FINAL
UNIFORM FEDERAL POLICY
QUALITY ASSURANCE PROJECT PLAN (UFP-QAPP)

FORT JACKSON NATIONAL CEMETERY
COLUMBIA, SOUTH CAROLINA

CONTRACT NO. W912DY-17-D-0004
DELIVERY NO. W912DY19F0217

Prepared for

U.S. Army Engineering and Support Center, Huntsville

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

Prepared by:

HydroGeoLogic, Inc.
4835 University Square, Suite 15
Huntsville, AL 35816

October 2019

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Huntsville, AL 35816

October 2019

Signed: Jeff Dick Digitally signed by Jeff Dick
DN: cn=Jeff Dick, o, ou, email=jdick@hgl.com, c=US
Date: 2019.10.03 05:21:08 -05'00'
Jeff Dick, HGL Corporate Quality Management Representative

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UNIFORM FEDERAL POLICY-
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EXECUTIVE SUMMARY

ES.1 The objective of this project is to provide all Military Munitions Response Program (MMRP) services under the Multiple Environmental Government Acquisition Multiple Award Task Order Contract necessary to remove Munitions and Explosives of Concern (MEC) and Material Potentially Presenting an Explosive Hazard (MPPEH), to include Munitions Debris (MD) at Fort Jackson National Cemetery (FJNC) to enable these areas to be rendered usable for cemetery construction development. HydroGeoLogic, Inc. (HGL) has prepared this Uniform Federal Policy-Quality Assurance Project Plan to provide the scope of work and field protocols required to implement the MMRP services at the site. This work is being conducted under Contract No. W912DY-17-D-0004, Delivery No. W912DY19F0217.

ES.2 FJNC was established following a Memorandum of Agreement between Fort Jackson and the Department of Veterans Affairs in April 2008 followed by the transfer of land by the U.S. Department of Defense to the Department of Veterans Affairs in April 2010. The transferred land is on the North border of Fort Jackson and was previously used for field training exercises. Portions of FJNC overlap with former safety fans of 1950s era mortar ranges and small arms range fans. The Master Plan for FJNC contains a total of 8 planned phases with room for additional phases.

ES.3 During construction activities in September 2009, three landmines were unearthed. As a result, a Removal Action at the FJNC was initiated within the boundaries of designated Phases 1A, 1B, 2, 3, and the spoils area to the North and East of Phase 1B (Figure 2, Appendix I). Subsurface clearance was performed in Phase 1 areas that were logged and scraped by the construction contractor and the remainder of the terrain (remaining forested area) was surface cleared. Approximately 40 acres of the 120-acre Phase 1 site were surveyed by Digital Geophysical Mapping (DGM). A total of 1,041 anomalies were selected for investigation from the DGM data. A total of 157 MEC items were encountered in the 120 acres (36 MEC items in the DGM-covered area and 121 MEC items in the mag and dig area), including 44 landmines, 24 landmine fuzes, 38 flares, 48 grenades, 2 illuminating candles, and one 75-millimeter projectile. The depth range for items found using DGM ranged from 1 inch to 38 inches. An additional removal action was performed in September 2010 to provide construction support in additional areas totaling 4 acres. During this removal, one MEC item was encountered (M7B1 Box Mine) at a depth of 4 inches.

ES.4 The planned field activities for this project includes the FJNC Gravesite Expansion Phase 2 Area, which is divided into cleared and wooded areas (Figure 4, Appendix I). Acreage estimates are approximately 14.52 acres, 15.57 acres of wooded areas, as well as an additional 0.75 acre of trees that will remain. Field activities at FJNC will include vegetation removal, a geophysical instrument assisted surface clearance, DGM, and subsurface removal of identified anomalies.

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LIST OF ACRONYMS/ABBREVIATIONS

%	percent
cm	centimeter(s)
AHA	activity hazard analysis
APP	Accident Prevention Plan
BIP	blown-in-place
CA	Corrective Action
CAR	Corrective Action Report
CEHNC	U.S. Army Engineering and Support Center Huntsville
CESAC	
cm	centimeters
CoC	chain-of-custody
CESAC	U.S. Army Corps of Engineers, Charleston District
CMQ/CE	Certified Manager of Quality/Organizational Excellence
COR	Contracting Officer Representative
CPR	cardiopulmonary resuscitation
CS	Construction Support
CSM	conceptual site model
CST	Central Standard Time
DDESB	DoD Explosives Safety Board
DFW	definable feature of work
DGM	digital geophysical mapping
DID	data item description
DoD	Department of Defense
DQCR	daily quality control report
DQO	data quality objective
DUA	data usability assessment
EM	Engineer Manual
EM-CX	Environmental and Munitions Center of Expertise
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
ESS	Explosives Safety Submission
ESTCP	Environmental Security Technology Certification Program
FJNC	Fort Jackson National Cemetery
FTP	File Transfer Protocol
FWV	Field Work Variance
GIS	geographic information system
GPS	global positioning system

H&S	Health and Safety
HAZMAT	hazardous material
HAZWOPER	Hazardous Waste Operations and Emergency Response
HGL	HydroGeoLogic, Inc.
HTRW	hazardous, toxic, and radioactive waste
IAW	in accordance with
IDQTF	Intergovernmental Data Quality Task Force
ISO	industry standard object
IVS	instrument verification strip
LEED-AP	Leadership in Energy and Environmental Design-Accredited Professional
MC	munitions constituents
MD	munitions debris
MDAS	material documented as safe
MEC	munitions and explosives of concern
mm	millimeter(s)
MMRP	Military Munitions Response Program
MPC	measurement performance criteria
MPPEH	material potentially presenting an explosive hazard
MQO	measurement quality objective
MR	munitions response
MRS	munitions response site
N/A	not applicable
NCA	National Cemetery Administration
OESS	ordnance and explosives safety specialist
OSHA	Occupational Safety and Health Administration
P.E.	Professional Engineer
P.G.	Professional Geologist
PDF	portable document format
PDT	project delivery team
PM	Project Manager
PMP	Project Management Professional
PWS	Performance Work Statement
QA	quality assurance
QAPP	Quality Assurance Project Plan
QASP	Quality Assurance Surveillance Plan
QC	quality control
QSM	Quality Systems Manual

RA	Removal Action
RCA	root cause analysis
RONCO	RONCO Consulting Corporation
RRD	range-related debris
RTC	response to comment
RTK	real-time kinematic
RTS	robotic total station
SCDHEC	South Carolina Department of Health and Environmental Control
SOP	standard operating procedure
SPP	Systematic Planning Process
SSFR	Site-Specific Final Report
SSHO	Site Safety and Health Officer
SUXOS	Senior Unexploded Ordnance Supervisor
TBD	to be determined
TP	technical paper
TPP	technical project planning
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USC	University of South Carolina
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer
VA	Veterans Affairs
WS	Worksheet

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CROSSWALK FROM UFP-QAPP MANUAL TO WORKSHEETS

The following table provides a "crosswalk" between the Quality Assurance Project Plans (QAPP) elements outlined in the Uniform Federal Policy (UFP) for QAPP (UFP-QAPP Manual), the necessary information, and the location of the information within the text document and corresponding QAPP Worksheet.

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual	Required Information	Crosswalk to Worksheet No.
2.1 Title and Approval Page	- Title and Approval Page	1 & 2
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	1 & 2
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	3 & 5 4, 7 & 8
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications - Special Personnel Training Requirements	3 & 5 6 4, 7 & 8
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background	9 10
2.6 Project Quality Objectives and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific Project Quality Objectives - Measurement Performance Criteria	11 12
2.8 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations	13 13
2.9 Project Overview and Schedule 2.9.1 Project Overview 2.9.2 Project Schedule	- Summary of Project Tasks - Project Schedule/Timeline	14 & 16 14 & 16

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual	Required Information	Crosswalk to Worksheet No.
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Project Sampling Standard Operating Procedures (SOP) References - Field Equipment Calibration, Maintenance Testing, and Inspection	17 21 22
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UNIFORM FEDERAL POLICY-
QUALITY ASSURANCE PROJECT PLAN
FORT JACKSON NATIONAL CEMETERY
COLUMBIA, SOUTH CAROLINA

INTRODUCTION

HydroGeoLogic, Inc. (HGL) has prepared this Uniform Federal Policy (UFP)-Quality Assurance Project Plan (QAPP) to support the Removal Action (RA) at Fort Jackson National Cemetery (FJNC), Columbia, South Carolina. This work is being conducted for the U.S. Army Engineering and Support Center Huntsville (CEHNC) under Contract No. W912DY-17-D-0004, Delivery No. W912DY19F0217.

The QAPP provides information on five areas: (1) Project Management and Objectives, (2) Measurement and Data Acquisition, (3) Field Sampling Rationale, (4) Assessment and Oversight, and (5) Data Review. This document meets the requirements and elements set forth in DID HNC-001.02; EM 200-1-15; EM 385-1-1; EM 385-1-97 including Errata Sheets and Changes; Intergovernmental Data Quality Task Force UFP-QAPP Manual: Munitions Response (MR)-QAPP template and other Interim Guidance and DIDs as appropriate.

This QAPP provides a process for obtaining data of sufficient quality and quantity to satisfy project needs. It describes the functional activities, data quality objectives (DQOs), and measures necessary to obtain adequate data for a given purpose. Data acquisition, reporting, and evaluation will be completed in accordance with this QAPP. As any new procedures are required, addenda to this document will be issued.

All staff participating in project/field efforts are required to read this plan and become familiar with the analytical procedures and the implementation of these procedures to ensure that analytical/sample goals are met consistently. In addition, key personnel are responsible for mentoring assigned staff in aspects of this UFP-QAPP that would have a potential impact on the work assigned to them.

