC] locations) intrusive points from the surface with a magnetometer and or all metals detector IAW the instruments manufacturer's instructions, to locate ferrous and/or nonferrous subsurface anomalies.
- When relocation of a coordinate point is required because of subsurface anomalies, the UXO Technician will request a note be recorded within the land survey/sampler's logbook. Record a written description for direction with feet or inches of the offset location from primary point.

8.0 Quality Control of Analog Geophysical Systems

QC of the analog geophysical instruments will be accomplished through daily checks that verify the instruments are functioning prior to being used for field activities. Each instrument will be operated within an instrument check area containing buried metallic items. This check area may be the instrument verification strip (IVS) used during DGM or a separate analog instrument check area that would be established by the UXO personnel. If the instrument is not able to detect the item, it will be removed from use until it is repaired.

9.0 Vegetation Reduction MEC Avoidance (Manual/Mechanical)

Do not apply vegetation cutting closer than 6 inches or 152.4 millimeters to ground surface.

Vegetation reduction actions that occur less than 6 inches or 152.4 millimeters above ground surface, may result in movement, or shock to MEC, resulting in an unintentional detonation or functioning as designed of the item.

Personnel performing vegetation reduction activities will not operate equipment closer than 6 inches to the ground thus, all brush cutting equipment (chain saws, weed whackers, string trimmers, brush cutters, bush hogs, hydro-ax, or debarking equipment) will operate a minimum of 6 inches or 152.4 millimeters greater above ground surface.

- A UXO Technician will escort vegetation reduction personnel, perform a visual and/or magnetometer and/or all metals detection instrument search of surface access routes, walking paths, and vegetation reduction locations for avoidance and marking of surface MEC/HTRW and or obstruction hazards.
- The UXO Technician will perform a visual surveillance of the surface to locate surface hazards (MEC, HTRW) or obstructions to equipment, mark the location and instruct vegetation reduction crews to avoid the location.
- The UXO Technician will wear high visibility outerwear, use hearing and eye protection, and avoid the swing radius of powered equipment.
- The UXO Technician will remain far enough away (IAW equipment operating safe instructions), from the immediate operating throw hazard radius of powered equipment and remain alert to avoid flying debris.

10.0 MEC Avoidance (Down-hole)

When applying MEC avoidance procedures for drilling or the use of DPT, the steel mass of drill rigs and DPT power plants will influence gradiometers, and magnetometer reporting instruments. Thus, drill rigs and DPT equipment will be withdrawn a minimum of 10 feet from intrusive points while performing down-hole avoidance search.

- Before drilling, the UXO Technician will conduct a visual reconnaissance of access paths and drilling area. The reconnaissance will include locating the designated sampling or drilling location(s) ensuring that the locations

do not have surface MEC, or MPPEH, and magnetometers or all metal detection search do not indicate the presence of subsurface anomalies. If detection of subsurface anomalies occurs, at the sampling point, the sampling point will be abandoned. Once the designated sampling point has been determined free of anomalies, an access route for the sampling crew's vehicles will be searched. The access path requires twice the width of the widest vehicle and the edges visually marked with flags, ribbon, engineer tape, stakes, or equivalent.

- If an observation of MEC or MPPEH should occur, the UXO Technician will mark the item, avoid it, and notify the project manager for either military EOD or UXO Contractor Support.
- A UXO Technician will clear each work site for drilling/DPT and clearly mark the safe to walk, and drill or DPT, boundaries. Each drill/DPT safe area will be large enough to accommodate the drilling equipment and provide a work area for the crews. As a minimum, the safe area will be a rectangle, with a side dimension equal to twice the length of the largest vehicle or piece of equipment for use onsite.

Note: Drilling and application of DPT may require an ingress route and pad turning radius, twice the width, and length of the mechanical equipment.

Note: MEC may exist within the subsurface up to 20 feet bgs, dependent on site-specific history. Refer to Work Plan (WP)/Quality Assurance Project Plan (QAPP) to determine maximum depth for down-hole MEC avoidance support.

The UXO Technician is required to escort personnel and remain with personnel when sampling/drilling at a suspected MEC/MPPEH site.

10.1 Warning

Drilling equipment may produce injury from snapping cables, pinch points, chain failures or falling booms, derricks, and drill piping. Avoid the immediate operational radius of drillers when supporting efforts.

- Soil bore holing may be by hand-auger, power-auger, drilling, or DPT. A UXO Technician will examine, before sampling/drilling, the borehole location with a down-hole gradiometer or magnetometer, a minimum of every 1 foot, to the deepest sampling depth or a maximum of 30 feet bgs to ensure avoidance of anomalies, or to depth identified within the WP/QAPP.
- Drilling down-hole monitoring requires, at a minimum, 1-foot increments of search, during the actual well drilling operations. This will require the withdrawal of the drill rod or augers from the hole and moving the drill rig a minimum of 10 feet or enough feet away from the drill-hole location to prevent the metal in the rig from influencing the magnetometer/gradiometer.
- The UXO Technician will perform down-hole monitoring for anomalies at each location identified within the WP/QAPP.

11.0 Definitions

Discarded Military Munitions (DMM)—Military munitions that have been abandoned without proper disposal or have been removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include UXO, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations [Title 10 United States Code (U.S.C.) Section (§) 2710(e) (2)].

Fuzes—Devices that initiate the detonation sequence in munitions. Fuzes are typically associated with munitions (for example, mortars and bombs), but they are occasionally found separately. They may contain a charge large enough to cause injury. Magnetic and proximity fuzes are the most sensitive and, depending on other factors (for example, fuze location and arming), greatly influence the likelihood of detonation. When separated from the munitions, a fuze may not look like an explosive munitions item.

The terms fuse and fuze mean different things. For this SOP, a fuze is a mechanical or electrical device with explosive or nonexplosive components designed to initiate a train of fire or detonation in ordnance (for example, hand grenade). A fuse is a cord of readily combustible material that can be lit at one end to carry a flame along the length of the fuse to detonate an explosive at the other end (for example, firecracker).

Military Munitions—Ammunition products and components produced for or used by the armed forces for national defense and security. The term military munitions include ammunition products or components under the control of the Department of Defense (DoD), Coast Guard, Department of Energy, and National Guard. The term includes the following munitions:

- Confined gaseous, liquid, and solid propellants
- Explosives
- Pyrotechnics
- Chemical and riot control agents
- Smokes and incendiaries
- Bulk explosives
- Chemical agents
- Chemical munitions
- Rockets
- Guided and ballistic missiles
- Bombs
- Warheads
- Mortar rounds
- Artillery ammunition
- Small arms ammunition
- Grenades
- Mines
- Torpedoes
- Depth charges
- Cluster munitions and dispensers
- Demolition charges
- Devices and components thereof

Military munitions do not include wholly inert items, improvised explosive devices, or nuclear weapons, nuclear devices, or nuclear components. However, military munitions do include nonnuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 U.S.C. §2011 et seq.) have been completed [10 U.S.C. §101(e)(4)].

Munitions Constituents (MC)—Any materials originating from UXO, DMM, or other military munitions, including explosive and nonexplosive materials. MC also includes emission, degradation, or breakdown elements of such ordnance or munitions [10 U.S.C. §2710(e)(3)].

Note: MC are MEC when explosive compounds of the munitions, such as trinitrotoluene (TNT), Royal Demolition eXplosive (RDX), and High Melting eXplosive (HMX), are in sufficient concentration as to pose an explosive hazard. This situation arises when concentration levels are 10 percent or more. Nonexplosive MC and explosive concentrations less than 10 percent are not considered MEC.

Munitions and Explosives of Concern (MEC)—Specific categories of military munitions that may pose unique explosive risks, including UXO, as defined in 10 U.S.C. §101(e)(5); DMM, as defined in 10 U.S.C. §2710(e)(2); or MC (for example, TNT or RDX), as defined in 10 U.S.C. §2710(e)(3), present in high enough concentrations to pose an explosive hazard. (See Munitions Constituents)

Material Potentially Presenting an Explosive Hazard (MPPEH)—Material owned or controlled by the DoD that, before determination of its explosives safety status, potentially contains explosives or munitions (for example, munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (for example, equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are munitions within the DoD-established munitions management system, nonmunitions-related material (for example, horseshoes, rebar, other solid objects), munitions-related solid metal fragments that do not realistically present an explosive hazard, and other items that may present explosion hazards (for example, gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions.

Munitions Response—Response actions, including investigation, removal actions, and remedial actions, to address the explosives safety, human health, or environmental risks presented by UXO, DMM, or MC, or to support a determination that no removal or remedial action is required.

Unexploded Ordnance (UXO)—Military munitions that have been primed, fuzed, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and remain unexploded whether by malfunction, design, or any other cause [10 U.S.C. §101(e)(5)(A) through (C) P.L. 106-65, section 3031 (c)(5)(A) provides a more detailed description].

UXO Operations—UXO operations are defined as MEC identification; access procedures such as excavation, either by hand or using heavy equipment; handling of UXO, explosives or explosive items; or disposal, including movement, transportation, and final disposal of MEC.

12.0 References

Code of Federal Regulations Title 29 Part 1910 (29 CFR 1910), "Occupational Safety and Health Standards." Occupational Safety and Health Administration.

Code of Federal Regulations Title 40 Parts 260 to 299 (40 CFR 260-299), "Protection of Environment" (applicable sections). U.S. Environmental Protection Agency.

Code of Federal Regulations Title 49 Parts 100 to 199 (49 CFR 100-199), "Transportation" (applicable sections). U.S. Department of Transportation.

Defense Explosives Safety Regulation (DESR). 2019. DESR 6055.09, Edition 1. January 13.

Department of Defense (DoD). 2012. DoD Manual 6055.09-M. *Ammunition and Explosives Safety Standards.* Original publication date of 2008; administratively revised August 4, 2010 with Change 1 dated March 12, 2012 and Change 2 dated December 29, 2017 (volumes 1 and 2), December 15, 2017 (volumes 3 and 4), December 18, 2017 (volumes 5, 6 and 7), January 24, 2018 (volume 8).

DoD. 2018. DoD 4145.26-M. *Contractor's Safety Manual for Ammunition and Explosives.* Change 2. August 31.

DoD. 2019. Instruction 4140.62. *Material Potentially Presenting an Explosive Hazard (MPPEH).* Change 3. September 9.

Department of the Navy (Navy). 1997. EOD Bulletin 60A-1-1-31. Technical Manual. *Explosive Ordnance Disposal Procedures, EOD Disposal Procedures*. December 31.

Naval Sea Systems Command (NAVSEA). 2008. SW060-AA-MMA-010, Technical Manual, Demolition Materials, Volume 1, Revision 8. March 24.

NAVSEA. 2020. *OP-5, Volume 1,* Seventh Revision, "Ammunition and Explosives Safety Ashore," Change 15. March 25.

Naval Ordnance Safety and Security Activity (NOSSA). 2020. Instruction 8020.15E *Explosive Safety Review, Oversight, and Verification of Munitions Responses*. September 11.

13.0 Supervisor's or Process Supervisor's Statement

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Signature
Worker Name:

Date:

14.0 Worker's or Operator's Statement

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:

This page intentionally left blank.

Standard Operating Procedure
Surface Clearance of MEC

Document No: JE-SOP-02
Effective Date: February 24, 2023
Revision: 005

Contents

Rev No.	Effective Date	Revision Description	Procedure Owner Approval
001	11.21.18	Original issue	George DeMetropolis
002	11.29.18	Revised SOP #, added Record of Approval	George DeMetropolis
003	01.01.21	Updated references and completed review	George DeMetropolis
004	08.01.22	Annual review	Jeff McCauley
005	02.24.23	Annual review and update	Jeff McCauley

Attachments

None.

1.0 Scope and Application

This standard operating procedure (SOP) outlines the requirements for Munitions Response (MR) personnel when performing surface clearance operations to reduce explosive hazards resulting from Munitions and Explosives of Concern (MEC).

This SOP is to be used during MR projects directly performed by unexploded ordnance (UXO) technicians engaged in surface clearance operations. The objectives of such operations typically include detection, location, identification and disposal of MEC or material potentially presenting an explosive hazard (MPPEH).

This SOP should be used in conjunction with JE-SOP-03, Explosives Transportation; JE-SOP-05, MPPEH Management; JE-SOP-06, Demolition and Disposal; and JE-SOP-11, Munitions Response Data Management.

2.0 Equipment

- Shovels
- Buckets
- Hand Trowels
- Measuring Tape or Calipers
- Digital Cameras
- Geophysical Instruments

3.0 General Roles and Responsibilities

Project Manager (PM): Provides the project leadership and direction to ensure that the project is performed within the scope, schedule, and budget, ensures quality, risk management, safety, and contract compliance. The PM will ensure that site-specific work plans, safety plans, and/or SOPs that adequately address site-specific hazards and control measures are in place prior to the start of work.

MR Health, Safety, and Environment (HSE) and Quality Manager: Assists and advises the MR and project staff to plan, staff, and execute the MR safety and quality programs. Final reviewer of all project plans and reports. Audits and evaluates MR field projects and safety programs to verify that MR requirements and practices are implemented and effective. Unexploded ordnance (UXO) Quality Control Specialist (UXOQCS) and UXO Safety Officer (UXOSO) report directly to the MR HSE and Quality Manager.

Senior UXO Supervisors (SUXOS): Supervise all field operation and reports to the PM. Responsible for executing the project in accordance with (IAW) the site-specific documents (Work Plan [WP], Explosives Safety Submission [ESS], ESS-Determination Request [ESS-DR], and/or Quality Assurance Project Plan [QAPP]). The SUXOS is responsible for completing the Contractor Production Report for each day that activities are performed onsite. They are required on all MR projects and authorized to stop work at any time to prevent accidents.

UXOQCS: Supervise the quality of all field operation and reports to MR HSE and Quality Manager. Responsible for monitoring the quality of the project IAW the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOQCS is responsible for completing the Quality Control Report each day activities are performed onsite.

UXOSO: Supervise the safety of all field operation and reports to MR HSE and Quality Manager. Responsible for monitoring the safety of the project IAW the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOSO provides a Daily Site-specific Tailgate Safety Briefing that includes MEC, construction, industrial, environmental and natural safety hazard awareness, and provides the plan of the day. As applicable, they provide a hazardous materials briefing for items used, consumed, or required for this SOP. The UXOSO performs risk assessment to determine the number of visitors permitted, provides a safety briefing, and verifies training and medical surveillance qualifications of personnel.

UXO Technicians III and II: UXO Team Leaders will also be responsible for recording data and results of the surface clearance in their logbooks or data entry smart tablets. The UXO Technicians will be responsible for performing the surface sweeps and/or managing sweep personnel (SP) and support workers.

SP and Support Workers: Assist the UXO Technicians in field operations but will not interact with donor explosives, MEC, or MPPEH.

4.0 Site Layout Procedures

The site layout and search grid lots/blocks will be established using either global positioning system (GPS), differential GPS, or compass and measuring tape. The grid lots will be marked using survey flags or pins. If survey stakes are used, a UXO Technician will sweep the intended survey stake locations with a magnetometer prior to driving stakes into the ground. The procedures are as follows:

- Identify and mark the operating area boundaries

  - The boundary may be marked with survey stakes, or survey tape, rope, or equivalent if necessary to delineate boundaries. The stakes and tape should be visible from one to the next; therefore, depending on terrain it may be necessary to place them closer together.

- Identify marks and search grids
  - If UXO avoidance procedures are used during the staking, all MEC/MPPEH found on the surface will be avoided, marked, and the location reported to the SUXOS.
  - If an existing grid network is available, it will be used to develop daily grid lots or blocks of grids that are planned for surface clearance operations on a daily basis.
  - The grid network and corresponding grid blocks will be uploaded into handheld devices, such as GPS or data collectors, for use in the field.
  - The SUXOS will identify the number of personnel in the sweep team-based project instructions.
  - Grid boundaries may be marked with survey stakes, marked with survey tape or rope, and temporary survey lanes with pin flags or twine and string rope if necessary.
- Establish and mark search lanes (if required).
  - Line spacing intervals within the grid blocks being cleared will be divided into search lanes that are suitable for the terrain and vegetation. The search lanes will be delineated with rope, flags, marking paint, or marking tape. The search lanes will be no less than 3 feet and no more than 5 feet wide.
  - If temporary lanes are marked before surface clearance it will be marked by a UXO Technician to ensure safety.
  - The SUXOS will determine the appropriate surface clearance techniques daily.

5.0 Surface Clearance

A surface clearance is a visual clearance of MEC, MPPEH, and MD from a specified geographic surface by qualified UXO Technicians or SP. Surface clearances may also be aided by handheld detectors in vegetated areas where visibility of the surface is reduced. These clearances are frequently performed in advance of digital geophysical mapping (DGM) surveys to reduce the number of DGM-selected subsurface anomalies. They also serve to reduce the risks associated with explosive hazards and, thereby, eliminate the need to provide UXO Technician escorts to non-UXO-qualified individuals such as geophysicists or site visitors.

Surface clearances frequently employ a grid-based approach to define the boundary of the geographic area to be cleared. MEC and MPPEH items that are deemed unacceptable to move are flagged for subsequent disposal operations. Extreme care will be taken during surface clearances to avoid moving or otherwise disturbing items that are assumed to be MEC or MPPEH until determined acceptable or safe to move by SUXOS and UXOSO. MEC and MPPEH items that are acceptable to move are usually collected and placed in a designated corner of the grid to await further evaluation and processing.

Surface clearances are typically coordinated by a SUXOS and conducted by a UXO Technician Level III UXO Team Leader who leads a team of UXO Technician Levels Is and IIs and SP, if required by the technical approach. Teams will consist of a minimum of two people. A UXOQCS will perform an independent evaluation of the surface clearance IAW the WP/ QAPP. All work will be supported by the observations and advice provided by the UXOSO using the Work Plan and Site-specific Health and Safety Plan.

The following general safety practices will be followed:

- Operations will be conducted only during daylight hours.
- Access to operating areas will be limited to only those personnel necessary to accomplish the specific operation.
- MEC/MPPEH will only be handled by UXO Technicians.
- During UXO operations the minimum separation distance (MSD) between UXO and non-UXO operations will be either the hazardous fragmentation distance for fragmenting munitions, or the K40 distance for non-

fragmenting munitions of the munition with the greatest fragmentation distance (MGFD), as stated in the Department of Defense Explosives Safety Board (DDESB)-approved ESS. UXO surface clearance teams will maintain the K40 distance for the MGFD between each other as stated in the DDESB-approved ESS.

- Personnel remaining onsite will be limited to those personnel needed to safely and efficiently prepare the items for destruction.
- All personnel will attend the Daily Site-specific Tailgate Safety Briefing before entering the operating area.
- Anyone can stop operations for an unsafe act or situation.
- Safety violations and unsafe acts will be immediately reported to the UXOSO.
- Failure to comply with safety rules and procedures may result in termination of employment.

6.0 Clearance Procedures

Clearance procedures are done by placing the UXO Technicians on a line and proceeding through the search area. The technicians visually check the surface and use a handheld detector to check areas covered with vegetation while monitoring the audible tone produced by the metal detector and identifying the location of any hidden surface metallic anomalies. As the team advances, the UXO Technician at the end of the line places pin flags in the ground or other means of flagging at regular intervals to indicate the area covered. During the surface clearance, the UXO Technician III will typically follow behind the sweep line, monitoring their progress, and ensuring all grids are covered. The UXO Technician III also performs a cursory survey of the individual work lane to assist in preparation for the UXOQCS. Separate records are prepared and maintained for each grid being surveyed.

7.0 Equipment Check Area

To ensure all-metals detectors and magnetometers are working properly, personnel and equipment will pass instruments over an equipment check area (ECA) or instrument verification strip (IVS) to test the instrument's functionality. The ECA or IVS will consist of one to two large/deep and one to three small/shallow industry standard objects (ISOs). To establish an ECA or IVS, the designated area is surveyed and ensured to be clear of metal debris. The ISOs will be buried at approximately 75 percent of their detection depth and at various orientations. The ECA or IVS will be used to determine if detection equipment is working properly at the beginning and end of each day and after a battery change. If an instrument does not detect the items when it is passes over, that instrument will be rejected and replaced. If the project involves DGM, then the IVS will be installed so that the DGM effort can be used to satisfy this operational test.