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WORKSHEETS #1 AND #2
TITLE AND APPROVAL PAGE

1.1 PROJECT IDENTIFYING INFORMATION

Site Name/ Project Name:	Removal Action at Fort Jackson National Cemetery
Site Location/No.:	Fort Jackson National Cemetery, Columbia, South Carolina
Contract/TO No.:	W912DY-17-D-0004, Delivery No. W912DY19F0217

1.2 CONCURRING SIGNATURES

The below signatures indicate the representatives of the subject organizations have reviewed this UFP-QAPP and concur with its implementation as written.

Lead Stakeholder/ Project Manager

Juan Kays

Juan Kays, Project Manager, National Cemetery Administration Design and Construction — Date

Design Center Lead/ Contracting Officer Representative

DOSS.AMY.LEIGH.1265127645 Digitally signed by DOSS.AMY.LEIGH.1265127645 Date: 2019.10.01 12:12:20 -05'00'

Amy Doss, Contracting Officer Representative — Date

Contractor Project Manager

Derek R. Anderson Digitally signed by Derek R. Anderson Date: 2019.09.30 10:33:04 -04'00'

Derek Anderson, HydroGeoLogic Project Manager — Date

Contractor Quality Control Manager

Jeff Dick Digitally signed by Jeff Dick DN: cn=Jeff Dick, o, ou, email=jdick@hgl.com, c=US Date: 2019.09.30 13:02:16 -05'00'

Jeff Dick, HydroGeoLogic Quality Control Manager — Date

1.3 QAPP IDENTIFYING INFORMATION

Guidance Used:	Data Item Description (DID) HNC-001.02; Engineer Manual (EM) 200-1-15; EM 385-1-1; EM 385-1-97 including Errata Sheets and Changes; Intergovernmental Data Quality Task Force UFP-QAPP Manual; Munitions Response (MR)-QAPP template and other Interim Guidance and DIDs as appropriate.	
Regulatory Program:	Comprehensive Environmental Response, Compensation, and Liability Act	
Approval Entity:	U.S. Army Corps of Engineers (USACE)	
Data Users:	National Cemetery Administration (NCA), USACE Charleston District; HGL.	
QAPP Type:	The UFP-QAPP is a project-specific UFP-QAPP	
Lead QAPP Preparer:	Scott Schroepfer; sschroepfer@hgl.com; (256) 970-2120	
Scoping Session Dates:	*Session*	*Date*
	Project Kickoff Meeting	24 April 2019
	First Project Planning Meeting	10 May 2019
	Second Project Planning Meeting	Tentatively Scheduled for 9 July 2019
	Third Project Planning Meeting	Tentatively Scheduled for 27 August 2019
	Further scoping session details are present on Worksheet #9.	
Previous UFP-QAPPs:	None	

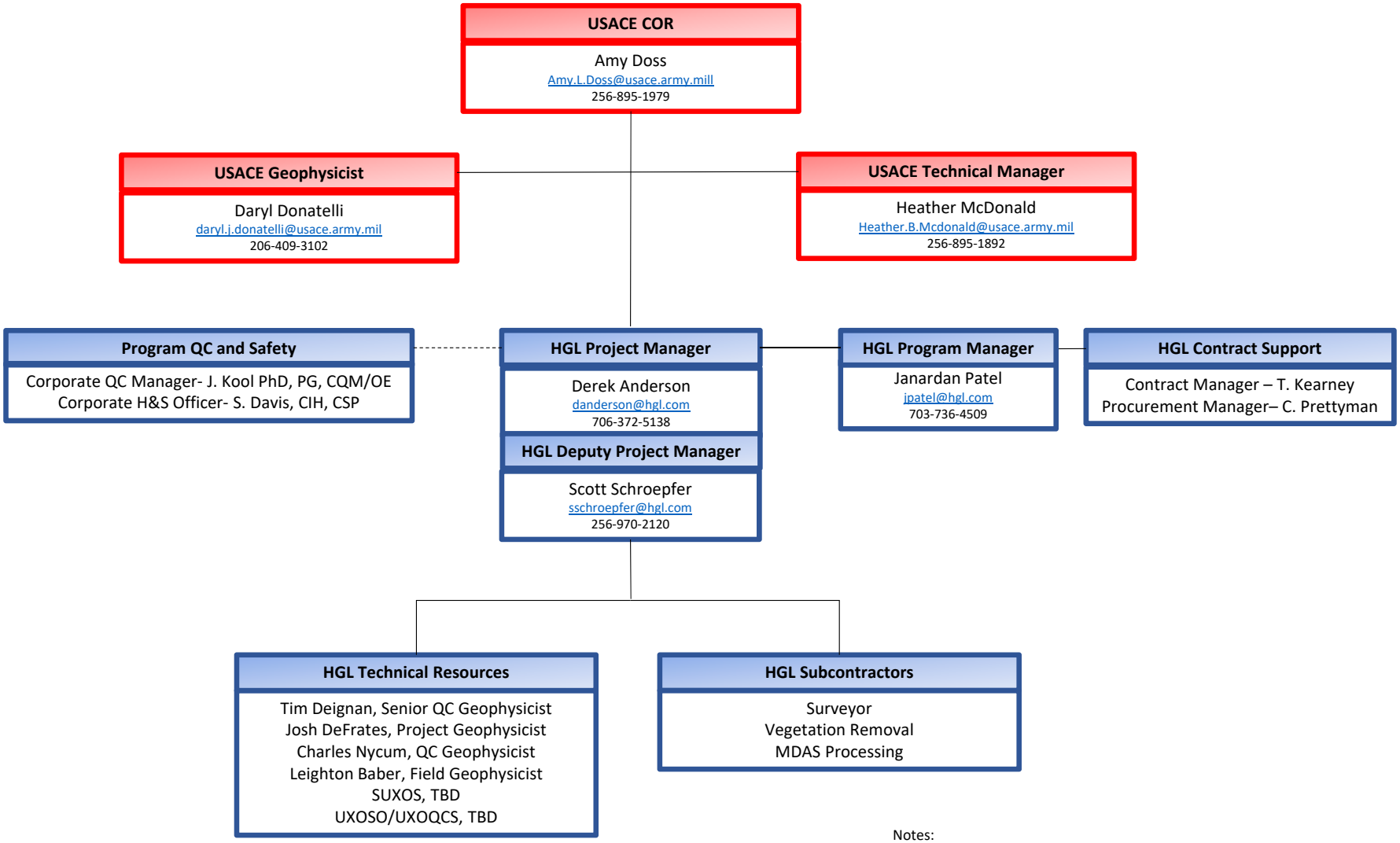
WORKSHEETS #3 AND #5
PROJECT ORGANIZATION AND QAPP DISTRIBUTION

QAPP Recipients	Title	Organization	Telephone Number	E-mail Address
Amy Doss	Contracting Officer's Representative (COR)	CEHNC	(256) 895-1979	Amy.L.Doss@usace.army.mil
Heather McDonald	Technical Manager	CEHNC	(256) 895-1892	Heather.B.Mcdonald@usace.army.mil
Daryl Donatelli	Geophysicist	CEHNC	(206) 409-3102	daryl.j.donatelli@usace.army.mil
Jim Whiteman	Project Manager (PM)	USACE Charleston District	(843) 329-8161	james.g.whiteman@usace.army.mil
Brent Rabon, P.E.		US Army Environmental Command Southeast Environmental Services and Support Division	(210) 466-1896 (DSN 450)	Carl.b.rabon.civ@mail.mil
Juan Kays	Design and Construction Project Manager	NCA	(202) 273-5400	juan.kays@va.gov
Lisa Appel	Environmental Health Manager	SCDHEC	(803) 898-0366	appellr@dhec.sc.gov
Zachary Tice	Environmental Engineer	Fort Jackson Department of Public Works	(803) 751-7332	zachary.a.tice.ctr@mail.mil
Derek Anderson	PM	HGL	(706) 372-5138	danderson@hgl.com
Scott Schroepfer	Deputy PM	HGL	(707) 330-6411	sshroepfer@hgl.com
Neil Feist	Quality Assurance (QA) Lead, MR	HGL	(256) 970-2100	nfeist@hgl.com
Tim Deignan	Senior/Quality Control (QC) Geophysicist	HGL	(720) 625-0039	tdeignan@hgl.com
Josh DeFrates	Project Geophysicist	HGL	(720) 491-8149	jdefrates@hgl.com
Charles Nycum	QC Geophysicist	HGL	(831) 359-8664	cnycum@hgl.com
Leighton Baber	Field Geophysicist	HGL	(303) 524-3473	lbaber@hgl.com
TBD	Senior Unexploded Ordnance (UXO) Supervisor (SUXOS)	HGL	TBD	TBD
TBD	UXO Quality Control Specialist (UXOQCS)	HGL	TBD	TBD
TBD	UXO Safety Officer (UXOSO)	HGL	TBD	TBD

SCDHEC = South Carolina Department of Health and Environmental Control

TBD = to be determined

Project Organization:



WORKSHEETS #4, #7, AND #8
PROJECT PERSONNEL QUALIFICATIONS AND SIGN-OFF SHEET

Name	Organization-Title-Role	Education/ Experience	Specialized Training/Certification	Signature/Date
Janardan Patel	Program Manager	M.S. Environmental Engineering Management Experience: 28 years	PMP	
Jeff Dick	Program QA Manager	BS Civil Engineering MS Environmental Engineering Experience: 28 years	PE. CQCM	
Derek Anderson	HGL – PM	B.S. Agricultural Engineering (Environmental Focus) Experience: 18 years	P.E. Civil Engineering, North Carolina, Arizona LEED-AP	
Tim Deignan	HGL – Senior QC Geophysicist	B.S. Geophysical Engineering Experience: 31 years;	Registered Professional Geophysicist; OSHA HAZWOPER 40-Hour, 8-Hour Refresher, OSHA 8-Hour Supervisor, 30-Hour Construction, First Aid/CPR; Oasis Montaj Geophysical Data Processing for UXO 3 day – UXAnalyze-instruction by ESTCP; UXAnalyze training	
Josh DeFrates	HGL – Project Geophysicist	M.S., Geology, B.S., Geology, 2005 Experience: 13 Years	OSHA HAZWOPER 40-Hour, 8-Hour Refresher, OSHA 8-Hour Supervisor, 30-Hour Construction, First Aid/CPR; Oasis Montaj Geophysical Data Processing for UXO 3 day – UXAnalyze-instruction by ESTCP; UXAnalyze training	