8.0 Definitions

Fuzes—Devices that initiate the detonation sequence in munitions. Fuzes are typically associated with munitions (for example, mortars and bombs), but they are occasionally found separately. They may contain a charge large enough to cause injury. Magnetic and proximity fuzes are the most sensitive and, depending on other factors (for example, fuze location and arming), greatly influence the likelihood of detonation. When separated from the munitions, a fuze may not look like an explosive munitions item.

The terms fuse and fuze mean different things. For this SOP, a fuze is a mechanical or electrical device with explosive or nonexplosive components designed to initiate a train of fire or detonation in ordnance (for example, hand grenade). A fuse is a cord of readily combustible material that can be lit at one end to carry a flame along the length of the fuse to detonate an explosive at the other end (for example, a firecracker).

Military Munitions—Ammunition products and components produced for or used by the armed forces for national defense and security. The term military munitions include ammunition products or components under the control of the DoD, U.S. Coast Guard, Department of Energy, and National Guard. The term includes the following munitions:

- Confined gaseous, liquid, and solid propellants
- Explosives
- Pyrotechnics
- Chemical and riot control agents
- Smokes and incendiaries
- Bulk explosives
- Chemical agents
- Chemical munitions
- Rockets
- Guided and ballistic missiles

- Bombs
- Warheads
- Mortar rounds
- Artillery ammunition
- Small arms ammunition
- Grenades
- Mines
- Torpedoes
- Depth charges
- Cluster munitions and dispensers
- Demolition charges
- Devices and components thereof

Military munitions do not include wholly inert items, improvised explosive devices, or nuclear weapons, nuclear devices, or nuclear components. However, military munitions do include non-nuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 United States Code [U.S.C.] Section [§] 2011 et seq.) have been completed [10 U.S.C. §101(e)(4)].

Minimum Separation Distance (MSD)— MSD is the distance at which personnel in the open must be from an intentional or unintentional detonation.

Munitions Constituents (MC)—Any materials originating from UXO, discarded military munitions, or other military munitions, including explosive and nonexplosive materials. MC also includes emission, degradation, or breakdown elements of such ordnance or munitions [10 U.S.C. §2710(e)(3)]. Note: MC are MEC when explosive compounds of the munitions, such as trinitrotoluene (TNT), Royal Demolition eXplosive (RDX), and High Melting eXplosive (HMX), are in sufficient concentration as to pose an explosive hazard. This situation arises when concentration levels are 10 percent or more. Non-explosive MC and explosive concentrations less than 10 percent are not considered MEC.

Munitions and Explosives of Concern (MEC)—Specific categories of military munitions that may pose unique explosive risks, including UXO, as defined in 10 U.S.C. §101(e)(5); discarded military munitions (DMM), as defined in 10 U.S.C. §2710(e)(2); or MC (for example, TNT and RDX), as defined in 10 U.S.C. §2710(e)(3), present in high enough concentrations to pose an explosive hazard. (See Munitions Constituents)

Material Potentially Presenting an Explosive Hazard (MPPEH)—Material owned or controlled by the DoD that, prior to determination of its explosives safety status, potentially contains explosives or munitions (for example, munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (for example, equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are munitions within the DoD-established munitions management system, non-munitions related material (for example, horseshoes, rebar, other solid objects), munitions related solid metal fragments that do not realistically present an explosive hazard, and other items that may present explosion hazards (for example, gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions.

Munitions Response (MR)—Response actions, including investigation, removal actions, and remedial actions, to address the explosives safety, human health, or environmental risks presented by UXO, DMM, or MC, or to support a determination that no removal or remedial action is required.

Unexploded Ordnance (UXO)—Military munitions that have been primed, fuzed, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and remain unexploded whether by malfunction, design, or any other cause [10 U.S.C. §101(e)(5)(A) through (C) P.L. 106-65, §3031 (c)(5)(A), provides a more detailed description].

UXO Operations—UXO operations are defined as MEC identification; access procedures such as excavation, either by hand or using heavy equipment; handling of UXO, explosives or explosive items; or disposal, including movement, transportation, and final disposal of MEC.

9.0 References

Code of Federal Regulations Title 49 Parts 100 to 199 (49 CFR 100-199), “Transportation” (applicable sections). U.S. Department of Transportation.

Department of Defense (DoD). 2015. DoD Instruction 3200.16. *Operational Range Clearance.* April 21.

DoD. 2018. DoD 4145.26-M. *Contractor’s Safety Manual for Ammunition and Explosives.* Change 2. August 31.

DoD. 2019. Instruction 4140.62. *Material Potentially Presenting an Explosive Hazard (MPPEH).* Change 3. September 9.

Department of Justice, Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF). 2012. *Federal Explosives Laws and Regulations.* April 27.

Department of the Navy (Navy). 2022. EOD Bulletin 60A-1-1-31. Technical Manual. *Explosive Ordnance Disposal Procedures, EOD Disposal Procedures*. June 30.

Naval Sea Systems Command (NAVSEA). 2008. SW060-AA-MMA-010, Technical Manual. *Demolition Materials.* Volume 1, Revision 8. March 24.

NAVSEA. 2020. OP-5, Volume 1, Seventh Revision. *Ammunition and Explosives Safety Ashore.* Change 15. March 25.

Naval Ordnance Safety and Security Activity (NOSSA). 2020. Instruction 8020.15E *Explosive Safety Review, Oversight, and Verification of Munitions Responses*. September 11.

Supervisor’s or Process Supervisor’s Statement

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Signature
Worker Name:

Date:

10.0 Worker's or Operator's Statement

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:

:

Standard Operating Procedure
Explosives Transportation

Document No: JE-SOP-03
Effective Date: February 24, 2023
Revision: 005

Contents

Rev No.	Effective Date	Revision Description	Procedure Owner Approval
001	11.21.18	Original issue	George DeMetropolis
002	11.29.18	Revised SOP #, added Record of Approval	George DeMetropolis
003	01.01.21	Updated references and completed review	George DeMetropolis
004	08.01.22	Annual review	Jeff McCauley
005	02.24.23	Annual review and update	Jeff McCauley

Attachments

None.

1.0 Scope and Application

The purpose of this standard operating procedure (SOP) is to establish the overall practices for the performance of transporting munitions and explosives of concern (MEC) or explosives.

This SOP provides the minimum procedures and safety and health requirements applicable to the transportation of MEC or explosives.

2.0 General Roles and Responsibilities

Project Manager (PM): Provides the project leadership and direction to ensure that the project is performed within the scope, schedule, and budget, ensures quality, risk management, safety, and contract compliance. The PM will

ensure that site-specific work plans, safety plans, and/or SOPs that adequately address site-specific hazards and control measures are in place before the start of work.

Munitions Response (MR) Health, Safety, and Environment (HSE) and Quality Manager: Assists and advises the MR and project staff to plan, staff, and execute the MR safety and quality programs. Acts as the final reviewer of all project plans and reports. Audits and evaluates MR field projects and safety programs to verify that MR requirements and practices are implemented and effective. Unexploded ordnance (UXO) Quality Control Specialist (UXOQCS) and UXO Safety Officer (UXOSO) report directly to MR HSE and Quality Manager.

Senior UXO Supervisors (SUXOS): Supervise all field operation and reports to the PM. Responsible for executing the project in accordance with (IAW) the site-specific documents (Work Plan [WP], Explosives Safety Submissions [ESS], ESS-Determination Request [ESS-DR], and/or Quality Assurance Project Plan [QAPP]). The SUXOS is responsible for completing the Contractor Production Report for each day that activities are performed onsite. They are required on all MR projects and authorized to stop work at any time to prevent accidents.

UXOQCS: Supervise the quality of all field operation and reports to MR HSE and Quality Manager. Responsible for monitoring the quality of the project IAW the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOQCS is responsible for completing the Quality Control Report each day activities are performed onsite.

UXOSO: Supervise the safety of all field operation and reports to MR HSE and Quality Manager. Responsible for monitoring the safety of the project IAW the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOSO provides a Daily Site-specific Tailgate Safety Briefing that includes MEC, construction, industrial, environmental and natural safety hazard awareness, and provides the plan of the day. As applicable, they provide a Hazardous Materials briefing for items used, consumed, or required for this SOP. The UXOSO performs risk assessment to determine the number of visitors permitted, provides a safety briefing, and verifies training and medical surveillance qualifications of personnel.

3.0 Transportation Requirements for Explosives and MEC

Transportation of MEC and explosives will comply with all Federal, State, and local regulations. Permits are not required under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for onsite or on Federal Installation transportation of explosives or MEC. Offsite shipment of MEC will be made using commercial carriers approved to transport ammunition and explosives. For offsite shipment:

- MEC will be packaged IAW 49 Code of Federal Regulations (CFR) part 173.
- Drivers will be provided a Department of Defense Form (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.

4.0 Federal Installations and Onsite

Transportation of explosives and MEC onsite and on Federal Installations will comply with the following:

- Vehicles will be inspected daily using the DD Form 626 and will be properly placarded.
- Explosives will be transported in closed vehicles whenever possible. When using an open vehicle, explosives will be covered with a flame-resistant tarpaulin (except when loading/unloading).
- Explosives will not be transported in the passenger compartment of a vehicle.
- The cargo compartment must be lined with a non-metallic material in any portion that comes in contact with the load.
- Vehicles transporting explosives will have a first aid kit, two 10 BC rated fire extinguishers, and communications capability.

- If a vehicle containing explosives or detonators is parked, the brakes will be set, the engine shut off, and the wheels will be blocked securely against rolling.
- Explosive-laden vehicles will not be left unattended.
- No person is permitted to ride on, or in, the cargo compartment.
- Smoking is prohibited in and around vehicles transporting explosives.
- Vehicles will be refueled only when there is no explosive cargo.
- Vehicles will not exceed the posted speed limit. If a prudent speed is less than the posted speed limit, the operator may not exceed a safe and reasonable speed.
- Transportation of explosives over public roads is not authorized unless all Department of Transportation requirements are met, including manifest, proper United Nations-approved packaging, proper labeling, and placards.

5.0 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.

6.0 Definitions

Munitions and Explosives of Concern (MEC)—Specific categories of military munitions that may pose unique explosive risks, including UXO, as defined in Title 10 United States Code (U.S.C.) Section (§) 101(e)(5); Discarded military munitions, as defined in 10 U.S.C. § 2710(e)(2); or Munitions constituents (for example, trinitrotoluene [TNT] or Royal Demolition eXplosive [RDX]), as defined in 10 U.S.C. §2710(e)(3), present in high enough concentrations to pose an explosive hazard.

Unexploded Ordnance (UXO)—Military munitions that have been primed, fuzed, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and remain unexploded whether by malfunction, design, or any other cause [10 U.S.C. § 101(e)(5)(A) through (C), Public Law 106-65, § 3031 (c)(5)(A), provides a more detailed description].

7.0 References

Code of Federal Regulations (CFR) Title 49 Parts 100 to 199, “Transportation” (applicable sections).

Department of Defense (DoD). 2012. DoD Manual 6055.09-M. *Ammunition and Explosives Safety Standards.* Original publication date of 2008; administratively revised August 4, 2010 with Change 1 dated March 12, 2012 and Change 2 dated December 29, 2017 (volumes 1 and 2), December 15, 2017 (volumes 3 and 4), December 18, 2017 (volumes 5, 6 and 7), January 24, 2018 (volume 8).

DoD. 2018. DoD 4145.26-M. *Contractor’s Safety Manual for Ammunition and Explosives.* Change 2. August 31.

DoD. 2019. Instruction 4140.62. *Material Potentially Presenting an Explosive Hazard (MPPEH).* Change 3. September 9.

Department of Justice, Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF). 2012. *Federal Explosives Laws and Regulations.* April 27.

Department of the Navy (Navy). 2022. EOD Bulletin 60A 1-1-31. Technical Manual. *Explosive Ordnance Disposal Procedures, EOD Disposal Procedures.* June 30.

Naval Sea Systems Command (NAVSEA). 2008. SW060-AA-MMA-010, Technical Manual. *Demolition Materials.* Volume 1, Revision 8. March 24.

NAVSEA. 2020. OP-5, Volume 1, Seventh Revision. *Ammunition and Explosives Safety Ashore.* Change 15. March 25.

Naval Ordnance Safety and Security Activity (NOSSA). 2020. Instruction 8020.15E *Explosive Safety Review, Oversight, and Verification of Munitions Responses*. September 11.

8.0 Supervisor’s Or Process Supervisor’s Statement

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Signature
Worker Name:

Date:

9.0 Worker's or Operator's Statement

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:

Name:

Standard Operating Procedure
Subsurface Excavation

Document No: JE-SOP-04
Effective Date: February 24, 2023
Revision: 005

Contents

Rev No.	Effective Date	Revision Description	Procedure Owner Approval
001	11.21.18	Original issue	George DeMetropolis
002	11.29.18	Revised SOP #, added Record of Approval	George DeMetropolis
003	01.01.21	Updated references and completed review	George DeMetropolis
004	08.01.22	Annual review	Jeff McCauley
005	02.24.23	Annual review and update	Jeff McCauley

Attachments

None.

1.0 Scope and Application

This standard operating procedure (SOP) outlines the requirements for Munitions Response (MR) personnel when performing subsurface excavation operations to reduce explosive hazards resulting from munitions and explosives of concern (MEC).

This SOP is to be used during MR projects directly performed by unexploded ordnance (UXO) technicians engaged in subsurface clearance operations. The objectives of such operations typically include detection, location, identification and disposal of MEC or material potentially presenting and explosive hazard (MPPEH). Subsurface excavation operations include those that are conducted manually and with earth-moving equipment (EME).

This SOP does not include processes and requirements associated with explosive demolition of MEC or the evaluation processes related to MPPEH, which are addressed in JE-SOP-06, Demolition and Disposal and JE-SOP-05, MPPEH Management. It is also intended that the procedures included herein apply specifically to land-based MR operations. For marine or underwater environment MR activities see procedures JE-SOP-01-U through JE-SOP-08-U. There are also data management requirements associated with the surface clearance of MEC,

MPPEH, material documented as safe, and non-munitions-related debris (NMRD) that are outlined in JE-SOP-11 Munitions Response Data Management.

2.0 General Roles and Responsibilities

Project Manager (PM): Provides the project leadership and direction to ensure that the project is performed within the scope, schedule, and budget, ensures quality, risk management, safety, and contract compliance. The PM will ensure that site-specific work plans, safety plans, and/or SOPs that adequately address site-specific hazards and control measures are in place prior to the start of work.

MR Health, Safety, and Environment (HSE) and Quality Manager: Assists and advises the MR and project staff to plan, staff, and execute the MR safety and quality programs. Final reviewer of all project plans and reports. Audits and evaluates MR field projects and safety programs to verify that MR requirements and practices are implemented and effective. Unexploded Ordnance Quality Control Specialist (UXOQCS) and Unexploded Ordnance Safety Officer (UXOSO) reports directly to MR HSE and Quality Manager.

Senior UXO Supervisors (SUXOS): Supervise all field operation and reports to the PM. Responsible for executing the project in accordance with (IAW) the site-specific documents (Work Plan [WP], Explosives Safety Submissions [ESS], ESS-Determination Request [ESS-DR], and/or Quality Assurance Project Plan [QAPP]). The SUXOS is responsible for completing the Contractor Production Report each day activities are performed onsite. They are required on all MR projects and authorized to stop work at any time to prevent accidents.

UXOQCS: Supervise the quality of all field operations and reports to MR HSE and Quality Manager. Responsible for monitoring the quality of the project IAW the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOQCS is responsible for completing the Quality Control Report each day activities are performed onsite.

UXOSO: Supervise the safety of all field operation and reports to MR HSE and Quality Manager. Responsible for monitoring the safety of the project IAW the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOSO provides a Daily Site-Specific Tailgate Safety Briefing to include MEC, construction, industrial, environmental, and natural safety hazard awareness and provides the plan of the day. As applicable, they provide a Hazardous Materials briefing for items used, consumed, or required for this SOP. The UXOSO performs risk assessment to determine the number of visitors permitted, provides a safety briefing, and verifies training and medical surveillance qualifications of personnel.

EME Operator: Authorized as essential personnel to support mechanical excavations. Will have a letter from the employing organization stating competence to operate assigned equipment. EME operators may be a non-UXO-Qualified Person who is obligated to follow prescribed guidance within this SOP, WP, ESS, ESS-DR, and/or QAPP, and Accident Project Plan (APP) and is under the direct supervision of a UXO Technician. EME operators shall follow the requirements of the EME SOP, which includes evaluation and approval from an authorized Contractor EME operator evaluation-designated person. Evaluations will be conducted only by designated persons on file with the project Health and Safety Manager (HSM). Only EME operators with an evaluation form and test on file with the project HSM will operate EME.

3.0 Subsurface Excavation

Before the start of excavation operations, the PM, SUXOS, or UXOSO will establish an exclusion zone (EZ) based on a determination of the Explosives Safety Quantity Distance requirements associated with the Munition with the Greatest Fragment Distance as outlined within the ESS and WP/QAPP, both of which are required to be onsite.

Only the minimum number of project-essential personnel, consistent with safe and effective operations, will be in the established EZ during anomaly excavation operations. Minimum composition of the excavation or dig team will be two UXO Technicians, one of whom must be a UXO Technician II. The dig team will work under the direct supervision of a UXO Technician III. Direct supervision for the purposes of this SOP means that the UXO Technician III will be physically located at the location where intrusive operations are being conducted and team members can promptly obtain their attention or assistance.

Personal protective equipment and safety equipment will be readily available and emergency communications established before the commencement of excavation operations. Personnel will be trained on their role and duties, operator hand signals, and emergency actions as assigned by the UXO Technician III.

The area to be excavated will be free of nonexplosive buried hazards such as utilities or Hazardous, Toxic, or Radiological Waste. If such hazards are present, ensure the crews are aware of the hazards, the hazard locations, and what proper precautions have been established.

A subsurface excavation is usually conducted before the identification of target anomalies derived through the processing of geophysical data collected during the digital geophysical mapping (DGM) phase of the MR project. Target anomalies are provided to the SUXOS who, in turn, distributes them to designated UXO Team Leaders for reacquisition and excavation. However, if no digital geophysical survey was conducted, the SUXOS will assign UXO Team Leaders to specific grids to conduct “mag, flag & dig” operations. In these operations, UXO Technicians use handheld detection equipment to locate anomalies within the lanes of a grid. The anomalies are flagged and subsequently excavated to determine if the source of the anomaly was MEC, MPPEH, MD, or NMRD. “Mag, flag & dig” operations are the exception rather than the rule and most subsurface excavations are to determine whether target anomalies are MEC, MPPEH, or NMRD. Note that the benefit of the DGM approach is to significantly reduce the number of excavations to only those anomalies having geophysical properties associated with MEC or MPPEH.

Subsurface excavations are conducted to explore the results of geophysical sensors by excavating and identifying the source of selected metallic anomalies and subsequently disposing of those items determined to be MEC or MPPEH. Subsurface excavations are also completed using a grid-based approach to define the boundary of the geographic area to be cleared. MEC and MPPEH items that are deemed unacceptable to move and MD are flagged for subsequent disposal operations. MEC and MPPEH items that are acceptable to move are usually collected and placed in a designated corner of the grid to await further evaluation and processing. Subsurface excavations are typically coordinated by a SUXOS and conducted by a UXO Technician Level III UXO Team Leader who leads a team of UXO Technician Level IIs and Is. Teams are usually comprised of four or six UXO Technicians led by a Team Leader. A UXOQCS will independently perform subsurface excavations IAW the WP/QAPP. All will be supported by the observations and advice provided by the UXOSO using the WP/QAPP and the Health and Safety Plan.

Anomaly excavation operations will be executed by UXO-qualified personnel under the direct supervision of a UXO Technician III. The excavation team will not dig directly down to the item but will dig to the side to avoid striking the item with digging implements. Extreme care will be taken during anomaly excavation to avoid striking, moving, or otherwise disturbing items that are assumed to be MEC or MPPEH until determined acceptable or safe to move by UXO Technicians Level II or above. Investigation will continue laterally to the project-specific critical search radius and maximum depth of excavation, or until the anomaly is identified and confirmed to have been resolved.