WORKSHEETS #4, #7, AND #8 (CONTINUED)
PROJECT PERSONNEL QUALIFICATIONS AND SIGN-OFF SHEET

Name	Organization-Title-Role	Education/ Experience	Specialized Training/Certification	Signature/Date
Leighton Baber	HGL – Field Geophysicist	B.S., Geology, 2012 Experience: 7 years	OSHA HAZWOPER 40-Hour, 8-Hour Refresher, First Aid/CPR; Oasis Montaj Geophysical Data Processing for UXO	
Charles Nycum	HGL – QC Geophysicist	M.S. Geophysics Experience: 24 years	Registered Professional Geophysicist; OSHA HAZWOPER 40-Hour, 8-Hour Refresher, OSHA 8-Hour Supervisor, 30-Hour Construction, First Aid/CPR; Oasis Montaj Geophysical Data Processing for UXO 3 day – UXAnalyze-instruction by ESTCP; UXAnalyze training	
TBD	HGL - SUXOS	Naval EOD School Graduate	HAZWOPER 40 Hour; 8-Hour Refresher, OSHA 8-Hour Supervisor, OSHA 10-Hour Construction Safety and Health Training, QC Training per TP18	
TBD	HGL – UXOQCS	Naval EOD School Graduate	HAZWOPER 40 Hour; 8-Hour Refresher, OSHA 8-Hour Supervisor, QC Training per DDESB TP18	
TBD	HGL – UXOSO	Naval EOD School Graduate	HAZWOPER 40 Hour; 8-Hour Refresher, OSHA 8-Hour Supervisor, OSHA 30-Hour Construction Safety and Health Training, QC Training per DDESB TP18	

CMQ/CE = Certified Manager of Quality/Organizational Excellence
CPR = cardiopulmonary resuscitation
DDESB = Department of Defense Explosive Safety Board
EOD = Explosive Ordnance Disposal
ESTCP = Environmental Security Technology Certification Program
HAZWOPER = Hazardous Waste Operations and Emergency Response
LEED-AP = Leadership in Energy and Environmental Design-Accredited Professional
OSHA = Occupational Safety and Health Administration
P.E. = Professional Engineer
P.G = Professional Geologist
PMP = Project Management Professional
TP = Technical Paper

WORKSHEET #6
COMMUNICATION PATHWAYS

Communication Driver	Initiator (role) (1)(2)	Recipient(s) (role) (1)	Procedure
General communication between USACE and other project delivery team (PDT) members	CEHNC COR or designee	Appropriate PDT member(s)	Communicates directly as needed (verbally and/or in writing).
Regulatory interface	CEHNC COR	Stakeholders	As required, all materials and information about the project will be forwarded by the CEHNC COR, or by the HGL PM with permission from the COR.
Stakeholder agency contacts	Stakeholders	CEHNC COR	Communicate directly as needed (verbally and/or in writing).
Project management, Task Order administration and logistics	HGL PM	CEHNC COR and appropriate PDT member(s)	Communicate directly as needed (verbally and/or in writing). The PM will communicate project related issues, including changes in schedule, changes in scope of fieldwork or delays, and recommendations to stop work, to the CEHNC COR by phone, email, or fax by Close of Business, next business day. The PM will also provide project information to the CEHNC COR through monthly progress reports, email updates, teleconference calls, and meetings. They will document deviations from QAPP and corrective action (CA) in memoranda to the CEHNC COR.
Daily reports	HGL SUXOS	HGL PM and lead technical and site personnel	Documents progress in daily report and submits to HGL PM for onward distribution to PDT. Daily reports will be submitted to PDT by 9 a.m. of the following workday. Field logbooks will be provided upon request. Field progress reports will vary based on the objectives of each definable feature of work (DFW). Examples of these reports are geophysical surveying, intrusive investigation, and daily production reports.

WORKSHEET #6 (CONTINUED)
COMMUNICATION PATHWAYS

Communication Driver	Initiator (role) (1)(2)	Recipient(s) (role) (1)	Procedure
Stop work due to safety issues	HGL Site Safety and Health Officer (SSHO) (or USACE Ordnance and Explosives Safety Specialist [OESS])	HGL SUXOS, SSHO, USACE OESS, and other field personnel	If unsafe work conditions are noted, the SSHO will stop work immediately. Work will not be allowed to resume until the unsafe condition is corrected. The SSHO will notify the Corporate Health and Safety (H&S) Officer immediately when a stop work situation is encountered. In some cases, such as inclement weather (for example, lightning or high winds), no CA is required, and work may resume when the SSHO and Corporate H&S Officer determine that conditions allow.
	HGL SUXOS or SSHO	HGL PM	Verbally notify HGL PM as soon as possible after work stoppage.
	HGL PM	CEHNC COR	Notify CEHNC verbally or via e-mail as soon as possible after work stoppage.
QAPP changes before fieldwork	HGL PM	CEHNC COR	If errors or changed conditions require the modification of the QAPP before fieldwork begins, the HGL PM will prepare revised text. All changes to the QAPP will require final approval from USACE and regulatory agencies.
Minor QAPP changes during project execution	HGL SUXOS, UXOQCS, Project Geophysicist, QC Geophysicist	HGL PM, HGL QC Manager, HGL Project Geophysicist	Minor QAPP changes will be noted on the Daily QC reports and forwarded to the Project Geophysicist, HGL PM, and the Project QC Manager, at the end of each day.
Major QAPP changes during project execution	HGL PM	CEHNC COR	Within 24 hours, HGL PM will submit a field change request form to the HGL QA Manager and USACE PM for approval. Following approval, CEHNC COR informs stakeholders via email.
Geophysical QC variances	QC Geophysicist	Project Geophysicist, HGL Corporate QC Manager, and HGL PM	QC Geophysicist notifies HGL Project Geophysicist and PM immediately.
	HGL PM	CEHNC COR, and USACE Project Geophysicist	HGL PM notifies USACE within 24 hours. CEHNC COR notifies regulator as necessary.
Geophysical QA Concerns	Design Center Lead, CEHNC Geophysicist	HGL PM, and technical personnel	HGL responds to geophysical QA concerns within 24 hours with a CA plan.

WORKSHEET #6 (CONTINUED)
COMMUNICATION PATHWAYS

Communication Driver	Initiator (role) (1)(2)	Recipient(s) (role) (1)	Procedure
Field team finds munitions and explosives of concern (MEC) item(s)	HGL SUXOS	HGL PM, COR, USACE OESS	Verbally notifies HGL PM and USACE OESS immediately
	HGL PM	CEHNC COR	Verbally notifies CEHNC COR.
	CEHNC COR	Stakeholders and other PDT members	Notify other PDT members as necessary.
Field team ready to conduct MEC disposal operations	HGL SUXOS	HGL PM	Notifies HGL PM and other organizations as necessary.
	HGL PM	USACE PM, and PDT	HGL PM notifies CEHNC COR verbally and other USACE PDT members via e-mail.
Field corrective actions	HGL SUXOS	HGL PM	CA resulting from either failure to follow QAPP requirements or due to changes in site conditions will be documented by the SUXOS; the SUXOS will communicate the need for CA to the PM on the same business day. SUXOS may initiate interim CA in the field subject to final approval by the PM and Program QA Manager.

(1) Names and contact information for personnel provided on Worksheets #4, 7, & 8.
(2) The initiator may designate another qualified individual to communicate with the recipient(s); however, the initiator shown is responsible for the communication being made.

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WORKSHEET #9
PROJECT SCOPING SESSION PARTICIPANTS SHEET

Planning Session: Kickoff Meeting
Date: 24 April 2019
Time: 1100 to 1200 Central Standard Time (CST)
Location: Teleconference
Purpose: Discuss the overall project goals, implementation of tasks, due dates for tasks and deliverables, fieldwork schedule, meeting schedule, and other documentation.

Attendees:

Name	Org	Role	Number	Email
Amy Doss	CEHNC	COR PM	256-895-1979	Amy.L.Doss@usace.army.mil
Heather McDonald	CEHNC	Technical Manager	256-895-1892	Heather.B.Mcdonald@usace.army.mil
Daryl Donatelli	CEHNC	Geophysicist	206-409-3102	daryl.j.donatelli@usace.army.mil
Audrey Nore	CEHNC	Engineer	256-895-1777	audrey.l.nore@usace.army.mil
Derek Anderson	HGL	Senior PM	706-372-5138	danderson@hgl.com
Scott Schroepfer	HGL	Deputy PM	707-330-6411	sschroepfer@hgl.com
Tim Deignan	HGL	Senior QC Geophysicist	720-625-0039	tdeignan@hgl.com
Josh DeFrates	HGL	Project Geophysicist	720-491-8149	jdefrates@hgl.com
Charles Nycum	HGL	QC Geophysicist	831-359-8664	cnycum@hgl.com
Leighton Baber	HGL	Field Geophysicist	303-524-3473	lbaber@hgl.com
Nancy McMillan	HGL	Project Admin	256-970-2106	nmcmillan@hgl.com

Mr. Derek Anderson opened the meeting with reviewing the agenda and introducing the attendees and their roles. The following discussions occurred during the presentation:

Slides 1 -5: Introduction, Roles and PDT
Mr. Anderson reviewed the project participants and the PDT.

Mr. Anderson asked if a chemist is required for project. Ms. Amy Doss stated that the requirement for a chemist is to be determined. **Note: Munitions Constituent (MC) sampling was determined not to be required for the project after the kickoff call.**

Mr. Anderson discussed establishing a weekly project status call and asked if the USACE Charleston District (CESAC) PM, Mr. Jim Whiteman, should be included on the calls. Ms. Doss stated that the CESAC should be invited to attend the weekly calls. Mr. Anderson stated that the calls will be held weekly on Thursdays at 10 am CST based on team discussion.