Anomalies deeper than 2 to 3 feet should be assisted by mechanical excavation of buffer layers of confining soils by EME such as a backhoe or track excavator. Mechanical excavation should be performed by specifically qualified and authorized personnel IAW Enterprise SOP HSE 306. All excavations will be conducted IAW Enterprise SOP HSE 307, Excavation and Trenching Safety. Additional safety procedures including daily inspections, step downs, shoring, or confined space considerations and the placement of spoils may be required. The UXOSO will monitor mechanical excavations and will prescribe additional safety procedures as required by WP, ESS, ESS-DR, and/or QAPP, and APP. If an excavation is deeper than 4 feet or presents a cave-in hazard a “Competent Person” must be onsite. Shoring or sloping may be necessary. Contact the UXOSO who will assess the requirements for a professional engineer; requesting the advice of others within Contractor Safety organization as necessary.

4.0 Definitions

Exclusion Zone (EZ) —An explosive safety quantity distance arc established around a MR work area where MEC procedures are being conducted. An EZ is created by a response operation that may move within defined boundaries, can be suspended, and will be cancelled upon project completion.

Fuzes—Devices that initiate the detonation sequence in munitions. Fuzes are typically associated with munitions (for example, mortars and bombs), but they are occasionally found separately. They may contain a charge large enough to cause injury. Magnetic and proximity fuzes are the most sensitive and, depending on other factors (for example, fuze location and arming), greatly influence the likelihood of detonation. When separated from the munitions, a fuze may not look like an explosive munitions item.

The terms fuse and fuze mean different things. For this SOP, a fuze is a mechanical or electrical device with explosive or nonexplosive components designed to initiate a train of fire or detonation in ordnance (for example, hand grenade). A fuse is a cord of readily combustible material that can be lit at one end to carry a flame along the length of the fuse to detonate an explosive at the other end (for example, firecracker).

Military Munitions—Ammunition products and components produced for or used by the armed forces for national defense and security. The term military munitions include ammunition products or components under the control of the DoD, U.S. Coast Guard, Department of Energy, and National Guard. The term includes the following munitions:

- Confined gaseous, liquid, and solid propellants
- Explosives
- Pyrotechnics
- Chemical and riot control agents
- Smokes and incendiaries
- Bulk explosives
- Chemical agents
- Chemical munitions
- Rockets
- Guided and ballistic missiles
- Bombs
- Warheads
- Mortar rounds
- Artillery ammunition
- Small arms ammunition
- Grenades
- Mines
- Torpedoes
- Depth charges
- Cluster munitions and dispensers
- Demolition charges
- Devices and components thereof

Military munitions do not include wholly inert items, improvised explosive devices, or nuclear weapons, nuclear devices, or nuclear components. However, military munitions do include non-nuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 United States Code [U.S.C.] Section [§] 2011 et seq.) have been completed [10 U.S.C. §101(e)(4)].

Munitions Constituents (MC)—Any materials originating from UXO, discarded military munitions (DMM), or other military munitions, including explosive and nonexplosive materials. MC also includes emission, degradation, or breakdown elements of such ordnance or munitions [10 U.S.C. §2710(e)(3)]. Note: MC are MEC when explosive compounds of the munitions, such as trinitrotoluene (TNT), Royal Demolition eXplosive (RDX), and High Melting eXplosive (HMX), are in sufficient concentration as to pose an explosive hazard. This situation arises when concentration levels are 10 percent or more. Nonexplosive MC and explosive concentrations less than 10 percent are not considered MEC.

Munitions and Explosives of Concern (MEC)—Specific categories of military munitions that may pose unique explosive risks, including UXO, as defined in 10 U.S.C. §101(e)(5); DMM, as defined in 10 U.S.C. §2710(e)(2); or MC (for example, TNT and RDX), as defined in 10 U.S.C. §2710(e)(3), present in high enough concentrations to pose an explosive hazard (See Munitions Constituents).

Material Potentially Presenting an Explosive Hazard (MPPEH)—Material owned or controlled by the DoD that, before determination of its explosives safety status, potentially contains explosives or munitions (for example, munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (for example, equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are munitions within the DoD-established munitions management system, non-munitions-related material (for example, horseshoes, rebar, other solid objects), munitions related solid metal fragments that do not realistically present an explosive hazard, and other items that may present explosion hazards (for example, gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions.

Munitions Response (MR)—Response actions, including investigation, removal actions, and remedial actions, to address the explosives safety, human health, or environmental risks presented by UXO, DMM, or MC, or to support a determination that no removal or remedial action is required.

Unexploded Ordnance (UXO)—Military munitions that have been primed, fuzed, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and remain unexploded whether by malfunction, design, or any

other cause [10 U.S.C. §101(e)(5)(A) through (C) P.L. 106-65, section 3031 (c)(5)(A), provides a more detailed description].

UXO Operations—UXO operations are defined as MEC identification; access procedures such as excavation, either by hand or using heavy equipment; handling of UXO, explosives or explosive items; or disposal, including movement, transportation, and final disposal of MEC.

5.0 References

Code of Federal Regulations Title 49 Parts 100 to 199 (49 CFR 100-199), “Transportation” (applicable sections). U.S. Department of Transportation

Department of Defense (DoD). 2015. DoD Instruction 3200.16. *Operational Range Clearance.* April 21.

DoD. 2018. DoD 4145.26-M. *Contractor’s Safety Manual for Ammunition and Explosives.* Change 2. August 31.

DoD. 2019. Instruction 4140.62. *Material Potentially Presenting an Explosive Hazard (MPPEH).* Change 3. September 9.

Department of Justice, Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) 2012. *Federal Explosives Laws and Regulations.* April 27.

Department of the Navy (Navy). 2022. EOD Bulletin 60A 1-1-31. Technical Manual. *Explosive Ordnance Disposal Procedures, EOD Disposal Procedures.* June 30.

Naval Sea Systems Command (NAVSEA). 2008. SW060-AA-MMA-010, Technical Manual. *Demolition Materials.* Volume 1, Revision 8. March 24.

NAVSEA. 2020. OP-5, Volume 1, Seventh Revision. *Ammunition and Explosives Safety Ashore.* Change 15. March 25.

Naval Ordnance Safety and Security Activity (NOSSA). 2020. Instruction 8020.15E *Explosive Safety Review, Oversight, and Verification of Munitions Responses*. September 11.

6.0 Supervisor’s or Process Supervisor’s Statement

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Signature
Worker Name:

Date:

7.0 Worker's or Operator's Statement

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:

:

This page intentionally left blank.

Standard Operating Procedure
Material Potentially Presenting an Explosive Hazard (MPPEH) Management

Document No: JE-SOP-05

Effective Date: February 24, 2023

Revision: 007

Contents

REV NO.	EFFECTIVE DATE	REVISION DESCRIPTION	PROCEDURE OWNER APPROVAL
001	11.21.18	Original issue	George DeMetropolis
002	11.29.18	Revised SOP #, added Record of Approval	George DeMetropolis
003	02.22.19	Clarified who can conduct inspections and re-inspections of MDAS	George DeMetropolis
004	06.19.19	Corrected TP 16 revision and deleted reference to ESS-DR during MPPEH processing	George DeMetropolis
005	01.01.21	Updated references and completed review	George DeMetropolis
006	08.01.22	Annual review	Jeff McCauley

REV NO.	EFFECTIVE DATE	REVISION DESCRIPTION	PROCEDURE OWNER APPROVAL
007	02.24.23	Annual review and update	Jeff McCauley

Attachments

None.

1.0 Scope and Application

This standard operating procedure (SOP) outlines the requirements for Munitions Response (MR) personnel when managing Material Potentially Presenting an Explosive Hazard (MPPEH).

This SOP is to be used during MR projects directly performed by contractor Unexploded Ordnance (UXO) Technicians engaged in MPPEH Management. The objectives of such operations typically include inspection, reinspection, verification, and certification of MPPEH into either Material Documented as Safe (MDAS) or Material Documented as an Explosive Hazard (MDEH).

This SOP does not include processes and requirements associated with surface clearance or subsurface excavation of munitions and explosives of concern (MEC) or explosive demolition operations of MEC/MDEH. The procedure for demolition and disposal is JE-SOP-06. Subsurface Clearance of MEC is JE-SOP-04. It is also intended that the procedures included herein apply specifically to land-based operations.

There are references that guide the general requirements within this SOP. Because of the inherent and hazardous nature of military munitions, most of these references are issued under the cognizance of the Department of Defense (DoD) through administration of its Military Munitions Response Program (MMRP) and the Component Services that execute the MMRP. While some of these references will be cited later in this SOP, it is the obligation of all contractor MR personnel to stay apprised of such requirements and their revisions. Additionally, MPPEH processing conducted for DoD projects will strictly comply with all requirements articulated in the approved Work Plan (WP), Explosives Safety Submissions (ESS), and/or Quality Assurance Project Plan (QAPP). Project Managers (PMs) will ensure ESS are amended appropriately whenever necessary.

2.0 Equipment

- Cellular telephone
- Magnetometer capable of monitoring to a depth of 2 feet below ground surface for ferrous items
- All metals detector capable of monitoring to a depth of 6 inches below ground surface for nonferrous items
- Marking flags, ribbon, and tape (various colors as required)
- Batteries (various, as required)
- First-aid Kit (25 person)
- Water
- Camera, tape measure, ruler, calipers, paper pencil
- Hand tools (such as, hammer and general-purpose tools)

3.0 General Roles and Responsibilities

PM: Provides the project leadership and direction to ensure that the project is performed within the scope, schedule, and budget, ensures quality, risk management, safety, and contract compliance. The PM will ensure that site-specific work plans, safety plans, and/or SOPs that adequately address site-specific hazards and control measures are in place prior to the start of work.

MR Health, Safety, and Environment (HSE) and Quality Manager: Assists and advises the MR and project staff to plan, staff, and execute the MR safety and quality programs. Final reviewer of all project plans and reports. Audits and evaluates MR field projects and safety programs to verify that MR requirements and practices are implemented and effective. UXO Quality Control Specialist (UXOQCS) and UXO Safety Officer (UXOSO) report directly to MR HSE and Quality Manager.

Senior UXO Supervisors (SUXOS): Supervise all field operation and reports to the PM and UXO Support Lead. Responsible for executing the project in accordance with (IAW) the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). The SUXOS is responsible for completing the Contractor Production Report each day activities are performed onsite. They are required on all MR projects and authorized to stop work at any time to prevent accidents.

UXOQCS: Supervise the quality of all field operation and reports to MR HSE and Quality Manager. Responsible for monitoring the quality of the project IAW the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOQCS is responsible for completing the Quality Control Report each day activities are performed onsite.

UXOSO: Supervise the safety of all field operation and reports to MR HSE and Quality Manager. Responsible for monitoring the safety of the project IAW the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOSO provides a Daily Site-specific Tailgate Safety Briefing to include MEC, construction, industrial, environmental, and natural safety hazard awareness and provides the plan of the day. As applicable, they provide a hazardous materials briefing for items used, consumed, or required for this SOP. The UXOSO performs risk assessment to determine the number of visitors permitted, provides a safety briefing, and verifies training and medical surveillance qualifications of personnel.

4.0 MPPEH Management

The objective of these procedures is to ensure that a complete visual inspection of the exterior and interior surfaces of all recovered MPPEH is conducted by qualified personnel, and IAW applicable DoD regulations to ensure they are accurately categorized as either MDAS or MDEH. Note that MPPEH as discussed within this SOP is understood to be material determined to be safe or acceptable to move. As the material potentially presents an explosive hazard, it is to be handled with extreme care and not subjected to heat, shock, or friction during the evaluation process.

MPPEH Management includes any action or operation involving MPPEH, MDAS, MDEH, including, but not limited to the following:

- Collection
- Consolidation, sorting, segregating
- Inspecting
- Storing
- Transferring, certifying, releasing
- Demilitarizing
- Transporting materials

4.1 Personnel Specific Duties and Responsibilities

UXO personnel will be graduates of military explosive ordnance disposal (EOD) school of the United States, Canada, Great Britain, Germany, or Australia, or a graduate of a formal training course of instruction or EOD assistant course as stated in DoD Explosives Safety Board (DDESB) Technical Paper (TP) 18.

SUXOS will:

- Be responsible for ensuring work and quality control plans specify the procedures and responsibilities for processing MDAS for final disposition as munitions debris.
- Ensure a requisition and turn-in document, DD Form 1348-1A is completed for all munitions debris and range-related debris (RRD) to be transferred for final disposition.
- Perform random checks to satisfy that the munitions debris and RRD is free from explosive hazards necessary to complete the DD Form 1348-1A.
- Certify all munitions debris and RRD as free of explosive hazards, engine fluids, radioluminescent dials and other visible liquid hazardous, toxic, or radiological waste (HTRW) materials.

- Be responsible for ensuring that inspected debris is secured in a closed, labeled and sealed container and documented as follows:
- The container will be closed and clearly labeled on the outside with the following information: The first container will be labeled with a unique identification that will start with U.S. Army Corps of Engineers, Air Force Civil Engineer Center, Naval Facilities Engineering Systems Command (NAVFAC), or other client identifier followed by installation name, contractor's name, and sequential numerical identifier (for example, NAVFAC/Installation Name/Contractor's Name/0001/Seal's unique identification) and continue sequentially.
- The container will be closed in such a manner that a seal must be broken to open the container. A seal will bear the same unique identification number as the container or the container will be clearly marked with the seal's identification if different from the container.
- A documented description of the container will be provided by the contractor with the following information for each container; contents, weight of container; location where munitions or RRD was obtained; name of contractor, names of certifying and verifying individuals; unique container identification; and seal identification, if required. The contractor in a separate section of the final report will also provide these documents.

UXOSO will:

- Ensure the specific procedures and responsibilities for processing MPPEH for documentation as munitions debris or RRD specified in the WP are being followed.
- All procedures for processing MPPEH are being performed safely and consistent with applicable regulations.

UXOQCS will:

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

UXO Technician III will:

- Determine if all recovered items are free of explosives hazards or other dangerous fillers and engine fluids, illuminating dials, and other visible liquid HTRW materials.
- Supervise disposal of items found to contain explosive hazards or other dangerous fillers and venting/demil procedures using demolition procedures established in the Explosive Demolition Operations SOP (JE-SOP-40).
- Supervise the consolidation of MDAS for containerization and sealing. Munitions Debris and RRD will be segregated.

UXO Technician II will:

- Determine the following regarding all recovered items:
  - Whether the item is a UXO, discarded military munitions (DMM), munitions debris, or RRD
  - Whether the item contains explosives hazards or other dangerous fillers
  - Whether the item requires disposal by detonation (MDEH)
  - Whether the item requires demil for disfigurement or to vent/expose potentially dangerous fillers
  - Whether the item requires draining of engine fluids, illuminating dials, and other visible liquid HTRW materials
  - Segregate items requiring demil or venting procedures from those items ready for documentation as MDAS
  - Items determined to contain explosive hazards or other dangerous fillers will be processed IAW applicable procedures and in compliance with ESP/ESS requirements

UXO Technician I:

- Can tentatively identify a located item as MPPEH, followed by a required confirmation by a UXO Technician II or III.

UXO Sweep Personnel (if required by technical approach) will:

- Only mark suspected items and will not be allowed to perform any assessment of a suspect item to determine its status.

  Note: UXO Sweep Personnel are not qualified UXO personnel.

4.2 Collection

All handling and processing of items regardless of classification will be performed with care. At no time will rough handling of an item be considered acceptable. Proper precautions will be taken when involving the handling of an item including but not limited to:

- Proper personal protective equipment will be worn at all times.
- Situational awareness of who and what make up the current surroundings.
- Validation of all inspection processes.
- Inspection and reinspection.

The collection process will consist of first identifying the item and determining if it is MPPEH, MDEH, MDAS, or cultural debris.

- An attempt will be made to identify all MPPEH items.
- If an item cannot be identified, the SUXOS will contact the UXO Technician Support Lead to assist with identification, or EOD if applicable.
- When required by project scope, an MPPEH item's original location will be recorded by global positioning system equipment, a photo will be taken, basic information of the item will be recorded in the team leader's logbook or on a dig sheet, and the information on the item will be reported to the SUXOS for inclusion in the daily report.

4.3 Consolidation, Sorting, and Segregating

The performance of consolidation, sorting, and segregating ensure the inspection process remains as safe and thorough as possible, as follows:

- Grouping similar items and materials allowing separation of known MPPEH from MDAS or nonmunitions-related scrap
- Using centralized location providing the necessary personnel, tools, containers, locks, seals, and documentation to maintain the chain-of-custody
- Preventing from co-mingling of items
- Allowing a more effective and efficient inspection process

4.4 Inspecting

When MPPEH is encountered, a UXO Technician III or above will perform an initial 100 percent inspection of each item as it is recovered to determine the following:

- Is the item MDEH or MDAS?
- Does the item require demilitarization or venting to expose voids that may contain dangerous fillers?
- Does the item require draining of visible liquid HTRW material?

Using the same logic, a second UXO Technician III or above different from the first UXO Technician III or above who conducted the initial inspection, will perform a reinspection of each item to verify each item as MDAS. All inspections of MDAS will only be performed by qualified UXO Technicians as specified by this SOP and identified in the MPPEH Inspection letter and document its explosive status submitted to and approved by the Client. MDAS

inspection, verification, and certification procedures as previously stated in this SOP will be documented using DD Form 1348-1.

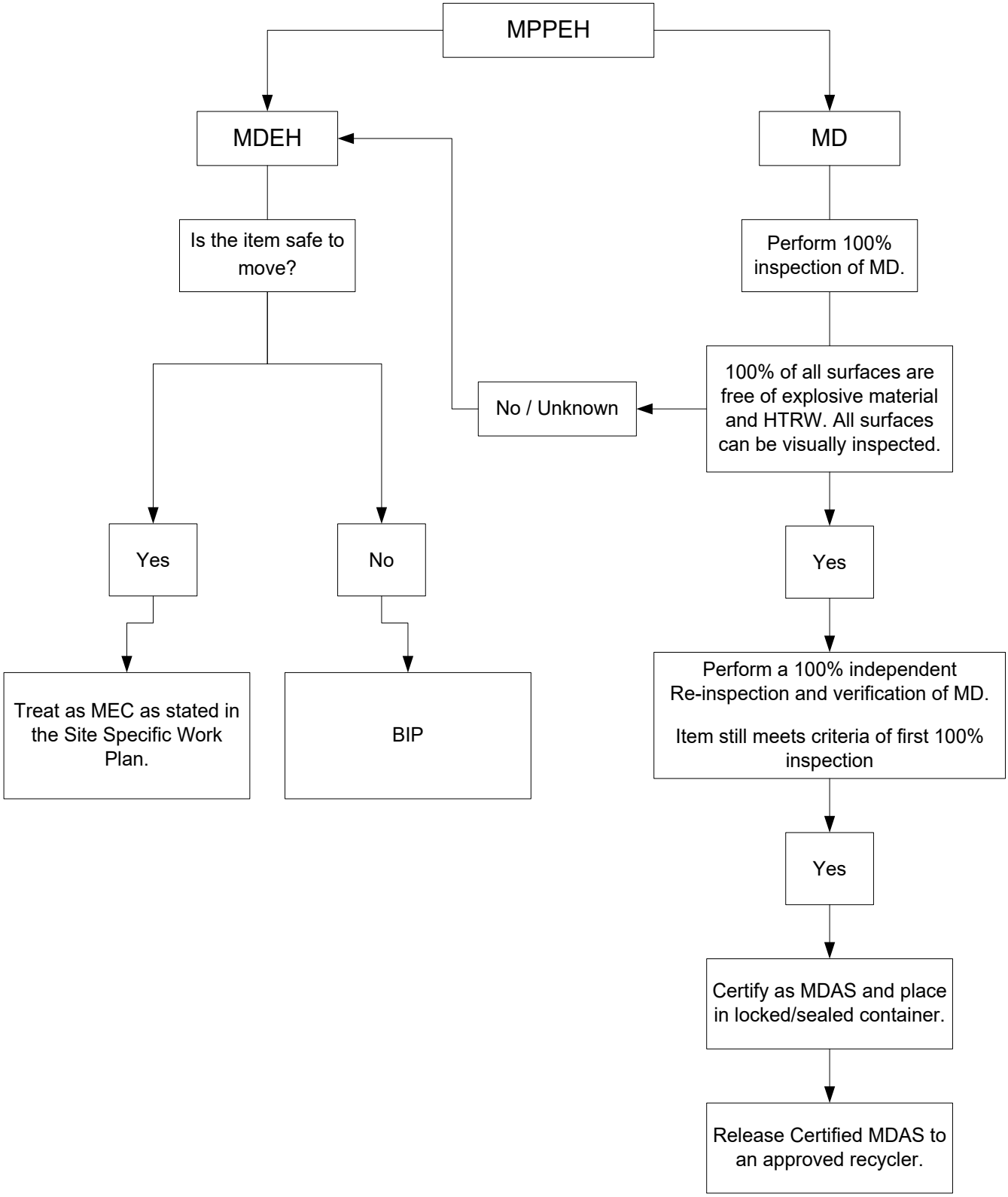
After each inspection, an item will be placed in one of the following categories:

- MPPEH – The item is awaiting inspection, reinspection, demilitarizing or venting, or treatment of its explosive status.
- MDAS – The item has been 100 percent inspected and all surfaces are deemed free of any explosive hazard with supervision by the SUXOS. The item has been 100 percent independently re-inspected and verified all surfaces are deemed free of any explosive hazard by the two UXO-qualified, UXO Technician III and above personnel. Through this process the item has been certified as MDAS. The item is no longer considered MPPEH.
- MDEH – The item cannot be certified as MDAS because of the inability to verify that 100 percent of all surfaces are free of any explosive hazard. The item has been documented MDEH. The item is no longer MPPEH. An item need not be independently re-inspected once it has been initially inspected and documented MDEH and to be treated for its explosive hazards.
- Empty Containers – All empty containers that were used for ammunition and explosives to be transferred or released are considered MPPEH and must be managed as such.
  - All previous markings on empty containers must be removed or obliterated
  - Approved cardboard, plywood containers, and packing material for C/D 1.4S materials may be discarded as solid waste (general trash) provided the following criteria are met.
    - The items are 100 percent visually screened for the presence of munitions by two different individuals per approved written operating procedures.
    - The items are broken down or otherwise deformed so that they may not be used for their original purpose.

If the MDEH item cannot be identified by type as a conventional munition or if in the unlikely event that the MDEH is suspected to be potential chemical warfare materiel, personnel will withdraw upwind from the area, assemble at a predesignated rally point, secure the site, and immediately request assistance from the point of contact at the facility and notify the UXO Technician Support Lead. If so directed, UXO personnel will take emergency noninvasive actions such as covering the item with plastic sheeting and securing the area until the appropriate exclusion and safety zones have been determined.

If HTRW is encountered onsite, the work site will be evacuated until the project health and safety officer, with concurrence of the client point of contact at the facility, identifies and implements appropriate protective measures.

For any of the scenarios, upon receiving notification from the UXO technician in charge, the UXO Support Lead will then immediately inform the PM, who will then immediately inform the client PM. Program management personnel will also be notified. The client PM will be responsible for making all other necessary notifications within the client's organization.



MPPEH Inspection Process

MDEH will be treated and stored as MEC. See WP/ QAPP and JE-SOP-06 for MEC treatment and disposition procedures.

4.5 Storage

- Recovered MPPEH will be managed as hazard C/D 1.1, Storage Compatibility Group L unless assigned differently by Naval Ordnance Safety and Security Activity (NOSSA) (N82) until it is inspected and certified.
- To maintain the chain-of-custody, co-mingling of different categories of materials (that is, MPPEH, MDAS, and MDEH) should not occur. Should commingling occur, MDAS and/or MDEH will lose its documented explosives safety status and become MPPEH until it goes through the process again.
- To prevent co-mingling, use a suitable combination of controls such as separate storage locations within the storage area, moveable signs, barriers, gates, locked containers, waterproof certification documents attached to containers, container seals traceable to the transfer documentation, or other methods included in approved written operating procedures.
- MDAS must be segregated in a location with controlled access, preferably in a locked container and secured facility.
- Minimize the quantity and time MPPEH is accumulated and retained at any location.
- MPPEH will be or stored in closed containers to prevent exposure to or the collection of precipitation.

4.6 Certification and Transfer

Material Documented as Safe

- Certification as MDAS requires dual signatures on the transfer of document (DD Form 1348-1). The initial inspection conducted by a UXO Technician III or above will certify that the MDAS has been 100 percent inspected, and to the best of his or her knowledge and belief, is free of explosive hazards. The second inspection or reinspection conducted by a different UXO Technician III and above will verify that the MDAS is to the best of his or her knowledge and belief, free of explosive hazards. All certification and verification documentation will clearly show the printed names of the two qualified UXO technicians, organization, signature, and phone numbers of the persons certifying and verifying the material as free of explosive hazards.
- The following certification and verification will be entered on each form (DD Form 1348-1) for turnover of MDAS and will be signed by the two qualified UXO technicians that performed the inspection and reinspection:
  - "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."

MDEH and MPPEH

Demolition operations to dispose of all MPPEH, MDEH, and MEC will be performed by the Contractor. No MDEH items will be transferred to another party for disposal.

4.7 Release

The certified and verified MDAS will be released with applicable transferring documentation (DD Form 1348-1) to the certified subcontractor, who will do the following:

- Upon receiving the unopened labeled and locked containers each with its unique identified and unbroken seal, ensure a continued chain-of-custody and after reviewing and concurring with all provided supporting documentation, sign for having received and agree with the provided documentation that the locked and sealed containers contained no explosives when received.
- Perform a shredding or cutting process capable of demilitarizing MDAS resembling military munitions.
- Perform 100 percent inspection of the shredded or cut scrap to ensure no resemblance to military munitions. Once this has been determined, the scrap will be transported to a qualified recycler and recycled.

- Provide an “END USE” destruction certification confirming that the material has been recycled. End Use certifications will be included in the final reporting documents.
- Material that has been documented as safe is no longer considered MPPEH, as long as the chain-of-custody remains intact. A legible copy of inspection, reinspection, and documentation must accompany the material through final disposition and be maintained for a period of 3 years thereafter.

If any organization breaks the MPPEH chain-of-custody, the affected items status will be changed to MPPEH until they undergo a second 100 percent inspection, a second 100-percent inspection, and be documented to verify its explosive safety status.

4.8 Demilitarizing

Demilitarizing will be performed on all MDAS that resembles a military munition. Demilitarizing will consist of altering the shape through the use of hand tools (such as pliers, cutters, or presses) so that the item no longer resembles a military munition. If needed, the use of mechanized equipment (for example, chop-saws) or propane torches may be used to break down items.

Demilitarization is often a separate requirement from documenting the explosive safety status of the material. MPPEH is often determined to be MDAS before demilitarization. In some cases, a demilitarization requirement (such as venting or burning) may be part of the safe certification requirement (see JE-SOP-40, Explosive Demolition and Disposal Operations).

5.0 Definitions

Note: Definitions other than those provided below may apply for MR work performed outside U.S. jurisdictions. Check contractual references to ensure correct definitions are applied.

Material Document as Safe (MDAS). Material that has been assessed and documented as not presenting an explosive hazard and for which the chain-of-custody has been established and maintained. This material is no longer considered MPPEH per DoD Instruction 4140.62 (see References).

Material Documented as an Explosive Hazard (MDEH). MPPEH that cannot be documented as MDAS that has been assessed and documented as to the maximum explosive hazards the material is known or suspected to present, and for which the chain-of custody has been established and maintained. This material is no longer considered to be MPPEH per DoD Instruction 4140.62 (see References). (The MDEH characterization only addresses the explosives safety status of the material.)

Munitions and Explosives of Concern (MEC). This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means: (A) UXO, as defined in 10 United States Code (U.S.C.) 101(e)(5); (B) DMM, as defined in 10 U.S.C. 2710(e)(2); or (C) Munitions constituents (e.g., TNT, RDX), as defined in 10 U.S.C. 2710(e)(3), present in high enough concentrations to pose an explosive hazard.

Material Potentially Presenting an Explosive Hazard (MPPEH). Material owned or controlled by the DoD that, before determination of its explosives safety status, potentially contains explosives or munitions (for example, munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and RRD) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (for example, equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations).

Excluded from MPPEH are munitions within the DoD-established munitions management system and other items that may present explosion hazards (for example, gasoline cans and compressed gas cylinders) that are not munitions and are not intended for use as munitions per DoD Instruction 4140.62 (see References).

Munitions Debris. A military munition or components thereof that do not contain explosives or pyrotechnics. Examples include practice munitions without spotting charges, inert training munitions, expended ejection munitions, and fragments of exploded/destroyed military munitions that do not contain explosives or pyrotechnics.

6.0 References

Code of Federal Regulations Title 49 Parts 100 to 199 (49 CFR 100-199), “Transportation” (applicable sections). Department of Transportation.

Department of Defense Explosives Safety Board (DDESB). 2016. Technical Paper 16. *Methodologies for Calculating Primary Fragment Characteristics.* Revision 5. December 19.

DDESB. 2020. Technical Paper 18. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities.* Revision 1. June 24.

Department of Defense (DoD). 2015. 4160.28-M. *Defense Demilitarization: Program Administration*. Volumes 1 through 3. October 22.

DoD. 2018. DoD 4145.26-M. *Contractor’s Safety Manual for Ammunition and Explosives.* Change 2. August 31.

DoD. 2019. Instruction 4140.62. *Material Potentially Presenting an Explosive Hazard (MPPEH).* Change 3. September 9.

Department of Justice, Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF). 2012. *Federal Explosives Laws and Regulations.* April 27.

Department of the Navy (Navy). 2022. EOD Bulletin 60A 1-1-31. Technical Manual. *Explosive Ordnance Disposal Procedures, EOD Disposal Procedures.* June 30.

Naval Sea Systems Command (NAVSEA). 2008. SW060-AA-MMA-010, Technical Manual. *Demolition Materials.* Volume 1, Revision 8. March 24.

NAVSEA. 2020. OP-5, Volume 1, Seventh Revision. *Ammunition and Explosives Safety Ashore.* Change 15. March 25.

Naval Ordnance Safety and Security Activity (NOSSA). 2020. Instruction 8020.15E *Explosive Safety Review, Oversight, and Verification of Munitions Responses*. September 11.

7.0 Supervisor's or Process Supervisor's Statement

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Signature
Worker Name:

Date:

8.0 Worker's or Operator's Statement

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:

Standard Operating Procedure
Demolition and Disposal of MPPEH and MEC

Document No: JE-SOP-06

Effective Date: February 24, 2023

Revision: 005

Contents

Rev No.	Effective Date	Revision Description	Procedure Owner Approval
001	11.21.18	Original issue	George DeMetropolis
002	11.29.18	Revised SOP #, added Record of Approval	George DeMetropolis
003	01.01.21	Updated references and completed review	George DeMetropolis
004	08.01.22	Annual review	Jeff McCauley

Rev No.	Effective Date	Revision Description	Procedure Owner Approval
005	02.24.23	Annual review and update	Jeff McCauley

Attachments

None.

1.0 Scope and Application

This standard operating procedure (SOP) provides minimum safety procedures and health and safety requirements applicable to the conduct of demolition and disposal operations on sites contaminated with material potentially presenting an explosive hazard (MPPEH) and munitions and explosives of concern (MEC).

This SOP applies to all site personnel involved in the conduct of MPPEH/MEC demolition and disposal operations on a MEC-contaminated site. The SOP is not intended to contain all the requirements needed to ensure complete compliance and should be used in conjunction with project plans and applicable federal, state, and local regulations. This SOP will address the demolition and disposal procedures that will be used in conjunction with the site-specific documents (Work Plan [WP], Explosives Safety Submission [ESS], ESS-Determination Request [ESS-DR], and/or Quality Assurance Project Plan [QAPP]) and Accident Prevention Plan.

2.0 Equipment

- One handheld radio per Senior Unexploded Ordnance (UXO) Supervisor (SUXOS), UXO Safety Officer (UXOSO), and Demolition Supervisor (DS)
- One 4x4 emergency response/personnel transport vehicle
- Galvanometer (when using MK 186 remote firing device [RFD])
- One blasting tool kit.
- One handheld radio per person or cell phone (must have minimum of three bar tower reception)
- One collection vehicle
- Collection containers as required
- Exclusion Zone (EZ) signs (one for each road to be blocked)
- Marking flags, tape, engineer ribbon, poles, and/or stakes
- Plastic pin flags - multiple colors
- Multicolor marking ribbons and spray paint
- Two fire extinguishers per vehicle moving MPPEH/MEC (BC extinguishers)

3.0 General Roles and Responsibilities

Project Manager (PM): Responsible for ensuring the availability of the resources needed to implement this SOP and will also ensure that this SOP is incorporated in plans, procedures, and training for sites where this SOP is to be implemented.

SUXOS: Responsible for ensuring adequate safety measures and housekeeping are taken 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 economical manner.

DS: Before initiation of demolition operations, the SUXOS will designate an experienced and trained UXO supervisor to act as the DS. The demolition activities will then be conducted under the direct control of the DS, who will have the responsibility of supervising all demolition operations. The DS will be responsible for training all onsite UXO personnel regarding the nature of the materials handled, the hazards involved, and the precautions

necessary. The DS will also ensure that the daily operational log, ordnance accountability log, demolition records, and inventory records are properly filled and accurately depict the demolition events and demolition material consumption for each day's operations. The DS will be present during all demolition operations or designate a competent, qualified person to be in charge during any absences.

UXOSO: 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 only exception to this rule is when the project site has multiple sites conducting various types of UXO investigation and remediation operations being conducted concurrently with periods where there may be continuous demolition operations throughout the day. In that event, a demolition team UXOSO will be designated. This individual will report to the UXOSO and assume the UXOSO's responsibilities at the demolition range. In this situation, the UXOSO will conduct periodic safety audits of the demolition team and assist the demolition team UXOSO in the performance of their duties.

UXO Quality Control Specialist (UXOQCS): Responsible for ensuring the completeness of demolition operations and for weekly inspection of the ordnance accountability log, the daily operational log, the 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 up to 250 feet in radius after each demolition shot to ensure there are no kick-outs, hazardous MEC components, or other hazardous items. In addition, the pit will be checked with a magnetometer and large metal fragments 4 inches and greater and any hazardous debris will be removed on a per use basis. Any MEC discovered during the quality control (QC) check will be properly stored for destruction at a later date. Extreme caution must be exercised when handling MEC that has been exposed to the forces of detonation.

Munitions Response (MR) Health, Safety, and Environment (HSE) and Quality Manager: Assists and advises the MR and project staff to plan, staff, and execute the MR safety and quality programs. Final reviewer of all project plans and reports. Audits and evaluates MR field projects and safety programs to verify that MR requirements and practices are implemented and effective. UXOQCS and UXOSO report directly to the MR HSE and Quality Manager.

4.0 Explosive Operations

4.1 General Operational and Safety Procedures

The 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 only exception to this rule is when the project site has multiple sites conducting various types of UXO investigation and remediation operations being conducted concurrently with periods where there may be continuous demolition operations throughout the day. In that event, a demolition team, UXOSO will be designated. This individual will report to the UXOSO and assume the UXOSO's responsibilities at the demolition range. In this situation, the UXOSO will conduct periodic safety audits of the demolition team and assist the demolition team UXOSO in the performance of their duties, outlined as follows:

- All personnel to comply with all safety regulations applicable to demolition range activities and demolition and MEC materials involved.
- Demolition of any kind is prohibited without the express permission from the client.
- Use of sandbags for mitigation of fragmentation will be in accordance with (IAW) HNC-ED-CS-98-7 Amendment 1, February 2011; and Amendment 2, November 2014.
- In the event of an electrical storm, heavy snow, or dust storms, immediate action will be taken to cease all demolition range operations and evacuate the area.
- In the event of a fire or unplanned explosion, if possible, put out the fire. If unable to do so, notify the fire department, and evacuate the area. If injuries are involved, remove victims from danger, administer first aid, and seek medical attention.
- The DS is responsible for reporting all injuries and accidents that occur to the UXOSO.
- Employees 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 DS or UXOSO.
- Methods of demolition will be conducted IAW this SOP and approved changes thereto.
- Fire prevention procedures for disposal operations will be enforced during all demolition operations.
- Adequate first aid equipment will be provided at all times.
- All personnel engaged in the destruction of MEC will wear under and outer garments made of natural fiber, close-weave clothes, such as cotton. Synthetic material such as nylon is not authorized unless treated with antistatic 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.
- The buddy system will be observed.
- Work locations will be maintained in a neat and orderly condition.
- All hand tools will be maintained in a good state of repair.
- Leather or leather-palmed gloves will be worn when handling wooden boxes or MEC.
- Lifting and carrying require care; improper methods cause unnecessary strains. Observe the following precautions 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 telephone and radio communication.
- 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 ABC-rated 10-pound, portable fire extinguisher will, if possible, be mounted on the vehicle outside of the cab, on the driver's side, and one Class ABC 10-pound 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 before 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.

- 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 DS to suspend firing if any aircraft, vehicles, or personnel are sighted approaching the general demolition area.
- Two-way radios will not be operated at the disposal site while the pit is primed or during the priming process.
- No demolition operation will be left unattended during the active portion of the operation (that is, during the burn or once any explosives or MEC are brought to the range).
- No demolition activities will be conducted if there is less than a 2,000-foot ceiling or if wind velocity exceeds 10 miles per hour.
- Demolition shots must be fired during daylight hours (that is, between 30 minutes after sunrise and 30 minutes before sunset).
- 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 or bed.
- Vehicles will not be refueled when carrying demolition material or MEC and must be 100 feet 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.
- Before conducting any other task, personnel will wash their face and hands after handling demolition material or MEC.
- Disposal sites will be spaced at least 50 feet apart, with no more than 10 pits prepared for a series of shots at any one time.

4.2 General Requirements for Demolition Activities

The following safety and operational requirements will be followed during demolition range operations. Any deviations from these procedures will be allowed only after receipt of written approval from the client. Failure to adhere to requirements and procedures listed in the subsection herein could result in serious injury or death; therefore, complete compliance with these required procedures will be strictly enforced. The two types of demolition for MEC items are Nonelectric Detonating System (NONEL) firing system or electric detonators as described in the following sections.

The following general disposal operations requirements will be followed at all times:

- Material awaiting destruction will be stored at not less than intraline distance, based on the largest quantity involved, from adjacent explosive materials and from explosives being destroyed. The material will be protected against accidental ignition or explosion from fragments, grass fires, burning embers, or detonating impulses originating in materials being destroyed.
- The Minimum Separation Distance (MSD) for MEC or bulk explosives to be destroyed will be calculated IAW DoD Explosives Safety Board (DDESB) Technical Paper (TP) 16, “Methodologies for Calculating Primary Fragment Characteristics.”
- The components should be placed on their sides or in a position to expose the largest area to the influence of the demolition material. The demolition material should be placed in intimate contact with the item to be detonated and held in place by tape or earth packed over the demolition materials. The total quantity to be destroyed below ground at one time will be kept at a minimum. Disposal shots will be completed using the Buried Explosion Module or sandbag mitigation will be used as deemed to be the most effective, IAW DDESB Fragmentation Data Review Form.
- Detonations will be counted to ensure detonation of all pits. After each series of detonations, a search will be made of the surrounding area for unexploded UXO and MEC. Items such as lumps of explosives or unfuzed ammunition may be picked up and prepared for the next shot. Fuzed ammunition or items that may have internally damaged components will be detonated in place, if possible.