Slides 6 and 7: Site History and Site Map

Mr. Anderson stated that the site map shown on Slide 7 was created by HGL during the proposal phase and presents the Phase and Buffer Areas at that time.

Slide 8: New Phases 2 & 3 Areas

Mr. Anderson stated that these figures were recently provided to HGL and show the revised post award Phase 2 and 3 Areas. Ms. Audrey Nore asked if the extent of the removal area is shown on this figure.

The team discussed the benefits of including all Phase and Buffer areas under the upcoming Explosives Safety Submission (ESS). The primary benefit would be that an ESS amendment would not be needed if optional areas are added to the project.

Dr. Heather McDonald stated that this project is the new Phases 2 and 3 Areas, which total 31 acres. She stated there is a slight adjustment to the RA boundaries from the proposal and that the green, orange, and pink areas are the extent of the removal area (Slide 9). Mr. Anderson recommended that Buffer Phase Areas 3, 4, and 5 should be added at a minimum to the ESS extents.

Ms. Doss questioned what the disadvantages are of incorporating the larger area in the ESS. Mr. Anderson stated that there are no disadvantages from the HGL team's perspective. Mr. Anderson stated that if the additional areas are not included in the ESS but added to the project, an amendment would be required. Mr. Anderson stated that it is common to include the entire area of a project site to avoid a future amendment. Mr. Anderson stated that for this project, the team would have to expand Phase 2 and 3 Areas from the proposal to the south (Slide 7).

Ms. Nore stated that she agrees with including the entire site and will coordinate with Mr. Walt Zange to coordinate a meeting with the Environmental and Munitions Center of Expertise (EM-CX) to discuss this issue.

Mr. Anderson stated that the ESS After-Action Report will close out areas where the RA is completed. Ms. Doss stated that Performance Work Statement (PWS) Paragraph 3.5.3.2 includes an After-Action Report. Mr. Anderson summarized that Ms. Nore will check with Mr. Zange on any disadvantages of including the larger area in the ESS and that Ms. Doss will check with Mr. Whiteman from CESAC on this issue.

Slide 9: Construction Support Areas

Mr. Anderson stated that Construction Support (CS) might be needed if timber harvesting is conducted prior to the RA. (This is an optional task).

Slide 13: Project Objectives & Task Performance Acceptance

Mr. Anderson questioned if CS is included for construction activities after the RA. Dr. McDonald confirmed that CS is planned for Phases 2 and 3 construction of the cemetery.

Slide 17: Schedule

Mr. Anderson questioned if the Systematic Planning Process (SPP) 1 meeting should be held with the CEHNC team. Ms. Doss confirmed that SPP 1 should be held with the CEHNC team and Mr. Whiteman should be included.

Mr. Anderson questioned if a webinar should be conducted for the SPP 1 meeting or if the meeting should be conducted in Huntsville. Ms. Doss stated that she thinks a webinar is fine.

Mr. Anderson questioned if the SPP 2 meeting should occur with the regulators. Ms. Doss responded that Mr. Whiteman wants to be involved and that the team can send the documents to him to review simultaneously with the regulator reviews.

Mr. Anderson stated that the team can tentatively plan for SPP 1 to be conducted via webinar on Friday, May 10th, 2019 and that the date can be adjusted if needed. Mr. Anderson stated that once SPP 1 is conducted, the remaining project schedule can be defined.

Questions Comments

Mr. Anderson summarized that construction is expected to start in March of 2020 and Ms. Doss agreed.

Mr. Anderson stated that the clearance will need to be completed before construction begins. Ms. Doss responded that HGL should prepare the project schedule based on the award, not taking into account potential preliminary CS.

Mr. Anderson questioned if tree harvesting occurs on the front end, does CEHNC have specifications for debris (cutting to certain height), and rutting (smoothing of terrain) in place for consideration to support HGL's digital geophysical mapping (DGM) planning. Dr. McDonald stated that she will follow up with Mr. John Maitland, Fort Jackson Forestry Branch Chief, to determine the procedures. Mr. Anderson stated that the proposed methodology of vegetation clearance (robotic mulching) might be a transferable level of effort to smoothing and mulching in place for remaining woody debris.

Mr. Anderson questioned if the EM-CX will be involved in the Quality Assurance Project Plan Review. Ms. Doss stated that she believes the EM-CX will not be involved but will confirm.

Ms. Doss asked Ms. Nore if she needs any information from HGL for the ESS. Ms. Nore stated that she needs the acreage of area in geographic information system (GIS), magazine location, and what will be stored in the magazine and if security will be required. Dr. McDonald responded that CEHNC GIS staff can provide the area boundaries and acreage.

Mr. Scott Schroepfer stated that the magazine would be used for donor explosives and not for storage of MEC, and that typically a fence is used but not a security guard.

Mr. Anderson stated that the magazine location would have to be coordinated with the installation and that it would be in or near the munitions response site (MRS) boundary. Mr. Anderson stated that HGL will assess and recommend a location to Ms. Doss for approval.

The call concluded at approximately 1200 CST.

Planning Session: Systematic Planning Process Meeting 1
Date: 10 May 2019
Time: 0900 to 1530 CST
Location: HGL Conference Room, Huntsville, Alabama
Purpose: Review and revision of preliminary draft QAPP Worksheets

Attendees:

Name	Org	Role	Number	Email	Presence
Amy Doss	CEHNC	COR	256-895-1979	Amy.L.Doss@usace.army.mill	In Person
Heather McDonald	CEHNC	TM	256-895-1892	Heather.B.Mcdonald@usace.army.mil	In Person
Daryl Donatelli	CEHNC	Geophysicist	206-409-3102	daryl.j.donatelli@usace.army.mil	In Person
Jim Whiteman	CESAC	SAC PM	843-329-8161	James.G.Whiteman@usace.army.mil	Telecon
Gene Linxwiler	VA/NCA	FJNC Director	866-577-5248	gene.linxwiler@va.gov	Telecon
Derek Anderson	HGL	Senior PM	706-372-5138	danderson@hgl.com	In Person
Scott Schroepfer	HGL	Deputy PM	707-330-6411	sschroepfer@hgl.com	In Person
Josh DeFrates	HGL	Geophysicist	720-491-8149	jdefrates@hgl.com	Telecon

The FJNC RA SPP meeting #1 was held on 10 May 2019 from 0900 to 1530 CST. Mr. Derek Anderson (HGL) opened the meeting, asking the participants to introduce themselves. All participants received a copy of the QAPP Worksheet (WS) and figures. Mr. Anderson then began to review and revise QAPP WSs with team participation. The following discussions occurred during the editing session:

- SPP meeting #2 was tentatively set for the week of 9 July 2019. A site walk will be held in the morning and meeting in the afternoon. Mr. Jim Whiteman would likely drive to Columbia from Charleston and arrive 0800 or 0900 for the site visit. The site visit will require coordinating with the NCA's Robert Bryson, and the availability of Fort Jackson and SCDHEC confirmed. HGL will coordinate a meeting location, potentially at a local library or a University of South Carolina (USC) library.
- Ft Jackson Department of Public Works project participants will include Mr. Zachary Tice, the Installation Restoration Program Manager/Environmental Engineer (primary reviewer), and Ms. Barbra Williams, Environmental Management Branch Chief.
- Mr. Juan Kays was identified as a QAPP Approver in the role of Lead Stakeholder/PM as NCA Design and Construction PM.
- The Draft QAPP can be reviewed by CEHNC, CESAC, the EM-CX, and NCA concurrently. The draft final QAPP can be reviewed by Ft Jackson and SCDHEC.

- SPP meeting #3 can occur after regulator review of the QAPP and address response to comments (RTCs) during the meeting with the RTC distributed a week before the meeting. The meeting could be in person or webinar based depending on the comments. A tentative date of 27 August 2019 was discussed.
- Schedule: the team agreed that the draft QAPP should be due 28 days after the Project Management Plan, not 28 days after Notice to Proceed as indicated in the PWS. The schedule will also be revised to include tentative dates above for the SPP meeting #2 and #3.
- Schedule: the team wants timbering to occur prior to DGM, given schedule concerns. Timbering could occur as early as October and may take four to six weeks. Construction Support would need to be funded on the contract for HGL to support. Mr. Whiteman will coordinate Construction Support funding with Army Environmental Command.
- The Design-Build contract should be awarded by the end of the Fiscal Year.

After the above discussion ceased and there were no other comments or questions, the meeting was dismissed. Team revisions were made to the QAPP through WS #29. Any further needed edits will be identified during review.

Planning Session: Site Visit and Systematic Planning Process Meeting 2 Site Visit
Date: 9 July 2019
Time: 8:00am-11:00am EST
Location: Fort Jackson National Cemetery, Columbia, SC
Purpose: Review field work schedule and discuss logistics.

Attendees:

Name	Org	Role	Number	Email	Presence
Amy Doss	CEHNC	COR	256-895-1979	Amy.L.Doss@usace.army.mil	In Person
Heather McDonald	CEHNC	TM	256-895-1979	Heather.B.Mcdonald@usace.army.mil	In Person
Daryl Donatelli	CEHNC	Geophysicist	206-409-3102	daryl.j.donatelli@usace.army.mil	In Person
Brian McComas	CEHNC	OE Safety	256-689-0462	brian.d.mccomas@usace.army.mil	In Person
Jim Whiteman	CESAC	SAC PM	843-329-8161	James.G.Whiteman@usace.army.mil	In Person
Gene Linxwiler	VA/NCA	FJNC Director	866-577-5248	gene.linxwiler@va.gov	In Person
Robert Bryson	VA/NCA	FJNC	866-577-5248	robert.bryson2@va.gov	In Person
John Maitland	Ft Jackson	Ft Jackson Forestry Chief	(803)-751-4622	john.s.maitland.civ@mail.mil	In Person
Sara Clayborne	Ft Jackson	Ft Jackson Forestry	803-751-6852	sara.a.clayborne.civ@mail.mil	In Person
Derek Anderson	HGL	Senior PM	706-372-5138	danderson@hgl.com	In Person
Scott Schroepfer	HGL	Deputy PM	707-330-6411	sschroepfer@hgl.com	In Person

The Fort Jackson National Cemetery Removal Action Site Visit was held on 9 July 2019 from 8:00am to 11:00am Eastern. After introductions, the team reviewed planned future construction phases and discussed the field work schedule, phases, and logistics. The following items were discussed in detail.