- Prevailing weather condition information will be obtained from the National Weather Service and the data logged in the demolition shot log before each shot or round of shots.
- All shots will be dual primed.
- A minimum of 30 seconds will be maintained between each detonation.
- After each detonation and at the end of each day's operations, surface exposed scrap metal, casings, fragments, and related items will be recovered from the demolition range and disposed of IAW munition debris procedures, as well as all applicable environmental regulations. All collected scrap metal will be 100 percent inspected for absence of explosive materials by UXO personnel and certified by the SUXOS.
- When operated IAW the conditions of this SOP, the demolition range should not present a noise problem to the surrounding community. However, if a noise complaint is received, the name, address, and phone number of the complaint should be recorded and reported to the SUXOS.
- Before and after each shot, the demolition shot record is to be filled out by the DS with all applicable information. This record will be kept with the MEC accountability log and reflect each shot.

4.3 Procedures for a NONEL Firing System

Assembling the NONEL Firing System

- Test and maintain control of the NONEL firing device
- Lay out the NONEL shock tube
- Protect the NONEL detonator
- Prime the charge(s)
- Connect the firing device to the shock tube

Testing and Maintaining Control of the NONEL Firing Device

The NONEL firing device will be tested each day before use as specified in the manufacturer's instruction. The DS is responsible for maintaining control of the NONEL firing device at all times.

Laying Out the NONEL Shock Tube

Care will be taken to prevent kinks or sharp bends in the shock tube. Control of the firing position will be maintained from this point on. This control will ensure that no one tampers with the shock tube or fires the charge prematurely. Personnel will not walk on or step over the shock tube.

Protecting the NONEL Detonator

The NONEL detonator will be protected at all times before priming the charge(s).

Priming the Charges and Returning to the Firing Point

Commercially available explosives to detonate MEC will be used. The NONEL detonator will be connected to the detonating cord trunk line or ring main system. Detonating cord trunk and branch lines will be used to link multiple shots.

Initiating the NONEL Firing System

The NONEL firing device will not be connected until all personnel are accounted for and the perimeter security is verified. The supervisor in charge of the demolition operation will give the order to fire the charge(s) only after all personnel are accounted for and the perimeter security is verified.

Detonating Cord Use

The following procedures are required when using detonating cord:

- Detonating cord should be cut using approved crimpers or a locked fixed-blade knife on a non-sparking surface and only the amount required should be removed from inventory.
- When cutting detonating cord, the task should be performed outside the magazine.

- For ease of inventory control, only remove detonating cord in 1-foot increments.
- Detonating 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 or a cloth satchel, depending on the magazine location and proximity to the demolition area.
- Detonating cord should be placed at least 25 feet 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 feet until ready for use.
- When ready to tie in either the detonating cord to demolition materials, or detonating cord to detonator, the detonating cord will be connected to the demolition material and secured to the MEC. The cord is then strung out of the hole and secured in place with soil, being sure to leave a 1-foot tail exposed outside the hole.
- Once the hole is filled, make a loop in the detonating cord that is large enough to accommodate the detonating cord detonator, place the detonator in the loop and secure it with tape. The explosive end of the detonator will face down the detonating cord toward the demolition material or parallel to the main line.
- In all cases, ensure there is sufficient detonating cord extending out of the hole to allow for ease of detonator attachment and detonator inspection and replacement should a misfire occur.
- If the detonating cord detonators are electric, they will be checked, tied into the firing line and shunted before being taped to the loop. If the detonating cord detonators are nonelectric, the time and safety fuse will be prepared with the igniter in place before taping the detonators to the detonating cord loop. If the detonating cord detonators are NONEL, simply tape the detonators into the loop as described above.
- In the event that a time and safety fuse is used, an igniter is not available, and a field expedient initiation system is used (that is, matches), do not split the safety fuse until the detonator is taped into the detonating cord loop.

Perforator Use

The following procedures are required when using perforators:

- Only remove from inventory the number of perforators required to perform the task.
- Transport perforators in an approved day box, cloth satchel, or plastic container, depending upon proximity to the demolition operations.
- Keep perforators stored at the demolition site at least 25 feet away from detonators and demolition materials until ready for use.
- When ready to use, place the detonating cord through the slot on the perforator, ensuring the cord fits securely and has good continuity with the perforator.
- Once the detonating cord is secure, place the perforator in the desired location and secure it in place.

4.4 Procedures for Electronic Detonators (Caps)

To prepare electric blasting caps for initiation, the following procedures will be followed:

- Before making a connection with the electric blasting cap, the firing circuit will be continuity tested.
- All parts of the firing circuit will be kept insulated from the ground or other conductors such as bare wires, rails, pipes, or other paths of stray current.
- The shunt will not be removed from the wires until the individual performing the operation has been grounded. Electric blasting caps will be connected to the firing circuit before connection to the main initiation charge.
- Electric blasting caps of different manufacturers or types will not be used in the same system.
- The electric blasting caps will be tested for continuity with the galvanometer at least 50 feet downwind from any explosives before connecting them to the firing circuit. After the testing is completed, the lead wires will be short-circuited by twisting the bare ends of the wires together. The wires will remain shunted until ready to connect to the firing circuit.

- The electrical lead wires of electrical blasting caps, detonators, or other electro-explosive devices should not be pulled; detonation may occur.
- The legs should be unrolled so that the cap is as far as possible from the operator and pointing away from him.
- The blasting cap will be placed in a hole or behind a barricade before removing the shunt and testing for continuity. The cap should not point toward other personnel or explosives.
- Only authorized and serviceable testing equipment will be used.
- The remote receiver will not be connected to the firing wires until all pre-firing tests have been completed, and all preparations have been made to fire the charge.
- The blasting cap will not be held directly in the hand when un-coiling the leads. The wires will be held approximately 6 inches from the cap. This will minimize injury should the cap explode. The lead wires should be straightened by hand and not thrown, waved, or snapped to loosen the coils.
- The shunt will not be removed from the lead wires of blasting caps except when testing for continuity or actual connection into the firing circuit. The individual removing the shunts should be grounded before performing this operation to prevent accumulated static electricity from firing the blasting cap.

4.5 Preparing Donor Charges for Initiation

- Prepare and place all explosive charges.
- After locating a firing position, move a safe distance away from the charges.
- Ground yourself. Test the blasting caps by removing the short circuit shunt. Touch one end of the cap lead wire to one post and other cap lead wire to other post of the galvanometer. The galvanometer's needle should deflect at least half scale. If it does not, the cap is defective and should not be used. When testing is complete, ensure cap lead wires are twisted together.
- Connect blasting cap lead wires to the remote receiver after checking it for static electricity.
- Request permission to prime for the SUXOS and, when granted, connect the blasting caps to the donor charges.
- Depart to firing point.
- Take cover.
- Obtain a head count.
- Ground yourself.
- Test entire circuit using test procedures for RFD. This should cause the lamp to glow if the firing circuit is defective. Then go down-range and recheck circuits. If a wire is found defective replace the wire, if a splice is found defective disconnect and re-splice the wires. If the cap is found defective, replace it. Retest the entire circuit again to make sure that all breaks have been located before attempting to fire.
- Follow the instructions on the RFD manual.
- Follow initiation sequence set in Section 4.6.

4.6 Initiation Sequence

The SUXOS or DS will ensure the actions taken before initiating a demolition shot are completed as follows:

- Ensure all required notifications have been made.
- Set up EZ.
- Set up engineering controls according to ESS.
- Verify shot is ready for initiation IAW the ESS.

- Move to a safe location.
- Announce on the radio that air-horn (or similar) demolition warnings will follow.
- Five-Minute Warning. The SUXOS/DS will give the five-minute warning on the radio, followed by a one-minute blast on the air-horn (or similar).
- One-Minute Warning. The SUXOS/DS will give the one-minute warning on the radio followed by a one-minute blast on the air-horn (or similar) prior to the shot.
- Before initiating the shot, the SUXOS/DS will give three loud “Fire in the Hole!” warnings and then give the "Fire!” command on the radio.
- When the area has been cleared (post-blast), the SUXOS will sound a prolonged blast on the air-horn.
- The SUXOS/DS will announce on the radio that demolition operations have ceased.

4.7 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 herein will be followed.

NONEL 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 (that is, slightly black), it has not fired.
- If it has not fired, cut a 1-foot 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 herein.
- If the tube is slightly black, then a “Black Tube” 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.

Detonating Cord Misfire

Detonating cord will be used to tie in multiple demolition shots and ensure that detonators are not buried. The following procedures will be performed:

- If there is a problem with the initiating system, wait the prescribed amount of time (60 minutes) 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.
- If the initiator detonated and the cord did not, inspect the cord to ensure it is detonating cord and not time fuze. Also, check to ensure there is pentaerythritol tetranitrate (PETN, pentrite) in the cord at the connection initiator.
- At this point, it may be necessary to uncover the detonating cord and replace it. If this is required, it must be accomplished carefully to ensure that the demolition charge and the MEC item are not disturbed.

Perforator Misfire

The use of perforators is both cost effective and considerably safer than the use of C-4 and many other demolition materials. If the perforator is not initiated properly, it could malfunction. Because the perforator is covered with tamping material, detonating cord is used as the initiator. Therefore, in the event of a misfire, and after waiting 1 hour, the procedures presented below will be followed.

- If everything went but the perforator, one of four things has occurred:
  - Detonating cord grain size was insufficient to initiate the perforator.
  - The detonating cord was dislodged from the perforator when placing tamping materials.

  - The perforator was defective.
  - The perforator was moved during the placement of tamping materials.

- Check to ensure the grain size of the detonating cord is sufficient, with 80 grain size or greater being the recommended size.
- If the detonating cord connection to the perforator was the problem, ensure that the next connection is secure (use duct tape if necessary).
- If it is evident that the perforator was moved, then ensure it is properly secured for the next shot.
- If cord size and connection are sufficient, replace the perforator, leaving the defective one on the shot.

Electric Misfire

If a misfire does occur, it must be cleared with extreme caution, and the responsible technician will investigate and correct the situation, using the following steps:

- Follow procedures contained in the RFD manual.
- 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, check the replacement detonator for continuity, connect the new detonator to the remote receiver, and prime the charge without disturbing the original detonator.
- Follow normal procedures for effecting initiation of the charge.

4.8 Recordkeeping

To document the demolition operations procedures and the completeness of the demolition of MEC, the following recordkeeping requirements will be met:

- Obtain and maintain all required permits.
- The DS will ensure the accurate completion of the logs, and the SUXOS will monitor the entries in the log for completeness, accuracy, and compliance with meteorological conditions.
- The DS 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 (that is, 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 of as scrap.
- The Contractor will retain a permanent file of all demolition records, including permits, magazine data cards, training records, inspector records, waste manifests (if applicable), and operating logs.
- Copies of Bureau of Alcohol, Tobacco, Firearms, and Explosives license, and any state or local permits must be on hand.

4.9 Quality Control

The UXOQCS will verify the quality of the task through the three-phased surveillance process and document the results on a check sheet. Any task the UXOQCS determines to not meet the QC metrics will be considered deficient. The UXOQCS will conduct a root cause analysis and recommend corrective actions and submit their findings to the PM, and SUXOS for review and approval. The UXOQCS will monitor the implementation of the corrective actions, document the results of the corrective actions and closeout the deficiency.

5.0 Definitions

Exclusion Zone (EZ)—A zone in which unauthorized personnel are not allowed to be present during MEC clearance or disposal activities. An explosive safety quantity-distance arc established around a MR work area

where MEC procedures are being conducted. An EZ is created by a response operation that may move within defined boundaries, can be suspended, and will be cancelled upon project completion.

Minimum Separation Distance (MSD)— MSD is the distance at which personnel in the open must be from an intentional or unintentional detonation.

Munitions and Explosives of Concern (MEC)—Specific categories of military munitions that may pose unique explosive risks, including the following:

- UXO, as defined in Title 10 United States Code (10 U.S.C.) Section (§) 101(e)(5)
- Discarded military munitions, as defined in 10 U.S.C. §2710(e)(2)
- Munitions constituents (for example, TNT or RDX), as defined in 10 U.S.C. §2710(e)(3), present in high enough concentrations to pose an explosive hazard

Material Potentially Presenting an Explosive Hazard (MPPEH)—Material owned or controlled by the Department of Defense (DoD) that, before determination of its explosives safety status, potentially contains explosives or munitions (for example, munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (for example, equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are munitions within the DoD-established munitions management system, non-munitions-related material (for example, horseshoes, rebar, other solid objects), munitions-related solid metal fragments that do not realistically present an explosive hazard, and other items that may present explosion hazards (for example, gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions.

Unexploded Ordnance (UXO)—Military munitions that have been primed, fuzed, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and remain unexploded whether by malfunction, design, or any other cause. [10 U.S.C. §101(e)(5)(A) through (C) P.L. 106-65, Section 3031 (c)(5)(A), provides a more detailed description.]

MEC Operations—MEC operations are defined as MEC identification; access procedures such as excavation, either by hand or using heavy equipment; handling of UXO, explosives or explosive items; or disposal, including movement, transportation, and final disposal of MEC.

6.0 References

Code of Federal Regulations Title 29 Part 1910 (29 CFR 1910). “Occupational Safety and Health Standards.” Occupational Safety and Health Administration.

Department of Defense Explosives Safety Board (DDESB). 2016. Technical Paper 16. *Methodologies for Calculating Primary Fragment Characteristics.* Revision 5. December 19.

DDESB. 2020. Technical Paper 18, *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities.* Revision 1. June 24.

DoD. 2018. DoD 4145.26-M. *Contractor’s Safety Manual for Ammunition and Explosives.* Change 2. August 31.

DoD. 2019. Instruction 4140.62. *Material Potentially Presenting an Explosive Hazard (MPPEH).* Change 3. September 9.

Department of Justice, Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF). 2012. *Federal Explosives Laws and Regulations.* April.

Department of the Navy (Navy). 2022. EOD Bulletin 60A 1-1-31. Technical Manual. *Explosive Ordnance Disposal Procedures, EOD Disposal Procedures*. June 30.

Naval Sea Systems Command (NAVSEA). 2008. SW060-AA-MMA-010, Technical Manual. *Demolition Materials.* Volume 1, Revision 8. March 24.

NAVSEA. 2020. OP-5, Volume 1, Seventh Revision. *Ammunition and Explosives Safety Ashore.* Change 15. March 25.

Naval Ordnance Safety and Security Activity (NOSSA). 2020. Instruction 8020.15E *Explosive Safety Review, Oversight, and Verification of Munitions Responses*. September 11.

7.0 Supervisor's or Process Supervisor's Statement

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Signature
Worker Name:

Date:

8.0 Worker's or Operator's Statement

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:

:

Standard Operating Procedure
Vegetation Reduction

Document No: JE-SOP-07

Effective Date: February 24, 2023

Revision: 005

Contents

Rev No.	Effective Date	Revision Description	Procedure Owner Approval
001	11.21.18	Original issue	George DeMetropolis
002	11.29.18	Revised SOP #, added Record of Approval	George DeMetropolis
003	01.01.21	Updated references and completed review	George DeMetropolis
004	08.01.22	Annual review	Jeff McCauley
005	02.24.23	Annual review and update	Jeff McCauley

Attachments

None.

1.0 Scope and Application

The purpose of this standard operating procedure (SOP) is to establish the overall practices for the mechanical reduction of vegetation and applies to any unexploded ordnance (UXO) site where vegetation reduction is required to facilitate UXO operations.

2.0 General Roles and Responsibilities

Project Manager (PM): Provides the project leadership and direction to ensure that the project is performed within the scope, schedule, and budget, ensures quality, risk management, safety, and contract compliance. The PM will

ensure that site-specific work plans, safety plans, and/or SOPs that adequately address site-specific hazards and control measures are in place before the start of work.

Munitions Response (MR) Health, Safety, and Environment (HSE) and Quality Manager: Assists and advises the MR and project staff to plan, staff, and execute the MR safety and quality programs. Final reviewer of all project plans and reports. Audits and evaluates MR field projects and safety programs to verify that MR requirements and practices are implemented and effective. UXO Quality Control Specialist (UXOQCS) and UXO Safety Officer (UXOSO) report directly to MR HSE and Quality Manager.

Senior UXO Supervisors (SUXOS): Supervise all field operation and reports to the PM. Responsible for executing the project in accordance with (IAW) the site-specific documents (Work Plan [WP], Explosives Safety Submissions [ESS], ESS-Determination Request [ESS-DR], and/or Quality Assurance Project Plan [QAPP]). The SUXOS is responsible for completing the Contractor Production Report each day activities are performed onsite. They are required on all MR projects and authorized to stop work at any time to prevent accidents.

UXOQCS: Supervise the quality of all field operation and reports to MR HSE and Quality Manager. Responsible for monitoring the quality of the project IAW the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOQCS is responsible for completing the Quality Control Report each day activities are performed onsite.

UXOSO: Supervise the safety of all field operation and reports to MR HSE and Quality Manager. Responsible for monitoring the safety of the project IAW the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOSO provides a Daily Site-specific Tailgate Safety Briefing to include munitions and explosives of concern (MEC), construction, industrial, environmental, and natural safety hazard awareness and provides the plan of the day. As applicable, they provide a Hazardous Materials briefing for items used, consumed, or required for this SOP. The UXOSO performs risk assessment to determine the number of visitors permitted, provides a safety briefing, and verifies training and medical surveillance qualifications of personnel.

3.0 Procedure

Vegetation reduction will account for terrain features and will be conducted IAW the operator's manuals for the specific vegetation reduction equipment being used. Contractor personnel operating vegetation reduction equipment will be certified to operate the equipment or receive on-the-job training to safely operate the equipment.

3.1 General

Personnel will not enter within 50 feet of an operating piece of equipment. If, at any time, personnel enter closer than 50 feet, the operator will immediately stop, return the engine to idle speed, and disengage power to all attachments.

A communications check will be conducted with team personnel before the start of vegetation reduction operations. Hand signals will be reviewed and used as a secondary means of communication. All team personnel will know the hand signals before work commencing.

Before vegetation reduction activities, the UXO sweep team, consisting of UXO technicians and sweep personnel, will conduct a 100 percent surface clearance IAW the project-specific surface clearance SOP (JE-SOP-31). During the surface clearance, MEC/ material potentially presenting an explosive hazard (MPPEH) (any size) and metallic debris will be removed from the surface. Any secondary hazards (burrowing and nesting animals and cultural features) that may impede vegetation reduction operations will be identified by marking with a pin flag. Additionally, areas with steep terrain will be marked using a global positioning system for the visual surveys to be performed by an aerial drone or UXO technicians with binoculars. Following the surface sweep and removal or demarcation of hazards, the team leader will identify the direction and manner in which the vegetation will be reduced.

Handheld brush cutters will be used to reduce vegetation if necessary. Vegetation reduction will be tracked using the established grid system, as detailed in the WP or QAPP. Team personnel will also ensure that a 6-inch ground clearance is maintained during reduction operations, with those areas marked as hazards to be avoided (that is, using survey marking flags or equivalent).

3.2 Safety

All Contractor personnel will strictly adhere to the Accident Prevention Plan and the following general safety practices:

- Operations will only be conducted during daylight hours.
- Vegetation clearance operations will maintain a minimum of 200 feet from other mechanical equipment (such as a backhoe).
- A distance of 50 feet will be maintained between vegetation clearance equipment and team personnel. The UXOSO may increase the distance based on site history, MEC items encountered, terrain features, and other factors that may apply.
- Equipment safety features (that is, guards) will be used.
- Personnel will maintain 6 inches of ground clearance during reduction operations.
- Communications will be maintained between the team leaders, UXO escort, and equipment operator at all times.
- The SUXOS and UXOSO will maintain site control at all times.
- Any MEC encountered will only be handled by qualified UXO Technicians.
- UXO safety precautions will be observed for items encountered or suspected.
- Personal protective equipment (PPE) will be serviceable and worn or used in a proper manner.
- Equipment will be refueled in designated areas, and the equipment will be given an opportunity to cool off before refueling. Spill kits will be present in the refueling areas in the event of a fuel spill. A fire extinguisher will also be maintained at the refueling location.
- All personnel can stop operations for an unsafe act or situation.
- Safety violations and unsafe acts will be immediately reported to the UXOSO.
- All personnel will attend Daily Site-specific Tailgate Safety Briefing before entering the operating area.

Failure to comply with the above safety rules and procedures may result in termination of employment.

3.3 Surface Material Potentially Presenting an Explosive Hazard

If a surface MPPEH item is encountered, it will be identified by both a UXO Technician II and a UXO Technician III and marked IAW the approved WP or QAPP for future disposition.

4.0 Personal Protective Equipment

The project-specific Accident Prevention Plan and Site-specific Health and Safety Plan will identify the project PPE requirements. Level D PPE will be required for Contractor personnel engaged in mechanical vegetation reduction. Level D PPE includes, but is not limited to the following:

- Coveralls or work clothing, as prescribed
- Work gloves, leather, or canvas as appropriate
- Safety glasses
- Hardhats
- Hearing protection (noise attenuators such as earmuffs or ear plugs when appropriate)
- Dust mask (as required by wind conditions and/or the presence of airborne particulate matter)
- Other PPE as needed (for example, face shield, Kevlar chaps, or similar)

5.0 Definitions

Material Potentially Presenting an Explosive Hazard (MPPEH)—Material owned or controlled by the Department of Defense (DoD) that, before determination of its explosives safety status, potentially contains

explosives or munitions (for example, munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (for example, equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are munitions within the DoD-established munitions management system, nonmunitions related material (for example, horseshoes, rebar, other solid objects), munitions-related solid metal fragments that do not realistically present an explosive hazard, and other items that may present explosion hazards (for example, gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions.

Munitions and Explosives of Concern (MEC)—Specific categories of military munitions that may pose unique explosive risks, including UXO, as defined in Title 10 United States Code (U.S.C.) Section (§) 101(e)(5); discarded military munitions, as defined in 10 U.S.C. § 2710(e)(2); or munitions constituents (for example, trinitrotoluene [TNT] or Royal Demolition eXplosive [RDX]), as defined in 10 U.S.C. §2710(e)(3), present in high enough concentrations to pose an explosive hazard.

MEC Operations—MEC operations are defined as MEC identification; access procedures such as excavation, either by hand or using heavy equipment; handling of MEC, explosives or explosive items; or disposal, including movement, transportation, and final disposal of MEC.

Unexploded Ordnance (UXO)—Military munitions that have been primed, fuzed, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and remain unexploded whether by malfunction, design, or any other cause[10 U.S.C. § 101(e)(5)(A) through (C), Public Law 106-65, § 3031 (c)(5)(A), provides a more detailed description].

6.0 References

Code of Federal Regulations Title 29 Part 1910 (29 CFR 1910). “Occupational Safety and Health Standards.” Occupational Safety and Health Administration.

Code of Federal Regulations Title 29 Part 1926 (29 CFR 1926). “Construction Industry Standard.” Occupational Safety and Health Administration.

Code of Federal Regulations Title 40 Parts 260 to 299 (40 CFR 260-299). “Protection of Environment” (applicable sections). U.S. Environmental Protection Agency.

Department of Defense (DoD). 2012. DoD Manual 6055.09-M, *Ammunition and Explosives Safety Standards*. Original publication date of 2008; administratively revised August 4, 2010 with Change 1 dated March 12, 2012 and Change 2 dated December 29, 2017 (volumes 1 and 2), December 15, 2017 (volumes 3 and 4), December 18, 2017 (volumes 5, 6 and 7), January 24, 2018 (volume 8).

DoD. 2018. DoD 4145.26-M. *Contractor’s Safety Manual for Ammunition and Explosives.* Change 2. August 31.

DoD. 2019. Instruction 4140.62. *Material Potentially Presenting an Explosive Hazard (MPPEH).* Change 3. September 9.

Naval Sea Systems Command (NAVSEA). 2008. SW060-AA-MMA-010, Technical Manual. *Demolition Materials.* Volume 1, Revision 8. March 24.

NAVSEA. 2020. OP-5, Volume 1, Seventh Revision. *Ammunition and Explosives Safety Ashore.* Change 15. March 25.

Naval Ordnance Safety and Security Activity (NOSSA). 2020. Instruction 8020.15E. *Explosive Safety Review, Oversight, and Verification of Munitions Responses*. September 11.

7.0 Supervisor’s or Process Supervisor’s Statement

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Signature
Worker Name:

Date:

8.0 Worker's or Operator's Statement

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:

Standard Operating Procedure
Quality Control Blind Seeding

Document No: JE-SOP-08

Effective Date: February 24, 2023

Revision: 005

Contents

Rev No.	Effective Date	Revision Description	Procedure Owner Approval
001	11.21.18	Original issue	George DeMetropolis
002	11.29.18	Revised SOP #, added Record of Approval	George DeMetropolis
003	01.01.21	Updated references and completed review	George DeMetropolis
004	08.01.22	Annual review	Jeff McCauley
005	02.24.23	Annual review and update	Jeff McCauley

Attachments

None.

1.0 Scope and Application

The purpose of this standard operation procedure (SOP) is to establish the overall practices for the performance of quality control (QC) blind seeding operations. Contractor personnel will place blind seeds (that is, industry standard objects [ISOs]) within a subsurface removal area to test and validate the munitions and explosives of concern (MEC) detection process. The validity of blind seeding as a QC tool is based on assumptions that seed items will accurately mimic actual MEC items expected to be found in the production area. If the unexploded ordnance (UXO) team detects the blind seeds, QC personnel will conclude MEC procedures are working as planned. If the UXO team fail to find a blind seed, the detection process is either inadequate or being implemented inadequately. Blind seeding will be planned, implemented, documented, and controlled by the UXO Quality Control Specialist (UXOQCS).

This SOP applies to all instances where the UXOQCS is responsible for placement of blind QC seeds.

2.0 General Roles and Responsibilities

Project Manager (PM): Provides the project leadership and direction to ensure that the project is performed within the scope, schedule, and budget, ensures quality, risk management, safety, and contract compliance. The PM will ensure that site-specific work plans, safety plans, and/or SOPs that adequately address site-specific hazards and control measures are in place prior to the start of work.

Munitions Response (MR) Health, Safety, and Environment (HSE) and Quality Manager: Assists and advises the MR and project staff to plan, staff, and execute the MR safety and quality programs. Final reviewer of all project plans and reports. Audits and evaluates MR field projects and safety programs to verify that MR requirements and practices are implemented and effective. Unexploded Ordnance (UXO) Quality Control Specialist (UXOQCS) and UXO Safety Officer (UXOSO) report directly to MR HSE and Quality Manager.

Senior UXO Supervisors (SUXOS): Supervise all field operation and reports to the PM. Responsible for executing the project in accordance with (IAW) the site-specific documents (Work Plan [WP], Explosives Safety Submissions [ESS], ESS-Determination Request [ESS-DR], and/or Quality Assurance Project Plan [QAPP]). The SUXOS is responsible for completing the Contractor Production Report each day activities are performed onsite. They are required on all MR projects and authorized to stop work at any time to prevent accidents.

UXOQCS: Supervise the quality of all field operation and reports to MR HSE and Quality Manager. Responsible for monitoring the quality of the project IAW the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOQCS is responsible for completing the Quality Control Report each day activities are performed onsite.

UXOSO: Supervise the safety of all field operation and reports to MR HSE and Quality Manager. Responsible for monitoring the safety of the project IAW the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOSO provides a Daily Site-specific Tailgate Safety Briefing to include MEC, construction, industrial, environmental, and natural safety hazard awareness and provides the plan of the day. As applicable, they provide a Hazardous Materials briefing for items used, consumed, or required for this SOP. The UXOSO performs risk assessment to determine the number of visitors permitted, provides a safety briefing, and verifies training and medical surveillance qualifications of personnel.

3.0 Procedure

3.1 MEC Avoidance and Safety Considerations During Quality Control Seed Placement

MEC avoidance procedures specified and outlined in the MEC Anomaly Avoidance SOP (JE-SOP-01) will be implemented during placement of QC seeds to ensure the safety of personnel involved in blind seeding operations. Only the UXOQCS will conduct QC blind seeding. Non-UXO-trained personnel will not be allowed in the exclusion zone (EZ) or work zone unless accompanied by a UXO technician. During blind seeding, Contractor personnel will adhere to the procedures in the Accident Prevention Plan and ESS, as well as the following general safety practices:

- Operations will only be conducted during daylight hours.
- Access to operation areas will be limited to only those personnel necessary to accomplish the specific operation.
- MEC will not be handled during avoidance operations; personnel will be directed away from or around the item.
- During MEC operations, the minimum separation distance (MSD) between MEC and non-MEC operations is the fragmentation distance of the munition with the greatest fragmentation distance, as stated in the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). Onsite personnel will be limited to those personnel needed to safely and efficiently prepare the item for destruction.
- Non-UXO trained personnel will receive initial ordnance recognition and safety training before beginning operations and will be escorted by qualified UXO personnel at all times.

- All personnel will attend the Daily Site-specific Tailgate Safety Briefing before 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 these safety rules and procedures may result in termination of employment.

3.2 Blind Seed Placement Procedures

The immediate area will be clear of metallic anomalies to ensure the intended detection of the blind seed is unimpeded. The following procedures will be followed, after clearance with a magnetometer, to place blind seeds:

- Wrap each blind seed with duct tape.
- Label each seed with a unique identification number, then wrap the duct tape with clear packing tape to protect the identification number from being removed during changing weather conditions.
- Place the blind seed at the intended orientation and angle, with the center mass of the item on top of the ground surface.
- For subsurface blind seeds, record the location of each blind seed item using one of the following procedures listed in order of preference priority:
  - A real-time kinematic global positioning system (GPS) unit will be used to record the coordinates of the item.
  - Measuring tapes will be used in conjunction with existing grid stakes.
- Record date, grid number, unique identification number, item description, GPS location, depth, and orientation on a whiteboard.
- Take a picture of the blind seed showing with the white board. Ensure that the picture is in focus and no shadows are present.
- Record the item's information and location on the blind seed tracking log.

3.3 Confidentiality Procedures

The coordinates of the blind seed locations will be kept confidential to maintain the validity and effectiveness of the QC blind seeding program. To maintain confidentiality, the coordinate file within the GPS unit used during placement of the blind seeds will be erased or cleared after the coordinates have been recorded appropriately. If possible, a map will be generated to plot the blind seed locations. The UXOQCS will file and secure the blind seed tracking log and plot map, if generated, in such a way that it will not be available to project personnel. Once a blind seed has been discovered during MEC intrusive operations, the UXOQCS will compare the coordinates provided by the SUXOS and the coordinates recorded on the blind seed tracking log. Once a blind seed has been verified as a blind seed, the UXOQCS will report the blind seed as discovered.

4.0 Definitions

Exclusion Zone (EZ) —An explosive safety-quantity distance arc established around a MR work area where MEC procedures are being conducted. An EZ is created by a response operation that may move within defined boundaries, can be suspended, and will be cancelled upon project completion.

Material Potentially Presenting an Explosive Hazard (MPPEH)—Material owned or controlled by the Department of Defense (DoD) that, before determination of its explosives safety status, potentially contains explosives or munitions (for example, munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (for example, equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are munitions within the DoD-established munitions management system, nonmunitions-related material (for example, horseshoes, rebar, or other solid objects), munitions-related solid metal fragments that do not realistically present an explosive hazard, and other items that may present

explosion hazards (for example, gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions.

Military Munitions—Ammunition products and components produced for or used by the armed forces for national defense and security. The term military munitions include ammunition products or components under the control of the DoD, the U.S. Coast Guard, the Department of Energy, and the National Guard. The term includes the following munitions:

- Confined gaseous, liquid, and solid propellants
- Explosives
- Pyrotechnics
- Chemical and riot control agents
- Smokes and incendiaries
- Bulk explosives
- Chemical agents
- Chemical munitions
- Rockets
- Guided and ballistic missiles
- Bombs
- Warheads
- Mortar rounds
- Artillery ammunition
- Small arms ammunition
- Grenades
- Mines
- Torpedoes
- Depth charges
- Cluster munitions and dispensers
- Demolition charges
- Devices and components thereof

Military munitions do not include wholly inert items, improvised explosive devices, or nuclear weapons, nuclear devices, or nuclear components. However, military munitions do include non-nuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 U.S.C. §2011 et seq.) have been completed [10 U.S.C. §101(e)(4)].

Minimum Separation Distance (MSD)—MSD is the distance at which personnel in the open must be from an intentional or unintentional detonation.

Munitions and Explosives of Concern (MEC)—Specific categories of military munitions that may pose unique explosive risks, including UXO, as defined in Title 10 U.S.C. Section (§) 101(e)(5); DMM, as defined in 10 U.S.C. § 2710(e)(2); or munitions constituents (for example, trinitrotoluene [TNT] or Royal Demolition eXplosive [RDX]), as defined in 10 U.S.C. §2710(e)(3), present in high enough concentrations to pose an explosive hazard.

MEC Operations—MEC operations are defined as MEC identification; access procedures such as excavation, either by hand, or using heavy equipment; handling of MEC, explosives or explosive items; or disposal, including movement, transportation, and final disposal of MEC.

Unexploded Ordnance (UXO)—Military munitions that have been primed, fuzed, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and remain unexploded whether by malfunction, design, or any other cause. [10 U.S.C. § 101(e)(5)(A) through (C), Public Law 106-65, § 3031 (c)(5)(A), provides a more detailed description.]

5.0 References

Code of Federal Regulations Title 29 Part 1910 (29 CFR 1910). “Occupational Safety and Health Standards.” Occupational Safety and Health Administration.

Code of Federal Regulations Title 29 Part 1926 (29 CFR 1926). “Construction Industry Standard.” Occupational Safety and Health Administration.

Code of Federal Regulations Title 40 Parts 260 to 299 (40 CFR 260-299). “Protection of Environment” (applicable sections). U.S. Environmental Protection Agency.

Code of Federal Regulations Title 49 Parts 100 to 199 (49 CFR 100-199). “Transportation” (applicable sections). U.S. Department of Transportation.

Department of Defense (DoD). 2012. DoD Manual 6055.09-M. *Ammunition and Explosives Safety Standards*. Original publication date of 2008; administratively revised August 4, 2010 with Change 1 dated March 12, 2012 and

Change 2 dated December 29, 2017 (volumes 1 and 2), December 15, 2017 (volumes 3 and 4), December 18, 2017 (volumes 5, 6 and 7), January 24, 2018 (volume 8).

DoD. 2018. DoD 4145.26-M. *Contractor's Safety Manual for Ammunition and Explosives.* Change 2. August 31.

Naval Sea Systems Command (NAVSEA). 2020. OP-5, Volume 1, Seventh Revision. *Ammunition and Explosives Safety Ashore.* Change 15. March 25.

Naval Ordnance Safety and Security Activity (NOSSA). 2020. Instruction 8020.15E. *Explosive Safety Review, Oversight, and Verification of Munitions Responses*. September 11.

6.0 Supervisor’s or Process Supervisor’s Statement

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Signature
Worker Name:

Date:

7.0 Worker's or Operator's Statement

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:

This page intentionally left blank.

Standard Operating Procedure
Explosives Storage and Accountability

Document No: JE-SOP-09

Effective Date: February 24, 2023

Revision: 005

Contents

Rev No.	Effective Date	Revision Description	Procedure Owner Approval
001	11.21.18	Original issue	George DeMetropolis
002	11.29.18	Revised SOP #, added Record of Approval	George DeMetropolis
003	01.01.21	Updated references and completed review	George DeMetropolis
004	08.01.22	Annual review	Jeff McCauley
005	02.24.23	Annual review and update	Jeff McCauley

Attachments

None.

1.0 Scope and Application

This standard operating procedure (SOP) provides the minimum procedural and health and safety requirements applicable for the storage and accountability of explosives. The procedures of this SOP are designed to ensure that explosive materials are properly stored, accounted for, and issued. Personnel engaged in these activities will strictly comply with these procedures and those contained in the referenced documents.

2.0 General Roles and Responsibilities

Project Manager (PM): Provides the project leadership and direction to ensure that the project is performed within the scope, schedule, and budget, ensures quality, risk management, safety, and contract compliance. The PM will ensure that site-specific work plans, safety plans, and/or SOPs that adequately address site-specific hazards and control measures are in place prior to the start of work.

Munitions Response (MR) HSE & Quality Manager: Assists and advises the MR and project staff to plan, staff, and execute the MR safety and quality programs. Final reviewer of all project plans and reports. Audits and evaluates MR field projects and safety programs to verify that MR requirements and practices are implemented and effective. Unexploded Ordnance (UXO) Quality Control Specialist (UXOQCS) and UXO Safety Officer (UXOSO) report directly to MR HSE and Quality Manager.

Senior UXO Supervisors: Supervise all field operation and reports to the PM. Responsible for executing the project in accordance with the site-specific documents (Work Plan [WP], Explosives Safety Submissions [ESS], ESS-Determination Request [ESS-DR], and/or Quality Assurance Project Plan [QAPP]). The Senior UXO Supervisor (SUXOS) is responsible for completing the Contractor Production Report each day activities are performed onsite. They are required on all MR projects and authorized to stop work at any time to prevent accidents.

Unexploded Ordnance Quality Control Specialist (UXOQCS): Supervise the quality of all field operation and reports to MR HSE & Quality Manager. Responsible for monitoring the quality of the project in accordance with the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOQCS is responsible for completing the Quality Control Report each day activities are performed onsite.

Unexploded Ordnance Safety Officer (UXOSO): Supervise the safety of all field operation and reports to MR HSE & Quality Manager. Responsible for monitoring the safety of the project in accordance with the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOSO provides a Daily Site-Specific Tailgate Safety Briefing to include munitions and explosives of concern (MEC), construction, industrial, environmental, and natural safety hazard awareness and provides the plan of the day. As applicable, they provide a Hazardous Materials briefing for items used, consumed, or required for this SOP. The UXOSO performs risk assessment to determine the number of visitors permitted, provides a safety briefing, and verifies training and medical surveillance qualifications of personnel.

3.0 Storage and Accountability of Explosives

All donor explosives will be stored in a valid Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) Type 2 portable magazine with an attached cap that meets the specifications outlined in ATF Publication 5400.7 and sited at locations identified in the Explosives Safety Submission (ESS). Due to operational requirements, the explosives magazine may be relocated as required. 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 1/4 -inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples.

3.1 Signs and Placards

The ATF and Department of Defense (DoD) require that all magazines be appropriately posted to indicate the hazard class of the contents, the firefighting hazards, and the emergency notification list. Magazines will be placarded in accordance with DoD Manual 6055.09-M. 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.

3.2 Lightning Protection

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.
- The magazine is grounded in accordance with NFPA 780 requirements.
- All parts of the magazine are located at least 6.5 feet from the nearest fence.

4.0 Grounding Inspection

If a qualified electrician is available, he/she will perform grounding inspections listed below. As a minimum, if a qualified electrician is not available, the grounding kit (supplied with the magazine) will be installed following the prescribed procedures. Inspection components are discussed below.

4.1 Three-Point Fall of Potential Earth Resistance Testing

The grounding connectivity and effectiveness shall be tested using Three-Point Fall of Potential Earth Resistance testing.

4.2 Point to Point Bonding Testing

The bonding between the door and frame of the magazine is required to be tested through resistance testing.

4.3 Visual Inspection

A visual inspection of the magazine, installation, and grounding equipment shall be conducted.

5.0 Emergency Notification

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.

6.0 Compatibility

Explosive compatibility will be maintained.

7.0 Key Control

The magazine will remain locked except when receipts and issues are being made. The two locks on each of the magazine will require two different keys to unlock. One key will be kept by the SUXOS and the second key by the UXOQCS. This procedure ensures that access to the magazine cannot be made without obtaining the two keys and no one individual can gain access to the magazine.

8.0 Accountability

Commercial donor explosives received and stored in the magazine will be accounted for from the date of receipt until the date of destruction. The Contractor 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 the 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 UXOQCS.
- Only sufficient explosives for the day's operations are issued.

- Issues of explosives are recorded on the explosive usage record and deducted from the magazine data card(s). This procedure will ensure that the quantities of explosives 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 explosive usage record.
- At the end of each day the SUXOS and the UXO Team Leader reconcile the entries on each explosive usage record and will turn these records over to the PM.
- Weekly, the UXOQCS 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 PM.
- Usage Inventory: following each occurrence of a receipt or issue of explosive material, the SUXOS will conduct a joint inventory in conjunction with the demo team leader, drawing out or returning the explosives. Only those items issued/returned will be inventoried. The SUXOS will appropriately annotate the two sets of magazine data cards and the explosive usage record.