Tree harvest thinning and residual material:

- Tree harvest thinning will leave 50- to 60-square feet of tree base per acre. Tree harvest clear cut and harvest thinning operation will leave non-merchantable material (undergrowth) in place, and piles of limbs and treetops at deck sites.
- The U.S. Army Corps of Engineers Charleston District (CESAC) intends to include a smoothing phase (Phase I) in the design-build contract to clean up deck sites and undergrowth within clear cut and thinning harvest areas. Design-build proposals will be due early September. CESAC will solicit the U.S. Army Corps of Engineers Huntsville Center (CEHNC) and HGL to review scope language for Phase 1 to include:
    - No subsurface disturbance
    - Disposal of deck piles (stockpiled tops and limbs)
    - Surface smoothing: mulch non-deck site material in place to ground surface
    - The timber harvesting contractor will be scoped with cutting stumps as close to the ground as feasible. After harvesting, the design build contractor may be tasked with post-harvest cleanup activities, one of which would be mulching any stumps that are taller than 12-inches, to 12-inches or less in height.

Surface clearance with anomaly avoidance vs. 1-ft subsurface clearance in advance of timbering east of Bull Run Firebreak Road: During the meeting, surface clearance with anomaly avoidance was discussed as being problematic if a significant of number of anomalies exist (a flag would be placed at each location to be avoided). However, after the meeting, CEHNC determined that a surface clearance without flagging subsurface anomalies would be sufficient.

Site access: Security clearance may be needed through Fort Jackson. CEHNC will contact Fort Jackson about access to NCA areas near Fort Jackson property. (Note: only NCA property will be accessed.)

Operating hours: A 6am vs. 8am start time was discussed. FJNC opens at 8am, but UXO teams may prefer to start as early as 6am. Potentially issuing the SUXOS a key for early hour access through the maintenance gate was discussed. Mr. Linxwiler is confident we can find a solution.

Fence along Bull Run Firebreak Road: HGL will remove and stockpile portions of the fence ahead of timbering. HGL will retain chain-linking and rails and dispose of fence posts and concrete.

Site Visit Tour: During the tour, the team visited potential donor explosive storage magazine locations. HGL sent refined coordinates to CEHNC to update the ESS. Dr. McDonald will coordinate revisions to the ESS with updated locations.

The site walk concluded at 11:00am eastern.

SPP Meeting #2
Date: 9 July 2019
Time: 12:00pm-2:00pm Eastern
Location: SCDEHC Conference Room, Columbia, SC
Purpose: Review field work schedule and discuss logistics.

Attendees:

Name	Org	Role	Number	Email	Presence
Katherine Butler	SCDHEC-RCRA	PM	803-898-0294	Butlerkh@dhec.sc.gov	In Person
Lisa Appel	SC DHEC		803-898-0366	appellr@dhec.sc.gov	In Person
Kent Krieg	SCDHEC	FUDS PgM	803-898-0255	kriegkm@dhec.sc.gov	In Person
Stacy French	SC DHEC		803-898-0238	frenchsl@dhec.sc.gov	In Person
Brent Rabon	AEC		210-466-1896	carl.b.rabon.civ@mail.mil	telecon
Amy Doss	CEHNC	COR	256-895-1979	Amy.L.Doss@usace.army.mil	In Person
Heather McDonald	CEHNC	TM	256-895-1979	Heather.B.Mcdonald@usace.army.mil	In Person
Daryl Donatelli	CEHNC	Geophysicist	206-409-3102	daryl.j.donatelli@usace.army.mil	In Person
Brian McComas	CEHNC	OE Safety	256-689-0462	brian.d.mccomas@usace.army.mil	In Person
Jim Whiteman	CESAC	SAC PM	843-329-8161	James.G.Whiteman@usace.army.mil	In Person
Gene Linxwiler	VA/NCA	FJNC Director	866-577-5248	gene.linxwiler@va.gov	In Person
Robert Bryson	VA/NCA	FJNC	866-577-5248	robert.bryson2@va.gov	In Person
Derek Anderson	HGL	Senior PM	706-372-5138	danderson@hgl.com	In Person
Scott Schroepfer	HGL	Deputy PM	707-330-6411	sschroepfer@hgl.com	In Person
Tim Deignan	HGL	Sr Geo	720-625-0039	tdeignan@hgl.com	telecon
Josh DeFrates	HGL	Project Geo	720-381-5593	jdefrates@hgl.com	telecon
Leighton Baber	HGL	Geo	303-524-3473	lbaber@hgl.com	telecon

The FJNC RA SPP meeting #2 was held on 9 July 2019 from 12:00pm to 2:00pm Eastern. Mr. Derek Anderson (HGL) opened the meeting, asking the participants to introduce themselves. Mr. Anderson turned the meeting over to Mr. Scott Schroepfer to present the project technical approach slide presentation. The following discussions occurred during and after the presentation:

- Will timbering occur before or after the removal action?
  - Timbering will occur before the removal action is completed. A one-foot clearance was completed over the portion of the 30-acre area west of Bull Run Firebreak Road. A surface clearance or one-foot subsurface clearance will occur before harvesting east of Bull Run Firebreak Road. After timber harvesting, DGM will be conducted followed by removal of detected anomalies.
- What is the planned schedule?
  - The removal action will be completed by March 2020, at which time construction will commence. Construction will be completed by December 2020.
- Will the fence be moved?
  - Yes, the fence will be moved to the outer extents of the cleared area. The fence will be removed ahead of timber harvesting in October or November of 2019 and replaced prior to construction completion in December 2020.
- Will coordinates be generated for all the anomaly locations?
  - Yes, all DGM anomalies will be assigned unique IDs with corresponding location coordinates and dig results for each location recorded and stored in an access database that will be pulled into the project GIS.
- Consolidated shots may require an emergency permit. SCDHEC would like to see the ESS to evaluate whether emergency permits are needed. Will SCDHEC have an opportunity to review the ESS and will HGL conduct consolidated shots?
  - Yes, CEHNC can provide the ESS. The ESS is under development, but the in-progress ESS can be provided after it is approved by the Environmental and Munitions Center of Expertise. MEC found may be consolidated within a clearance footprint, if it is acceptable to move. An explosives magazine will be on site with same day, or near-same day demolition of encountered MEC anticipated.
- Will MEC be stored in the magazine?
  - No, only donor explosives will be stored in the magazine.
- Is there a community involvement component were Public Notices for demolition event are addressed?
  - CEHNC is drafting a Community Involvement Plan. Public notices for demolition operations are not anticipated. The closest resident is approximately 2,000 feet to the north, on the other side of Interstate 20. There will be significant coordination with the NCA. Demolition events would occur at the end of the day, two hours after last burial.
- The QAPP was provided to SCDHEC mid-June, but SCDHEC needs a transmittal letter addressed the SCDHEC to generate a response letter. CEHNC will send a cover letter to South Carolina SCDHEC from USACE so SCDHEC can respond.

After the above discussion concluded and there were no other comments or questions, the meeting was dismissed.

Planning Session: Systematic Planning Process Meeting 3
Date: 19 September 2019
Time: 10:00am-10:45am EST
Location: Webinar
Purpose: Review revisions to the final QAPP.

Planned Participants:

Name	Org	Role	Number	Email
Lisa Appel	SCDHEC		803-898-0366	appellr@dhec.sc.gov
Stacy French	SCDHEC		803-898-0238	frenchsl@dhec.sc.gov
Brent Rabon	Army Environmental Command (AEC)		210-466-1896	carl.b.rabon.civ@mail.mil
Amy Doss	CEHNC	COR	256-895-1979	Amy.L.Doss@usace.army.mil
Heather McDonald	CEHNC	Technical Manager	256-895-1979	Heather.B.Mcdonald@usace.army.mil
Daryl Donatelli	CEHNC	Geophysicist	206-409-3102	daryl.j.donatelli@usace.army.mil
Jim Whiteman	CESAC	CESAC PM	843-329-8161	James.G.Whiteman@usace.army.mil
Gene Linxwiler	VA/NCA	FJNC Director	866-577-5248	gene.linxwiler@va.gov
John Maitland	Ft Jackson	Chief, Forestry	803-751-4622	john.s.maitland.civ@mail.mil
Barbara Williams	Ft Jackson	Chief, Environmental Management Branch	803-751-6858	barbara.s.williams38.civ@mail.mil
Derek Anderson	HGL	Senior PM	706-372-5138	danderson@hgl.com
Josh DeFrates	HGL	Project Geophysicist	720-381-5593	jdefrates@hgl.com
BJ Shivar	HGL	Technical Support	704-248-1801	bshivar@hgl.com
Nancy McMillan	HGL	Project Coordinator	256-970-2106	nmcmillan@hgl.com

The FJNC RA SPP meeting #3 was held on 19 September 2019 from 10:00am-10:45am EST. Mr. Derek Anderson (HGL) opened the meeting and conducted roll call of participants. Mr. Anderson presented the meeting slides, overviewing the project and meeting objectives, scope and technical approach, recent QAPP revisions, and provided a detailed review of the project schedule. The following discussions occurred during and after the presentation.

The Final QAPP was provided on 9 August 2019, which was subsequently revised. The primary goal of the SPP meeting is to review QAPP revisions to ensure team concurrence with revisions. Revisions were limited to QC seeding criteria and adding that the Government will conduct QA seeding. The team concurred with QAPP revisions.