8.1 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. The Magazine Inspection Checklist will be completed.

8.2 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 Contracting Officer or the Contracting Officer Representative (COTR) and the ATF will be notified. All actions from this point will be dictated by the ATF.

9.0 References

Code of Federal Regulations Title 49 Parts 100 to 199 (49 CFR 100-199), “Transportation” (applicable sections). U.S. Department of Transportation.

Department of Defense (DoD). 2012. DoD Manual 6055.09-M. *Ammunition and Explosives Safety Standards.* Original publication date of 2008; administratively revised August 4, 2010 with Change 1 dated March 12, 2012 and Change 2 dated December 29, 2017 (volumes 1 and 2), December 15, 2017 (volumes 3 and 4), December 18, 2017 (volumes 5, 6 and 7), January 24, 2018 (volume 8).

DoD. 2018. DoD 4145.26-M. *Contractor’s Safety Manual for Ammunition and Explosives.* Change 2. August 31.

DoD. 2019. Instruction 4140.62. *Material Potentially Presenting an Explosive Hazard (MPPEH).* Change 3. September 9.

Department of Justice, Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF). 2012. *Federal Explosives Laws and Regulations.* April 27.

Naval Sea Systems Command (NAVSEA). 2008. SW060-AA-MMA-010, Technical Manual. *Demolition Materials.* Volume 1, Revision 8. March 24.

NAVSEA. 2020. OP-5, Volume 1, Seventh Revision. *Ammunition and Explosives Safety Ashore.* Change 15. March 25.

Naval Ordnance Safety and Security Activity (NOSSA). 2020. Instruction 8020.15E. *Explosive Safety Review, Oversight, and Verification of Munitions Responses*. September 11.

10.0 Supervisor’s or Process Supervisor’s Statement

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Signature
Worker Name:

Date:

11.0 Worker's or Operator's Statement

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:

Standard Operating Procedure
Munitions and Target Demilitarization

Document No: JE-SOP-10

Effective Date: February 24, 2023

Revision: 005

Contents

Rev No.	Effective Date	Revision Description	Procedure Owner Approval
001	11.21.18	Original issue	George DeMetropolis
002	11.29.18	Revised SOP #, added Record of Approval	George DeMetropolis
003	01.01.21	Updated references and completed review	George DeMetropolis
004	08.01.22	Annual review	Jeff McCauley
005	02.24.23	Annual review and update	Jeff McCauley

Attachments

None.

1.0 Scope and Application

This standard operating procedure (SOP) establishes the overall practices for the performance of field operations for demilitarization of munitions and targets. This SOP applies to all instances where targets are being demilitarized in the field.

2.0 General Roles and Responsibilities

Project Manager (PM): Provides the project leadership and direction to ensure that the project is performed within the scope, schedule, and budget, ensures quality, risk management, safety, and contract compliance. The PM will ensure that site-specific work plans, safety plans, and/or SOPs that adequately address site-specific hazards and control measures are in place prior to the start of work.

Munitions Response (MR) HSE & Quality Manager: Assists and advises the MR and project staff to plan, staff, and execute the MR safety and quality programs. Final reviewer of all project plans and reports. Audits and evaluates MR field projects and safety programs to verify that MR requirements and practices are implemented and effective. Unexploded Ordnance (UXO) Quality Control Specialist (UXOQCS) and UXO Safety Officer (UXOSO) report directly to MR HSE and Quality Manager.

Senior UXO Supervisors (SUXOS): Supervise all field operation and reports to the PM. Responsible for executing the project in accordance with the site-specific documents (Work Plan [WP], Explosives Safety Submissions [ESS], ESS-Determination Request [ESS-DR], and/or Quality Assurance Project Plan [QAPP]). The SUXOS is responsible for completing the Contractor Production Report each day activities are performed onsite. They are required on all MR projects and authorized to stop work at any time to prevent accidents.

Unexploded Ordnance Quality Control Specialist (UXOQCS): Supervise the quality of all field operation and reports to MR HSE & Quality Manager. Responsible for monitoring the quality of the project in accordance with the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOQCS is responsible for completing the Quality Control Report each day activities are performed onsite.

Unexploded Ordnance Safety Officer (UXOSO): Supervise the safety of all field operation and reports to MR HSE & Quality Manager. Responsible for monitoring the safety of the project in accordance with the site-specific documents (WP, ESS, ESS-DR, and/or QAPP). They are required on all MR investigations or removal action projects and authorized to stop work at any time to prevent accidents. The UXOSO provides a Daily Site-Specific Tailgate Safety Briefing to include munitions and explosives of concern (MEC), construction, industrial, environmental, and natural safety hazard awareness and provides the plan of the day. As applicable, they provide a Hazardous Materials briefing for items used, consumed, or required for this SOP. The UXOSO performs risk assessment to determine the number of visitors permitted, provides a safety briefing, and verifies training and medical surveillance qualifications of personnel.

3.0 Procedure

3.1 Certification

The SUXOS and UXOQCS will perform checks to satisfy material documented as safe (MDAS), target scrap and non-munitions related debris, are free of explosive hazards, engine fluids, radioluminescent or self-illuminating dials, and other visible hazardous, toxic, and radioactive materials (HTRW) and certify the material as scrap. Once the material has been certified as inert in the field, it is then separated by type, such as steel, aluminum, and mixed metals. MD will be sorted separately and not comingled and shipped with target or other range related debris in accordance with JE-SOP-05, MPPEH Management.

3.2 Demilitarization Operations

Hard targets and MD are demilitarized manually by cutting oxygen/propane torches.

- **Targets**: Lightweight items such as vehicles and containers of extruded and cast aluminum construction are processed by cutting or crushing using chop saws or hydraulic shears. Cutting or crushing is done in such a manner that the item cannot be restored to a usable condition. Demilitarization operations must meet or exceed Department of Defense demilitarization specifications of DoD Manual 4160.28.
- **Material Documented as Safe (MDAS):** Demilitarizing will be performed on all MDAS that resembles a military munition. Demilitarizing will consist of altering the shape through the use of hand tools (such as pliers, cutters, or presses) so that the item no longer resembles a military munition. If needed, the use of mechanized equipment (for example, chop saws) or oxygen/propane torches may be used to break down items.

Demilitarization is often a separate requirement from documenting the explosive safety status of the material. Material potentially presenting an explosive hazard (MPPEH) is often determined to be MDAS before demilitarization. In some cases, a demilitarization requirement, such as venting or burning, may be part of the safe certification requirement. (For more information refer to JE-SOP-40, Demolition and Disposal Operations).

4.0 Definitions

Munitions and Explosives of Concern (MEC) - Specific categories of military munitions that may pose unique explosive risks, including UXO, as defined in Title 10 United States Code (U.S.C.) Section (§)101(e)(5); discarded military munitions, as defined in 10 U.S.C. §2710(e)(2); or munitions constituents (for example, trinitrotoluene [TNT] or Royal Demolition eXplosive [RDX]), as defined in 10 U.S.C. §2710(e)(3), present in high enough concentrations to pose an explosive hazard.

Unexploded Ordnance (UXO) - Military munitions that have been primed, fuzed, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and remain unexploded whether by malfunction, design, or any other cause [10 U.S.C. §101(e)(5)(A) through (C) P.L. 106-65, section 3031 (c)(5)(A), provides a more detailed description].

UXO Operations - UXO operations are defined as MEC identification; access procedures such as excavation, either by hand, or using heavy equipment; handling of UXO, explosives or explosive items; or disposal, including movement, transportation, and final disposal of MEC.

5.0 References

Code of Federal Regulations Title 29 Part 1910 (29 CFR 1910). “Occupational Safety and Health Standards.” Occupational Safety and Health Administration.

Code of Federal Regulations Title 29 Part 1926 (29 CFR 1926). “Construction Industry Standard.” Occupational Safety and Health Administration.

Code of Federal Regulations Title 40 Parts 260 to 299 (40 CFR 260-299). “Protection of Environment” (applicable sections). U.S. Environmental Protection Agency.

Code of Federal Regulations Title 49 Parts 100 to 199 (49 CFR 100-199), “Transportation” (applicable sections).

Department of Defense (DoD). 2012. DoD Manual 6055.09-M. *Ammunition and Explosives Safety Standards.* Original publication date of 2008; administratively revised August 4, 2010 with Change 1 dated March 12, 2012 and Change 2 dated December 29, 2017 (volumes 1 and 2), December 15, 2017 (volumes 3 and 4), December 18, 2017 (volumes 5, 6 and 7), January 24, 2018 (volume 8).

DoD. 2015. DoD 4160.21-M. *Defense Reutilization and Marketing Manual.* October 22, with Change 4 dated August 31, 2022.

DoD. 2017. DoD 4160.28-M. *Defense Demilitarization: Program Administration*. Volumes 1 (dated August 9, 2017, with change 3 effective July 15, 2019) and Volume 2 (dated November 1, 2022). August 9.

DoD. 2018. DoD 4145.26-M. *Contractor’s Safety Manual for Ammunition and Explosives.* Change 2. August 31.

DoD. 2019. Instruction 4140.62. *Material Potentially Presenting an Explosive Hazard (MPPEH).* Change 3. September 9.

Department of the Navy (Navy). 2022. EOD Bulletin 60A 1-1-31. Technical Manual. Explosive Ordnance Disposal Procedures, EOD Disposal Procedures. June 30.

Naval Sea Systems Command (NAVSEA). 2008. SW060-AA-MMA-010, Technical Manual. *Demolition Materials.* Volume 1, Revision 8. March 24.

NAVSEA. 2020. OP-5, Volume 1, Seventh Revision. *Ammunition and Explosives Safety Ashore.* Change 15. March 25.

Naval Ordnance Safety and Security Activity (NOSSA). 2020. Instruction 8020.15E. *Explosive Safety Review, Oversight, and Verification of Munitions Responses*. September 11.

6.0 Supervisor’s or Process Supervisor’s Statement

I have read and understand this SOP. To the best of my knowledge, the processing described within this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker or operator's statement for this process. I will ensure the SOP has current procedures. If a major change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

Signature
Worker Name:

Date:

7.0 Worker's or Operator's Statement

I have read this SOP and I have received adequate training to perform the process according to the SOP. I will follow the SOP unless I identify a hazard not addressed in it or encounter an operation I cannot perform according to the SOP. If that occurs, I will stop the process and notify my immediate supervisor of the problem.

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature
Worker Name:

Date:

Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:
Signature Worker Name:	Date:

This page intentionally left blank.

Attachment C
Verification and Validation Plan for UXO 13

ATTACHMENT C

Verification and Validation Plan for UXO 13

Introduction

This Verification and Validation Plan has been developed to describe procedures for verifying advanced geophysical classification results. The purpose of the verification and validation plan activities is to provide confidence in the (1) selection of geophysical anomalies that meet the project-specific detection threshold for further investigation, and (2) classification of sources as a target of interest (TOI) versus non-TOI.

The validation process will be performed by selection of a number of validation digs designed to test the assumptions inherent in the classification approach. This plan is intended to describe the validation rationale and approach. The final number and distribution of validation digs required will be dependent upon several factors; including, but not limited to, the details of the classification approach, performance against the quality control seeds, quality assurance seeds, and native TOI.

Detection Threshold Validation

Anomalies representing potential TOIs will be detected and selected using an advanced electromagnetic induction (EMI) sensor detection reconnaissance. The detection threshold will be validated through a quality control and quality assurance blind seeding program designed to validate that TOIs were effectively detected to the depths required and selected from the data as a potential TOI for cued interrogation and classification (when applicable).

Classification Threshold Verification

The stop-dig threshold will be verified by intrusively investigating anomalies beyond the stop-dig threshold. The number of digs required to achieve this confirmation will depend on the dig results. An additional 200 anomalies or 10 percent (whichever is lower) will be investigated beyond the last TOI on the ranked dig list. These anomalies could include anomalies above the stop-dig threshold and/or anomalies below the stop-dig threshold. A validation failure will result if any TOI are found at anomalies with decision statistics below the stop-dig threshold.

Classification Validation

In addition to the verification targets, a total of 200 targets (or 10 percent [whichever is lower]) classified as non-TOI across the project site will be selected for validation. Rather than selecting the targets based on prioritized ranking, randomly chosen targets classified as non-TOI will be chosen by the project team. These sources will be intrusively investigated and compared to the classification prediction.

Attachment D
Responses to Regulator Comments

ATTACHMENT D

Responses to Regulator Comments

Responses to EPA Comments on the
Draft UXO 13 Munitions Response Time-Critical Removal Action Quality Assurance Project Plan
Atlantic Fleet Weapons Training Area-Vieques, Former Vieques Naval Training Range
Vieques, Puerto Rico, November 2023

GENERAL COMMENTS:

1. Consider adding a Document Control Number (DCN) to the cover page and/or WS1&2 to identify the most current version of the QAPP and to ensure that only that version of the QAPP is used by all project participants.

   Navy Response: The Navy concurs with the substantive content of the comment, but the standard process, which includes the use of "Draft," "Draft Final," and "Final" in the document title to ensure version control, will be continued. That process has been successfully used for documents generated for Vieques and other Navy facilities under the CLEAN program for many years.

2. Add the Geographic Information Systems (GIS) lead(s) to the personnel-related worksheets. As discussed in later worksheets, this role appears to be a "key project person" who will be performing tasks defined in the QAPP.

   Navy Response: The requested addition has been made.

3. Clarify if a surveyor will be utilized during the project (WS17 notes "if needed"). If so, add information on this role, including relationship (internal or subcontractor) and contact information, to the personnel-related worksheets. If it is not determined at this time if a surveyor will be used, explain when the decision will be made and how it would be documented/communicated to the project team.

   Navy Response: A land surveyor will be utilized only if required survey data are not possible to obtain via GPS within the accuracy specifications provided in the QAPP. Because this circumstance will not be known until the survey work is being performed, survey-specific information will not be available, and potentially not applicable, to include in this QAPP. Should a surveyor be utilized, details regarding the surveyor and associated survey, including compliance with the accuracy standards in this QAPP, will be provided in the TCRA Completion Report. This information has been added to the QAPP.

4. Clarify if an "embedded biologist" (as noted in the "Key Discussion Points" section of WS9) and/or an archaeologist (as discussed in DFW 3 under "Archaeological Demarcation" in WS17) are required for this project. If so, add information on this role(s), including responsibilities and tasks, throughout the QAPP.

   Navy Response: Whether a biologist and/or archaeologist will be needed and the specifics regarding that need will not be known until project implementation occurs (i.e., DFW 3 and beyond). As such, it is not judicious or necessarily possible to include that information in the QAPP. However, the general responsibilities of an archaeologist, should one be needed, are provided in WS 17 DFW 3 under "Archaeological Demarcation." The following has been added to the end of that subsection: "Should the presence of artifacts impact the ability to complete TCRA activities within the associated area, the

coordinates of the area will be recorded and a discussion on the potential impact on meeting the TCRA objectives will be included in the TCRA Completion Report."

Additionally, the last sentence of WS 17 DFW 3 under "Vegetation Clearance" has been revised to read: "If threatened or endangered species are present within certain TCRA areas requiring vegetation clearance, a biologist will advise or be embedded with the clearance team to ensure vegetation clearance activities will be conducted in a manner consistent with appropriate ecological protectiveness measures to the extent practical. Should the presence of threatened or endangered species impact the ability to complete TCRA activities within the associated area, the coordinates of the area will be recorded and a discussion on the potential impact on meeting the TCRA objectives will be included in the TCRA Completion Report."

5. The QAPP is inconsistent between WS14&16, WS17, Figure 17-1, and WS29 when describing deliverables and/or due dates associated with the various DFWs. Review the required documents/submittal schedules, and verify the appropriate ones are provided in all applicable worksheets. The following are examples of inconsistencies found during review (should not be viewed as a complete list):
   a) For DFW 1, WS17 also denoted an Operational Readiness Checklist. Additionally, should there be a Survey Report listed?
   b) For DFW 9, Figure 17-1b indicates Disposal Records as one of the deliverables. These records are not noted in either of the worksheets.
   c) For DFW 11, WS14&16 provide deliverable due dates of 2 or 5 days. WS17 indicates that the field documentation and raw data "will be uploaded at the end of each field day…" Additionally, WS14&16 lists Weekly QC Reports while WS17 includes the Target Selection Technical Memorandum as deliverables for this activity. Neither of these documents are provided on Figure 17-1.
   d) For DFW 13, WS17 also included the IVS Memoranda and the Classification Report.
   e) For DFW 17, both WS14&16 and Figure 17-1c list the Final Verification/Validation Plan; however, this document is not denoted in WS17.
   f) The QC Seeding and Validation Seeding Reports are denoted in WS14&16 as due 15 days following completion of activities, while WS29 states "30 working days".
   g) The IVS Technical Memorandum is denoted in WS14&16 as due 14 days following completion, while WS29 states "one week".
   h) WS29 indicates both "Preliminary" and "Final" Ranked Dig Lists, with due dates of 10 days and 20 days following survey unit completion. WS14&16 and WS17 include just "Dig List" with a due date of 14 days.

Navy Response: The three worksheets and Figure 17-1 have been reviewed and, as applicable, modified to ensure appropriateness and consistency in the required documents/submittal schedules, including consideration of Comments 5a through 5h above.

SPECIFIC COMMENTS:

The following comments reference the worksheets that present the information required by the MR-QAPP guidance. If the information is present in the UXO 13 TCRA QAPP, it will be so stated.

PROJECT MANAGEMENT and OBJECTIVES ELEMENTS

1. Worksheet #1 & 2
   a) Under Step 9, clarify the statement "Signature(s) not applicable". The QAPP discusses using analog technology, at a minimum for the surface clearance. Are the signatures in Steps 2 through 7 denoting

the acceptance of the use of analog? The MR-QAPP guidance format provides separate signatures for this step.

Navy Response: The Navy does not require flag-level signature for using analog technology, which is the primary focus of Item 9. Further, regulatory agency approval of the QAPP, which applies to all its contents, including the use of analog technology, is provided in Item 5. Therefore, signatures in Item 9 are not applicable to QAPPs issued for work at Navy sites.

2. Worksheet #3 & 5

   a) Verify if a line of communication should exist between the NAVFAC Site Manager and the contractors. It appears that WS6 allows for direct contact between these personnel.

      Navy Response: Lines of communication between the NAVFAC Site Manager and USAE and CH2M have been added to Figure 3-1.

3. Worksheet #4, 7 & 8

   a) Verify if lead agency staff should be listed in this worksheet. The MR-QAPP guidance format includes DoD personnel.

      Navy Response: An additional table (Table 4-1, with existing Tables 4-1 and 4-2 renumbered to 4-2 and 4-3, respectively) has been added with the key NAVFAC personnel associated with the project.

   b) Clarify if the USAE Field Geophysicist and/or the CH2M and/or USAE UXO field staff, denoted as "TBD" in the organization chart, require any specialized experience/training/certifications for work on the site. If not, then it is acceptable that they are not listed in this worksheet. If so, add a row to provide the requirement(s).

      Navy Response: The referenced staff do not require any specialized experience/training/certifications specific to this project; the standard training they possess is appropriate for this project.

4. Worksheet #6

   a) In the "Stop work due to safety issues" row, it is noted that the USAE and CH2M H&S Managers "are integral in the stop work communications…". However, these persons are not listed in the "Procedure" column and their contact information is not provided in the row. Additionally, there is no mention of the CH2M MR Safety/Quality Officer in the process. Clarify the role/responsibilities for the H&S Managers and/or Safety/QAO and revise the text as applicable.

      Navy Response: This worksheet is intended to identify the primary initiators and recipients for various communication drivers at the management (decision-making) level, not all staff that may be ultimately involved in the communication. As shown in the worksheet, for potential "stop work" issues, the Initiators and Recipients listed are the contractor and Navy managers for this project. They will receive information from and/or reach out to the appropriate USAE and CH2M staff for any issue requiring a "stop work."

   b) In the "QC or QA stand-down" row, clarify if there will be any involvement by the on-site UXOQCS personnel (USAE and/or CH2M). If they will not be explicitly involved, then no revisions are necessary.