Mr. Anderson stated that if there are no further revisions, HGL will proceed with gathering signatures for the revised QAPP and will distribute it to the team. Ms. Lisa Appel requested that only the changed pages be sent to her and not the entire document. Mr. Anderson confirmed

that only the revised pages would be submitted as slip pages to SCDHEC. The final ESS was approved earlier this month and will also be provided.

During discussion of the field schedule, Mr. Jim Whiteman stated that a surveyor is scheduled to start boundary flagging the week of 23 September 2019 to delineate timber harvesting extents with a completion date of 4 October 2019. Once completed, Mr. John Maitland will set up the acquisition for timber harvesting. The surveyor will coordinate the survey with Mr. Maitland and HGL.

Ms. Amy Doss asked Mr. Whiteman about the status of the Public Notice. Mr. Whiteman said that the Public Notice has been drafted and will be distributed for review. It is one-time notice to be advertised in the state paper to notify the public of the work to be performed. The notice will indicate that construction will follow a munitions removal action with Mr. Whiteman or the Charleston District Public Affairs Office as the point of contact. A public meeting is not planned. Mr. Gene Linxwiler and Ms. Barbara Williams pointed out that an unrelated public meeting is scheduled for 12 November 2019 regarding a separate issue concerning drinking water. While the issues are different and unrelated, lines of communication should remain open for situational awareness so questions for either issue can be directed to the correct contact. It is also important that the Public Notice not include "Ft Jackson" and only reference the VA National Cemetery to limit potential confusion.

It was agreed that Mr. Whiteman will distribute the Public Notice to the following personnel for review:

- Amy Doss
- Brent Rabon
- Stacy French
- Lisa Appel
- Gene Linxwiler
- Barbara Williams

Action Items:

- Mr. Anderson to finalize the QAPP and distribute to the team.
- Mr. Whiteman to provide Public Notice draft for review.

After the above discussion concluded and there were no other comments or questions, the meeting was dismissed at 10:45am.

WORKSHEET #10
CONCEPTUAL SITE MODEL

10.0.1 The conceptual site models (CSMs) for FJNC are summarized in the sections below.

10.1 OVERVIEW

10.1.1 The FJNC is a 583.77-acre area located in Richland County, South Carolina, approximately 12 miles northeast of Columbia, South Carolina (Figure 1, Appendix I). The property is owned by the NCA and currently used for the burial of members of the Armed Forces. FJNC was established following a Memorandum of Agreement between Fort Jackson and the Department of Veterans Affairs in April 2008 followed by the transfer of land by the U.S. Department of Defense to the Department of Veterans Affairs in April 2010.

10.1.2 The transferred land is on the north border of Fort Jackson and was previously used for field training exercises. Portions of FJNC overlap with former safety fans of 1950s era mortar ranges, and small arms range fans. Construction of Phase 1 of the 2009 version of the Master Plan began in September 2009 (Figure 3, Appendix I). During these activities, three landmines were unearthed. As a result, a RA of the FJNC was initiated within the areas shown on Figure 4, Appendix I.

10.2 SITE DESCRIPTION AND BACKGROUND

10.2.1 Construction at Phase 1 of the Historical Master Plan (circa 2009) began in May 2008. During the September 2009 construction activities in the Phase IB area, three landmines were unearthed. As a result, a RA of the FJNC was initiated within the boundaries of historical designated Phases 1A, 1B, 2, 3, and the spoils area to the North and East of Phase 1B (Figure 3, Appendix I). Work was conducted between December 2009 and February 2010. Subsurface clearance was performed in Phase 1 areas that were logged and scraped by the construction contractor and the remainder of the terrain (remaining forested area) was surface cleared. Approximately 40 acres were surveyed by DGM and intrusively investigated, the remaining 80 acres were cleared by analog methods. Another removal action was performed in September 2010 to provide construction support in additional areas totaling 4 acres.

10.2.2 Areas requiring removal for this contract include portions of historical expansion Phases 2 through 3 of the Master Plan. However, the 2009 Master Plan has been updated and the RA areas of concern for this Task Order will be referred to only as Phase 2 (Figure 4, Appendix I). The RA area in Phase 2 has been divided into two sections; one to remain wooded (15.57 acres) and one to be clear cut for cemetery expansion (14.52 acres), with a small portion of trees to remain within the clear-cut area (0.75 acres). A detailed timeline of activities that have taken place at FJNC can be found in Table 10.3.

10.3 PREVIOUS INVESTIGATIONS

Table 10.1
MEC Items Found During FJNC Previous Investigations

Item	Quantity
Landmine – M1, Practice	42
Fuze – Landmine, M1	24
Landmine – M7A1, Practice	2
Flares, Illuminating, personal	38
Grenade, Rifle	31
Grenade, Smoke	15
60 mm Illuminating, candle (exp)	2
Grenade, Hand, M26	2
Projectile, 75mm AP-T	1
M7B1 Box Mine	1

All items were discovered at depths from 1 inch to 38 inches

10.3.1 2010 Removal Action (December 2009 and February 2010)

10.3.1.1 Approximately 40 acres of the Phase 1, 120-acre site, were surveyed by DGM. A total of 1,041 anomalies were selected for investigation from the DGM data. A total of 157 MEC items were encountered in the 120 acres (36 MEC items in the DGM-covered area and 121 MEC items in the mag and dig area), including 44 landmines, 24 landmine fuzes, 38 flares, 48 grenades, 2 illuminating candles, and one 75mm projectile. The depth range for items found using DGM ranged from 1 inch to 38 inches.

10.3.2 2010 Removal Action (September 2010)

An additional removal action was performed in September 2010 to provide CS in additional areas totaling 4 acres. During this removal, one MEC item was encountered (M7B1 Box Mine) at a depth of 4 inches.

10.4 PHYSICAL SETTING

10.4.1 Topography

10.4.1.1 Gently to moderately rolling, moderately dissected high plains occupy most of FJNC. Flat to gently rolling low plains characterize the extreme western portion of the installation, including a major portion of the cantonment area and the alluvial plains occupied by southwesterly flowing Fills and Mill creeks. Local relief around the valley of Gills Creek and its tributaries is generally less than 60 feet. Slopes are predominately between zero and three percent on the alluvial plains, and slopes in the cantonment area are predominately between 3 percent (%) and 8%.

10.4.2 Vegetation

10.4.2.1 The site consists of undeveloped, forested land located within the eastern central portion of the Cantonment Area in the southwestern portion of FJNC. Vegetation at the Phase 2 MRS contains primary and secondary growth, which includes long leaf pine, scrub oak and understory. Vegetation removal will be used throughout the site in strategic locations to help facilitate DGM and surface removal efforts (Malcolm Pirnie, 2005).

10.4.3 Geology

10.4.3.1 FJNC is on the northwestern edge of the Atlantic Coastal Plain Province, a region of low to moderate relief and gently rolling plains, known as the Sand Hills. The Fall Line, a zone that marks the boundary between younger, softer sediments of the Province and ancient, crystalline rocks of the Piedmont Province, lies about four miles west of the cantonment area.

10.4.3.2 The principal geologic formation in the Sand Hills is the Tuscaloosa Formation, which consists of marine deposits of light-colored sands and kaolin clays. Most soils at FJNC are formed from sediment of the Tuscaloosa Formation. A layer of Quaternary sand terrace overlies the Tuscaloosa Formation, which generally consists of coarse to gravelly and arkosic sand. It lies unconformably on the peneplained surface of crystalline rocks.

10.4.4 Soils

10.4.4.1 Soils at FJNC range from nearly level to strongly sloping, characteristic of the Sand Hills. Principal soil map units occurring on FJNC are the Lakeland, Vaucluse-Ailey-Pelion, and Pelion-Johnston-Valcluse. The installation also has Blanton soil series and various soil-urban land complexes. These soils are typically well drained on high plains and side slopes and poorly drained in valleys. Surface soil layers in the Sand Hills are usually sandy with predominantly loamy subsoil.

10.4.4.2 Within the cantonment area, facilities are developed on moderately well drained, fine sands, silts, and clays, which are part of various soil-urban land complexes. Pelion urban land complex is the major soil series within the cantonment. Pelion soils occur on side slopes of ridges, with typical slopes of 2% to 15%. Pelion soils are loamy sands, very strongly acidic with moderately slow permeability.

10.4.5 Hydrology

10.4.5.1 Five separate watersheds receive surface water runoff from the Fort Jackson installation. These watersheds are drained by Wildcat, Gills, Colonels, Mill, and Cedar Creeks. Wildcat Creek drains most of the cantonment area of FJNC and flows west, where it enters the Gills Creek drainage area just below Lake Katherine. The Gills Creek drainage area is the second largest drainage area of the installation and is in the extreme northwest corner of Fort Jackson. This creek flows south along the installation's western boundary and enters the southeast-flowing Congaree River south of Columbia. Colonels Creek is the installation's largest drainage basin and drains the entire eastern one-third of Fort Jackson. Colonels Creek flows southeast and off-post, eventually discharging into the Wateree River, a tributary of the Congaree River. Mill

Creek drains the southwestern portion of the installation, flows off-post and eventually discharges into the Congaree River. Cedar Creek drains an area along the installation's southern boundary. Drainage from this area flows southward, off-post, and also eventually discharges in the Congaree River.

10.4.6 Hydrogeology

10.4.6.1 Groundwater is generally plentiful at Fort Jackson. The Tuscaloosa Formation, of Upper Cretaceous age, underlies Fort Jackson and is the primary source of groundwater in the area. Small quantities of groundwater may be available in alluvial deposits along major streams.

10.4.6.2 The Tuscaloosa Formation is at the surface over most of Fort Jackson. This formation lies unconformably on a peneplained surface of older, crystalline rocks. The formation consists of interbedded, generally unconsolidated, fine to coarse sand and clay, causing groundwater to occur under both unconfined and confined (i.e., artesian) conditions. Groundwater occurs under water table conditions in the upper part of the zone of saturation. At a depth of about 99-251 feet, permeable sand zones are frequently overlain by less permeable clay zones, and the groundwater exists under artesian conditions.