      Navy Response: Please see the response to Comment 4a. The USAE and/or CH2M UXOQCS may be involved in the communication, but the communication at the management level (NAVFAC, USAE, and CH2M) will be through the Initiators shown. For additional clarity, the following has been added as the first sentence of the "Procedure:" "If an issue is identified that may warrant a QC or QA stand-down, the USAE UXOQCS (for QC issues) or CH2M UXOQCS (for QA issues) will communicate and discuss the issue with the USAE QAO or CH2M Munitions Response Safety and QAO, respectively."

c) In the "Geophysical QC nonconformance" row, consider adding that, after notification, the process will follow, as applicable, the procedures in the change-related drivers discussed above.

Navy Response: The requested text has been added.

d) Consider adding the WS6 footnote (Page 33 of QAPP) text also to WS3&5 and/or WS4,7&8, as they similarly discuss personnel.

Navy Response: The suggested revision has been made.

5. Worksheet #9

a) Add the missing information for Felix Lopez from the USFWS.

Navy Response: The requested information has been added.

b) Provide any "Action Items" from the meeting including responsible entity and timeline.

Navy Response: No action items were recorded in the meeting minutes.

c) Clarify if this was the only project planning meeting. The MR-QAPP template discusses that "multiple planning sessions typically are conducted…"

Navy Response: This was the only project planning meeting.

6. Worksheet #10 – This information was provided in the QAPP and addressed the requirements.

Navy Response: Comment noted.

7. Worksheet #11 – This information was provided in the QAPP and addressed the requirements.

Navy Response: Comment noted.

8. Worksheet #12

a) For clarify, consider denoting if the personnel listed are from USAE and/or CH2M.

Navy Response: The requested information has been added.

b) Clarify the discussion in the "Specification" column under MPA #12 in Table 12-1. The text indicates the TOIs were established in Table 11-1. However, TOIs are not provided in the table. Additionally, WS17 (Step 4) states that the "size and decay parameters will be established based on the size and decay for a 37 mm projectile".

Navy Response: The referenced "Specification" has been corrected to read: "ISS size and decay parameters will be established based on the smallest TOI identified in Step 4 of Worksheet 11 under "Vertical Boundaries" with a 20-percent buffer applied."

c) Clarify the "tests and test objectives" noted in the "Specification" column under MPA #27 in Table 12-1. Were these established during project planning as indicated? If so, where are they denoted in the QAPP? Add reference(s) to the associated table(s)/worksheet(s) as applicable.

Navy Response: The parenthetical statement "(specific tests and test objectives established during project planning)" has been removed as it is not applicable to this MPA.

d) In Table 12-2, verify the documentation under MPA #6 and MPA #7. MPA #6 lists the "QC Seeding Plan" while MPA #7 denotes the "Validation Seeding Report"; however, the specification and performance activities are generally otherwise consistent.

Navy Response: "QC Seeding Plan" has been corrected to read "QC Seeding Report" in MPA #6

9. Worksheet #13 – This information was provided in the QAPP and addressed the requirements.

   Navy Response: Comment noted.

10. Worksheet #14 & 16

    a) Clarify if the signed review/acknowledgment document from the ESS Plan will be part of the applicable Daily Report. This is also discussed under DFW 2 in WS17.

       Navy Response: It is assumed the comment is referring to NOSSA and/or DDESB approval of the ESS that will be utilized for the TCRA. Those approvals will not be part of the Daily Reports. As noted in DFW 2 in WS 17, key project staff will meet to ensure a full understanding of the TCRA, which will include discussion of the ESS. The associated Daily Report(s) will provide a summary of this meeting(s).

    b) Verify the responsible parties for DFW 12. Should the QA Contractor also be listed, as noted in WS17 (last paragraph prior to "Documentation")?

       Navy Response: WS 14 DFW 12 specifies the "Responsible Party" (i.e., the Munitions Removal and Geophysical Contractor) for performing the detection data processing and preparing the DUA. WS 37 shows the QA Contractor is responsible for participating in the DUA for which the Munitions Removal and Geophysical Contractor is responsible. Therefore, WS 14 DFW 12 is correct as written. WS 17 is correct as written because the QA Contractor is responsible for review and approval of the DUA Report.

    c) Clarify if Daily Reports will be prepared during the demobilization activities. If so, add to the "Deliverables" column for DFW 21.

       Navy Response: "Daily Report" and "Daily" have been added to the "Deliverable(s)" and "Deliverable Due Date" cells, respectively for DFW 21. In addition, in WS 17 under "DFW 21: Demobilization," the "Documentation" entry has been corrected to remove "UXO 13 TCRA Completion Report." Further, in Figure 17-1d, "Daily Report(s)" has replaced "Not Applicable (N/A)" for the demobilization outputs.

<u>MEASUREMENT/DATA ACQUISITION ELEMENTS</u>

11. Worksheet #17

    a) Consider if a decision point for DFW 3 would be USFWS formal concurrence, or a lack thereof. If so, add to the text. If not, then no revisions are needed.

       Navy Response: The following has been added as the first sentence of "Decision Points": "Formal concurrence/documentation of planned land use boundaries as noted under 'Coordination with USFWS for Planned Land Use Areas' is the initial decision point upon which subsequent points associated with site preparations are established."

    b) DFW 8 discusses the draft final version of the IVS Tech Memo. Clarify who will be receiving the draft version if not the QA Contractor. Is this an internal version?

       Navy Response: The referenced sentence has been corrected to read: "The IVS Technical Memorandum will be provided to the QA Contractor for review and concurrence."

    c) Verify the lack of Documentation and Decision Rule sections for DFW 19. What may occur if none of the cliff face methods are feasible in the field? Revise as applicable.

       Navy Response: The following have been added to DFW 19:

       "Documentation: Daily Reports, DFW 18 documentation"

"Decision Rule: If no equipment/process is deemed suitable or safe for performing some or all of the cliff face MEC clearance, the approximate area where clearance cannot be performed will be documented and discussed in the TCRA Completion Report."

12. Worksheet #22

a) Clarify the reference to "FTL" in the SP2 and SP5 rows in Table 22-1. Is this the CH2M FTL? Currently, the Munitions Response and Geophysical Contractor does not include a FTL in their project personnel.

Navy Response: "FTL" in SP2 and SP5 has been revised to "SUXOS."

b) Add the missing information for the SP6 and SP7 rows in Table 22-1.

Navy Response: The following revisions have been made:

"Once following assembly" has been added to the "Frequency" cell for SP6 and SP7.

"Field Geophysicist/IVS Technical Memorandum/Project Geophysicist" has been added to the "Responsible Person/ Report Method/ Verified By" cell for SP7.

"Response (mean static spike minus mean static background) within 20 percent of predicted response for all Tx/Rx combinations" has been added to the "Acceptance Criteria" cell of SP7.

"RCA/CA: Make necessary adjustments, and reverify" has been added to the "Failure Response" cell of SP7.

c) Verify the "measured position of control point" for SP12 in Table 22-1, D1 in Table 22-2, C1 in Table 22-3, and SR1 in Table 22-4. The acceptance criterion is given as 0.10m, while it appears WS17 indicated 5cm (or 0.05m) for the RTK-GPS horizontal measurements.

Navy Response: The measurement acceptance criterion provided WS 17 is correct and is specific to surveying of site control. The MQOs in WS 22 are specific to geophysical surveys and geophysical equipment and have been established based on the minimum specified requirements in the QAPP Toolkit. To that end, the values in Tables 22-1, 22-2, and 22-3 are correct. The value in Table 22-4 has been corrected to 0.5m, which is also per the QAPP Toolkit.

13. Worksheet #29

a) Clarify to whom the AGC data file "will be delivered" as noted in the second paragraph. Is this the GIS Manager or another entity such as the QA Contractor and/or NAVFAC?

Navy Response: The referenced sentence will be revised to clarify the AGC data file will be delivered to the QA Contractor.

b) Verify if the Processed Geophysical Data Packages and the UXO 13 TCRA Completion Report rows should list the deliverable due date schedule (i.e., # of days following completion). Revise as applicable.

Navy Response: The "Completion/Update Frequency" cell for the "Processed Geophysical Data Packages" has been revised to read: "Within 7 days following completion of each defined survey unit." The "Completion/Update Frequency" cell for the "UXO 13 TCRA Completion Report" has been revised to read: "Prepared and issued following TCRA completion in accordance with the document preparation timeline provided in the Vieques Site Management Plan for the associated fiscal year."

c) Consider whether the Final Verification/Validation Plan should be added to this worksheet. Revise as applicable.

Navy Response: The Final Verification/Validation Plan has been added to Worksheet #29.

ASSESSMENT/OVERSIGHT ELEMENTS

14. Worksheet #31, 32 & 33

a) For clarify, consider denoting if the personnel listed are from USAE and/or CH2M.

Navy Response: It is assumed the comment is referring to the text contained in the "Three Phases of Control" section prior to Table 31-1. Under that assumption, the information has been added as requested. Table 31-1 already identifies whether the responsible party is from USAE (i.e., the Munitions Removal and Geophysical Contractor) or CH2M (i.e., QA Contractor), as defined in Worksheet #1&2.

b) Clarify how the Final Phase Inspection items will be documented. Will the same process be followed as previous inspections (i.e., inspection checklist forms and in QC logbook)?

Navy Response: The following sentence has been added before the last sentence: "The Final Phase inspection results will be documented in a checklist or the TCRA Completion Report."

c) In Table 31-1, clarify the role/responsibility of the QA Contractor in the following rows: GPS Function Test, Vegetation Clearance, ITS Construction, Analog Function Test, Surface and Subsurface MEC Removal Completion, MEC/MD Removal, Surface/Subsurface QC Seeding, Geophysical Sensor Assembly, Sensor Function Test, IVS Construction, IVS Surveys, Geophysical Surveys, and Intrusive Investigations.

Navy Response: For "GPS Function Test," the "Vegetation Clearance," "ITS Construction," "Analog Function Test," "MEC/MD Removal (including munitions management, demolition, and demilitarization)," "Surface/Subsurface QC Seeding," "Geophysical Sensor Assembly," "Geophysical Sensor Function Test," "IVS Construction," and "IVS Surveys," the QA Contractor has been removed from both the "Responsible Party" and "Responsible for Responding to Assessment Findings" cells. Please note, "Remedial Action Completion Report" has been revised to read "TCRA Completion Report" in the "Assessment Deliverable" cell for "Intrusive Investigations."

For "Surface and Subsurface MEC Removal Completion" and "Intrusive Investigations" under "Responsible Party" the "QA Contractor" has been revised to read: "QA Contractor (ensuring removal was completed in accordance with verification and validation requirements)" and under "Responsible for Responding to Assessment Findings" the "QA Contractor" has been revised to read: "QA Contractor (ensuring data are of sufficient quantity and quality to achieve the associated objectives and any findings have been adequately addressed)."

For "Geophysical Surveys" under "Responsible Party" the "QA Contractor" has been revised to read: "QA Contractor (ensuring geophysical survey was completed in accordance with QAPP)" and under "Responsible for Responding to Assessment Findings" the "QA Contractor" has been revised to read: "QA Contractor (ensuring data are of sufficient quantity and quality to achieve the associated objectives and any findings have been adequately addressed).

d) In Table 31-1, clarify the role/responsibility of the Munitions Removal and Geophysical Contractor in the following rows: Surface/Subsurface QA Seeding.

Navy Response: The following revisions have been made to the "Surface/Subsurface QA Seeding" row:

Under "Responsible Party," the "Munitions Removal and Geophysical Contractor" has been removed.

Under "Responsible for Responding to Assessment Findings," the text has been revised to read "QA Contractor (for confirming QA seeding was done in accordance with Validation Seeding Plan)/Munitions Removal and Geophysical Contractor (for addressing QA seed failures)"

e) Verify the "Deliverable Due Date" information for the Surface and Subsurface MEC Removal Completion row. It is unclear how the schedule would be "prior to start…" if the assessment would be at "completion" of the activity.

Navy Response: The referenced cell has been revised to read: "Daily for Daily Reports and within 20 days for the Surface and Subsurface MEC Removal Technical Memorandum."

DATA REVIEW ELEMENTS

15. Worksheet #35

a) Verify the inclusion of "the contractor's QC seeding plan" as one of the items addressed in the plan in Attachment C. This topic does not appear to be discussed in the Verification and Validation Plan.

Navy Response: The sentence in Worksheet #35 that reads: "It addresses the contractor's QC seeding plan, threshold verification, and classification validation." has been revised to read: "It addresses the detection threshold, classification verification, and classification validation." The following is text from the Verification and Validation Plan demonstrating verification and validation includes seed performance: "The detection threshold will be validated through a quality control and quality assurance blind seeding program designed to validate that TOIs were effectively detected to the depths required and selected from the data as a potential TOI for cued interrogation and classification (when applicable)."

b) In Table 35-1, clarify if the "Program Geophysicist" is the Geophysical QC or the Project Geophysicist as described in the earlier personnel-based worksheets.

Navy Response: All occurrences of "Program Geophysicist" in Table 35-1 have been revised to "Project Geophysicist."

c) Clarify the use of "intrusive" in the "Analog Equipment…Activities" row in Table 35-1. It is unclear if the row corresponds to DFW 9 (surface sweep) and/or DFW 10 (analog-based clearance) as discussed in WS12/WS17, but neither appears to include substantive intrusive activities.

Navy Response: The word "intrusive" has been removed from the referenced Activity and associated Process Description because analog equipment will support both surface and subsurface MEC removal.

d) Verify the listing of both a QC Seed Report and a QC Seeding Report in the "QC Seeding" row. Should it be the QC Seed Plan?

Navy Response: "QC Seed Report" has been corrected to "QC Seeding Plan."

e) Add the missing information for the "ITS Construction and Testing" row in Table 35-1.

Navy Response: "Field logbook and Surface and Subsurface MEC Removal Technical Memorandum" have been added to the "Documentation" cell of the referenced Activity.

16. Worksheet #37

a) Clarify if anyone from NAVFAC will be involved in the usability assessment. DoD personnel are listed in the MR-QAPP guidance template.

Navy Response: As has been done for all previous removal actions for Vieques sites, Navy and regulatory personnel involvement in the DUA is done at the TCRA Completion Report review stage because it is not realistic to coordinate personnel from all entities on as as-needed basis for the various intermediate stages of the DUA.

b) Verify inclusion of "Data Validation Reports" in the bullet list of inputs. These deliverables were not previously described. If part of the verification and validation activities, describe in the plan in Attachment C.

Navy Response: "Data Validation Reports" has been removed.

Responses to EPA's Additional Comments on
Draft UXO 13 Munitions Response Time-Critical Removal Action Quality Assurance Project Plan
Atlantic Fleet Weapons Training Area-Vieques, Former Vieques Naval Training Range
Vieques, Puerto Rico, November 2023

EPA has performed a backcheck review on the RTCs for the Draft UXO 13 TCRA QAPP. The revisions are considered acceptable (pending review of the revised plan), with the following two items for consideration for additional clarity:

- Comment 5b (WS9): Consider adding the statement about no action items to the end of the "Key Discussion Points" paragraph.

  Navy Response: The following text has been added as the last sentence in the Key Discussion Points section of WS #9, "No action Items were identified during discussion or recorded in the meeting minutes."

- Comment 16a (WS37): Consider adding the statement about Navy and regulatory personnel involvement in the DUA as part of the review of the TCRA Completion Report after the bullet list of personnel or as a footnote.

  Navy Response: The following text has been added at the end of the Personnel (Organization and Position/Title) Responsible for Participating in the DUA section of WS #37, "Note that NAVFAC and regulatory personnel involvement in the DUA is done at the TCRA Completion Report review stage."

Responses to PRDNER Comments
Draft UXO 13 Munitions Response Time-Critical Removal Action
Quality Assurance Project Plan
Atlantic Fleet Weapons Training Area – Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

General Comment

1. The current boundaries for differentiating clearance efforts (i.e. surface vs twelve inches below ground surface (bgs)) relies on historical use/research. The TCRA clearance effort should take into consideration the potential need to "step out" the boundaries of the clearance if MEC is still being found within proximity of those boundaries.

   Navy Response: As stated in DQO Step 4 of Worksheet #11, boundaries shown in the figures are approximate and final boundaries will be established based on field conditions. In addition, as shown in Worksheet #14&16 (DFW 3) and stated under "Coordination with USFWS Services for Planned Land Use Areas" in Worksheet #17 DFW 3: Site Preparation: "Prior to the TCRA activities for the planned land use areas, it is assumed that USFWS will provide formal concurrence/documentation of the boundaries to be established for the planned land use areas." Figure 17-1a also shows "USFWS Approval for Planned Use Area(s)" is an output of DFW 3.

Page-Specific Comments

1. Worksheets 1&2: Please add the *2018 Draft UXO 13 Remedial Investigation/Feasibility Study* to the list of plans and reports from previous investigations relevant to this project.

   Navy Response: The reference has been added as requested.

2. Figures 11-3, 11-4, 11-5, 11-6, 11-7 and 11-9: The total clearance area shown on the figures differs from the clearance areas listed In Table 11-1. Please reconcile.

   Navy Response: The following footnote has been added to Table 11-1 and assigned to the "Approximate Area (Acres)" column, which has been reworded as "Approximate Site Feature Area (Acres)": "[g] The acreages shown in this table are based on the boundary polygons of the associated features; the acreages shown in Figures 11-1 through 11-10 are based on the areas for which the TCRA will be conducted, which may be larger based on grid-based clearance."

3. Figures 11-1 and 11-10: The total clearance area for the Ranges shown appear to be inconsistent with the sum of the clearance area for the Ranges shown on Figures 11-4 through 11-7. Please reconcile.

   Navy Response: The 3-acre difference is based on the overlap of clearance areas associated with Range 3 and Range 4A, as shown in Figure 11-4. A note has been added to Figures 11-1, 11-4, and 11-10 explaining this.

4. Figure 11-7. Range 4B, Berm and Proposed Land Use: Please clarify if the gray line extending from the parking area to the scenic view represents the location of the earthen berm and if so, please identify in the legend. If not, please show and label its location.

   Navy Response: The "Berm Location" identifier in the Figure 11-1 Legend has been added to the Figure 11-7 Legend.

5. Pdf p. 63, Table 11-1; Within this table, the Puerto Diablo Trail maximum clearance depth is down to twenty-four inches bgs, and states this is visually represented in Figure 11-1, however, the Figure 11-1 legend states the clearance depth is twelve inches. Please clarify/edit.

   Navy Response: The maximum removal depth for the Puerto Diablo Trail in Table 11-1 has been corrected to 12 inches.

6. Pdf p. 82, Table 12-2, Row 6, 3rd column; While the blind seeding plan is firewalled, there should be a stated goal for analog seeding found within the QAPP specifications as is found within the DGM section regarding seeding on pdf p. 76. This provides confidence that the field effort has quality controls in place to meet the measurement quality objectives in alignment with industry standards/similar recent clearance efforts on Vieques. This target is found on pdf p. 97 under Definable Feature of Work (DFW) 5.

   Navy Response: The following entry has been added to the "Specification" cell for QC Seeding in Table 12-2: "QC seeds will be distributed so that each field team can be expected to encounter, on average, at least 10 QC seeds per day."

7. Pdf p. 108/109, WS #17; The targeted parameter of performing 100 validation digs is below what is typically found on advanced geophysical classification clearance projects. While the old standard of 200/200 verification/validation digs have been consistently superseded with an understandable percentage approach, 100 digs seem below a normal QC target goal. Please review and ensure that the current QC standard will ensure that the data quality objectives are being met.

   Navy Response: The text in WS #17 and WS #22 has been clarified to indicate 200 verification/validation digs or 10 percent (whichever comes first) will be performed for the total area where AGC is performed, which is up to approximately 200 acres (as shown in Figure 11-1), rather than by survey area. This is consistent with approaches commonly used for sites of this size while allowing for scalability to account for unknown but potentially substantial anomaly density variations among individual land areas.