10.4.6.3 Groundwater in FJNC area is suitable for human consumption; water quality is considered excellent. Total dissolved solids are generally less than 50 milligrams per liter. Water standards are occasionally exceeded by slight concentrations of iron and manganese. FJNC is not located within a recharge area for the sole-source aquifer. A figure from a 1997 environmental sampling report shows and active water supply well located southwest of Heise Pond and south of Semmes Road. This well is located south of the Live Hand Grenade Court No. 2 and the Transition Range. This figure also shows three active water supply wells located just east of Weston Lake and a water supply well located in the vicinity of the FJNC.

10.4.7 Endangered Species, Sensitive Habitats, and Historical or Cultural Resources

10.4.7.1 According to the June 2000 Integrated Cultural Resources Management Plan, only one federally listed endangered animal species exists on Fort Jackson: the Red-cockaded Woodpecker (Piciodes borealis). The bird nests in aging (greater than 70-year-old) pines, lives in family groups or clans, and inhabits park-like territories or clusters of 1,500 radii. This population is routinely monitored, and the surrounding forest managed to encourage the survival of the groups. The FJNC project area is not within the known habitat of the Red-cockaded Woodpecker.

10.5 POTENTIAL SOURCES

10.5.1 Munitions-related activities that have occurred at FJNC are the primary source of MEC. Portions of FJNC overlap with former safety fans of 1950s era mortar ranges, and small arms range fans (Figure 6, Appendix I).

10.6 TRANSPORT MECHANISMS

10.6.1 Potential MEC are present in areas of the sites that have not previously been investigated. Transport mechanisms could include frost heave and erosion of soil that result in migration of MEC.

10.7 EXPOSURE ROUTES

10.7.1 The exposure mechanism for MEC is direct contact at the surface and through intrusive activity at the subsurface.

Table 10.2
Preliminary Conceptual Site Model

Site Details	Known or Suspected Contamination Source(s)	Potential/Suspected Location and Distribution[1]	Source or Exposure Medium	Current and Future Receptors	Potentially Complete Exposure Pathway
Name: Fort Jackson National Cemetery, Columbia, South Carolina **Acreage**: 30.57-acre clearance area within 583.77-acre area of interest **Suspected Past DoD Activities (*release mechanisms*)**: Mortar and small arms range fans **Current and Future Land Use**: The property is owned by the NCA and currently used for the burial of members of the Armed Forces.	MEC and munitions debris (MD) from the following munitions types have been recovered on site form the surface to a depth of 38 inches: General small arms Landmine – M1, Practice Fuze – Landmine, M1 Landmine – M7A1, Practice Flares, Illuminating, personal Grenade, Rifle Grenade, Smoke 60 mm Illuminating, candle (exp) Grenade, Hand, M26 Projectile, 75 mm AP-T M7B1 Box Mine	Phase 2 (30.84 ac): anomaly densities ranging from 25-728 anomalies per acre.	Surface or subsurface soil.	Current and Future: Site workers, cemetery visitors, trespassers, and ecological receptors.	Exposure of human receptors to surface and/or subsurface MEC.

Table 10.3
Fort Jackson National Cemetery Timeline

Year	Month	Event	Source
2006	September	Environmental Assessment for construction of a new Veterans Affairs (VA) Cemetery	Final Environmental Assessment, Construction and Operation of a New Veterans' National Cemetery, Columbia-Greenville, South Carolina Area, U.S. Department of Veterans Affairs, National Cemetery Administration, September 2006.
2007	June	Final Environmental Baseline Study for the transfer of the parcel to the VA NCA	Final Environmental Baseline Survey for the Transfer of 600-Acre Parcel at Fort Jackson to the United States Veterans Affairs National Cemetery Administration, Fort Jackson, South Carolina, URS Group, Inc., June 2007.
2007	July	VA awarded design contract to Davis Floyd	https://www.cem.va.gov/cems/nchp/ftjackson.asp
2008	February	Permit issued by Army to VA for 25 acres of land for the construction, operation, and maintenance of a national cemetery for the term of one year (March 1, 2008 to February 28, 2009)	Permit DACA21-4-08-8247, Department of the Veterans Affairs Permit to Other Federal Government Department to Use Property on Fort Jackson, Richland County, South Carolina, 19 February 2008.
2008	April	Memorandum of Agreement between Fort Jackson and the VA	Memorandum of Agreement Between United States Army, Fort Jackson, South Carolina, and United States Department of Veterans Affairs, Washington D.C., April 8, 2008.
2008	May	Disposal Report from Chief of Army Department of Public Works stating concurrence on transfer of FNC site and that a temporary construction permit has been issued by Savannah District for VA construction.	Disposal Report, National Veterans Cemetery at Fort Jackson, South Carolina, Department of the Army, 2 May 2008.
2008	May	VA began to develop 15-acre burial area	https://www.cem.va.gov/cems/nchp/ftjackson.asp
2008	December	Stage 1A completed	https://www.inspirock.com/united-states/columbia/fort-jackson-national-cemetery-a1308916251
2009	January	Grounds opened for burials	https://www.inspirock.com/united-states/columbia/fort-jackson-national-cemetery-a1308916251
2009	January	VA requests extension of permit to extend 5 years and to include an additional 100 acres in order to accommodate Phase 1B expansion.	Request for extension letter from Department of Veterans Affairs National Cemetery Administration to Directorate of Public Works Master Planning Division, 15 January 2009.
2009	March	Permit extended for 5 years beginning on Sept 1, 2009, encompassing approximately 120 acres.	Supplemental Agreement No. 2 to Permit DACA21-4-08-8247, Fort Jackson Richland County, South Carolina, 3 March 2009.
2009	October	Formal dedication, cemetery opens for burials.	https://www.cem.va.gov/cems/nchp/ftjackson.asp

Table 10.3 (Continued)
Fort Jackson National Cemetery Timeline

Year	Month	Event	Source
2009	July	VA announces contract to develop 50-acre Stage 1B, with construction starting immediately.	https://www.inspirock.com/united-states/columbia/fort-jackson-national-cemetery-a1308916251
2009	September	During earthwork in 1B construction area, the VA's construction contractor. Encounters mines and stops work. Cemetery and non-essential employees evacuated and EOD called in.	Gene Linxwiler, FJNC Director, 05/06/2019
2009	September	EOD demos land mines, determined to be UXO.	Gene Linxwiler, FJNC Director, 09/18/2009
2009	September	RONCO Consulting Corporation (RONCO) contacted by VA to perform RA as a result of unearthing 3 landmines during heavy equipment earth moving activities.	Site Specific Final Report (SSFR), MEC Removal Action, Fort Jackson National Cemetery, South Carolina, RONCO Consulting Corporation, March 2010.
2010	January	RA activities by RONCO	RONCO SSFR
2010	March	RONCO SSFR	RONCO SSFR
2010	April	Letter of Transfer of parcel from Fort Jackson to VA	Transfer by Department of the Army of 583.77 Acre Parcel at Fort Jackson Military Reservation, Fort Jackson, South Carolina, to Department of Veterans Affairs, 26 April and 27 April 2010.
2015	June	Cemetery construction project of 50 acre Stage 1B completed	https://www.cem.va.gov/cems/nchp/ftjackson.asp
2016	December	Historical Records Review and Confirmatory Sampling Report for AOC S documents that for this portion of FJNC, no MEC was identified during a visual survey and no explosives were detected in soil samples and all detections of metals were below screening levels.	Historical Records Review and Confirmatory Sampling Report, AOC S, Fort Jackson National Cemetery, Columbia, South Carolina, Pika-Pirnie JV, LLC, December 2016.

WORKSHEET #11
MEC DATA QUALITY OBJECTIVES

11.0 This worksheet describes the MEC DQOs developed for the project, including the environmental problem, the related decisions that need to be made, the type and quantity of data, and level of data quality needed to ensure that those decisions are based on sound scientific data. The following DQO elements are based on the U.S. Environmental Protection Agency (EPA) seven-step DQO process defined in EPA *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4*, EPA/240/B-06/001, February 2006, and the USACE *Technical Project Planning Process (TPP)*, EM 200-1-2, February 29, 2016.

1. State the problem.	Previous investigations (listed in WS #10) have indicated that MEC in the form of UXO may be present in surface and subsurface at the FJNC. The potential presence of MEC is a safety hazard. This project will be conducted in accordance with (IAW) the January 2019 PWS for FJNC.
2. Identify the goal of the study.	Identify the principal study goal: The objective of this project is to reduce the unacceptable risk due to the presence of the potential munitions identified in Table 10.1 within the Phase 2 area (Figure 4, Appendix I) to a depth of 5 feet to address exposure to construction workers via intrusive activities such that an acceptable scenario is achieved. To achieve this objective, all subsurface sources that exceed the DGM target section threshold, inclusive of materials related to munitions, will be identified and removed to enable the project area to be rendered usable for cemetery construction development. Identify alternative outcomes: Surface and subsurface anomalies that may be related to munitions will be removed from assigned areas at FJNC. For areas cleared by DGM methods, subsurface anomalies meeting the agreed upon threshold value presented in the Instrument Verification Strip (IVS) Technical Memorandum will be reacquired and removed. State how the data will be used in solving the problem: AGC is not warranted due to the presumed low density of anomalies at the site. DGM is a cost-effective alternative, and will be conducted to the maximum extent practicable and will be used to detect anomalies resulting from munitions related historical activities and other metallic debris. DGM data collected using electromagnetic induction sensors will be used to detect and document the locations of subsurface anomalies for further investigation and removal at Phase 2 areas.
3. Identify information inputs.	The primary data required to guide or support choices during the DQO process are: (1) Up-to-date CSM summarizing site conditions based on previous studies including: a. MR objectives (WS #9 and WS #11) b. Site history and uses (Sections 10.2 and 10.3 of WS #10) c. RA boundaries (Figure 4, Appendix I) d. Types and quantities of MEC known or suspected to be present (WS #10, Table 10.1) e. Topography, geology, vegetation (Section 10.4 of WS #10) f. Exposure routes (Section 10.4 WS #10) g. Endangered species, sensitive habitats, and historic or cultural resources that could be affected by traffic or other disturbances occurring during the RA (Section 10.4.7 of WS #10)

WORKSHEET #11 (CONTINUED)
MEC DATA QUALITY OBJECTIVES

3. Identify information inputs (continued)	(2) Geophysical instrument assisted surface clearance results, including: a. Geophysical instrument assisted surface clearance results database b. Photos (photo log) c. Disposal records d. Updated CSM (3) Detection survey results, including: a. Areas covered (Standard Operating Procedure [SOP] 551.01) b. System QC test results (SOP 551.01) c. IVS results (IVS Technical Memorandum) d. Surveyed validation seed (as applicable) and QC seed locations (QC and QA Production Area Seed Tracking Log and Reports) e. Data collection point responses and locations (SOP 551.01) f. Data analysis results (SOP 551.01), including i. Anomaly / Target locations ii. Weekly DGM Data Deliverable (4) Intrusive investigation results, including a. Excavation results (database) b. Photos (photo log) c. Disposal records d. Comparison of intrusive results to geophysical dig list e. Acceptance sampling f. Final data usability evaluation g. Update CSM
4. Define the boundaries of the study.	Target Population: The target population for this study includes the MEC suspected to exist within the boundaries of assigned Phase 2 areas within FJNC. Spatial and temporal boundaries and scale: This study is designed to detect all anomalies meeting a predefined signal threshold within the established spatial boundaries for Phase 2 areas. The detection threshold for each project area will be evaluated during the IVS and include assessment of previous historical data related to the type and depth of munitions identified at the sites. The detection threshold for the MRS will be specified in the IVS Technical Memorandum. The horizontal boundaries of the project are defined by the clearance areas shown on Figure 4 (Appendix I). The vertical boundary for the Phase 2 MRS is based on each munition and the munition-specific maximum depth of detection, which is based on the established detection threshold up to 5 feet below ground surface. Expected vertical boundaries for each munition are shown on Table 11.1. There are no established temporal boundaries for this project. The scale of the DGM survey grids may range in size but will typically be 100 feet by 100 feet (Figure 5, Appendix I) with 100% DGM coverage of accessible areas at 0.75-meter line spacing and coil height of approximately 40 centimeters (cm).
5. Develop the analytic approach.	The project approach involves using DGM to detect subsurface anomalies. QC and QA blind seeds will be used for DGM areas. If analog methods are performed in DGM data gaps the government will place QA seeds. Areas of the project footprint inaccessible to DGM will be considered data gaps. Data gaps will be assessed with analog methods. Analog methods will also be used for the surface clearance and in regions of high anomaly density defined by the DGM (saturated areas), where it may be impractical to select individual anomalies for investigation. In saturated areas geographic polygons will be used to define the limits of high anomaly density areas for analog clearance.

WORKSHEET #11 (CONTINUED)
MEC DATA QUALITY OBJECTIVES

	The project approach involves two primary components: DGM and analog surveys. The decision rules for these components are listed below. (1) Decision Rules for DGM Surveys: • If a detected anomaly exceeds the selection threshold in the IVS Technical Memorandum, then it will be placed on the dig list. (2) Decision Rules for Analog Surveys: • If the surface clearance investigation locates MEC, MD, or other metal debris, then the item(s) will be removed and disposed of as detailed on WS #17. • If high density areas are identified using DGM, a geographic polygon will be drawn around the area for clearance with an analog survey. • Analog surveys will be performed in DGM data gaps.
6. Specify performance or acceptance criteria.	Measurement performance criteria (MPC) are the criteria that collected data must meet to satisfy the DQOs. Project-specific MPC are presented in WS #12. Geophysical investigations shall achieve applicable MPC as confirmed/modified by the IVS Technical Memorandum.
7. Develop the plan for obtaining data.	Steps 1 through 6 of the DQO process were used to develop the overall project design. The design is broken down into a series of specific elements, termed DFW (definable feature of work). WS #17 includes detailed descriptions of each DFW.

Table 11.1
Target Munitions

MRS	Munition (including nomenclature if known)	MEC or MD	Maximum Expected Depth of Penetration (inches)	Encountered Depth (inches) 2010 RA	Depth of Detection (Least Favorable Orientation) [inches]*
FJNC	M7B1 Box Mine	MEC	Near Surface[3]	N/A[1]	N/A[2]
	Flares	MEC	Near Surface[3]	0-8	N/A[2]
	Rifle Grenades	MEC	Near Surface[3]	1-12	N/A[2]
	Landmines (M7A1, M1, M1A1)	MEC	Near Surface[3]	0-38	N/A[2]
	Hand Grenade (M26)	MEC	Near Surface[3]	N/A[1]	12
	60mm Illuminating Candle	MEC	Near Surface[3]	N/A[1]	N/A[2]
	75mm projectile	MEC	38	N/A[1]	32

[1]Depth information unavailable in 2010 SSFR
[2]No Naval Research Laboratory detection curve data available for this munition type
[3]Near surface represents a depth range from the surface to approximately 6 inches in depth
N/A = not applicable
*depth of detection based on Naval Research Laboratory detection curve for EM61 and selection threshold of 5 millivolt (Channel 2)

WORKSHEET #12
METHOD MEASUREMENT PERFORMANCE FOR MEC-RELATED TASKS

12.0 The field operations for this project involve multiple elements or DFWs. A detailed discussion of each DFW is provided in WS #17. The specific field procedures to be used for the activities described in this summary are included in the various SOPs provided in Appendix G. The table below summarizes the MPCs that have been established for each DFW. The quality of these procedures and the related results will be evaluated for compliance with the DQOs in accordance with the procedures described in WS #37.

Definable Feature of Work (*Data Type*)	**Data Quality Indicator(s)**	**Performance Criteria**	**Activity Used to Assess Measurement Performance**
UXO Avoidance (*detection instrument function)*	Sensitivity	Audible response to presence of subsurface metallic test item	Operator checks instrument to confirm response to subsurface industry standard objects (ISOs) in the test strip or IVS.
QC Seeding (DGM)	Representativeness	Blind QC seeds (e.g. schedule 40 small ISOs, schedule 40 medium ISOs) will be distributed such that each team can be expected to encounter a minimum of (1) QC and minimum (1) Validation seed (as applicable) per system per day	Review of QC seeding report
QA seeding (DGM areas and analog performed in DGM data gaps)	Representativeness	Blind QA seeds will be placed by the Government in accordance with EM-200-1-15 in areas where analog is performed in DGM data gaps.	Review of QA seeding report
Conduct DGM Detection Survey	Completeness	100% of the accessible site is surveyed	Verification of conformance to measurement quality objectives (MQOs) for in-line spacing and cross-line spacing (see WS #22)
Conduct DGM Detection survey	Sensitivity	The detection threshold will be presented in the IVS Technical Memorandum and is expected to be 5 times the site noise as determined at the IVS. If site noise levels are considerably different across the site then noise will be evaluated on a case by case basis in each region of the site	Confirm detection with initial and ongoing IVS surveys and QC seeds selected as targets. Analysis of background variability across the site documented in Dynamic DUA.

WORKSHEET #12 (CONTINUED)
METHOD MEASUREMENT PERFORMANCE FOR MEC-RELATED TASKS

Definable Feature of Work (*Data Type*)	Data Quality Indicator(s)	Performance Criteria	Activity Used to Assess Measurement Performance
Process DGM Detection Data	Accuracy/ Completeness	100% of QC seeds and validation seeds must be detected.	Check target list to confirm each QC/QA seed was detected
Detection survey (DGM)	Completeness/ Comparability	Data and target lists (GBD or XYZ files) and databases delivered	Check DGM data deliverable to confirm required files are included
Intrusive Investigation	Completeness	All MEC-like anomaly sources above the project threshold are removed from the subsurface at locations where DGM methods are used	When the EM61 is used for post-dig verification (acceptance sampling), the signal intensity is required to be lower than the target selection threshold in IVS Technical Memorandum, or a valid reason provided. The number of target locations selected for acceptance sampling will be determined using EM 200-1-15, Table 6-6: Acceptance Sampling Table. For any inaccessible areas where analog clearance is used (such as data gaps) personnel will operationally test analog geophysical instruments on a test strip to ensure that their settings are appropriate for their tasks. This will be achieved by documenting the QC analog instrument can detect the smallest item of interest at the test strip. For relatively small areas where analog clearance is used (e.g., DGM data gaps), no metal objects will remain that are equivalent to or greater than 1 inch in diameter to a depth of 11 times the item diameter (or width) up to the specified clearance depth of 5 feet. The UXOQCS (or designee) will perform an independent check of a portion of the data gaps using EM 200-1-15, Table 6-6: Acceptance Sampling Table. When saturated polygons are cleared with analog methods, post-analog DGM methodologies will be performed over the entire polygon area to ensure the residual signal intensity is below the EM61-MK2 target selection threshold.

WORKSHEET #12 (CONTINUED)
METHOD MEASUREMENT PERFORMANCE FOR MEC-RELATED TASKS

Definable Feature of Work (*Data Type*)	Data Quality Indicator(s)	Performance Criteria	Activity Used to Assess Measurement Performance
Intrusive Investigation	Completeness/ Comparability	Complete Intrusive Results and QC tests in database	Data verification Data validation
MEC/MPPEH Handling	Accuracy	Should MPPEH be encountered, only UXO-qualified personnel (UXO Technician II or higher) will identify the item and ascertain its condition. The SUXOS and UXOSO must agree on the nature and condition of a MEC item before any action is taken.	Joint SUXOS and UXOSO determination that a MEC item is acceptable to move. After determining an item is acceptable to move, the SUXOS and UXOSO will determine the most expeditious route for safe movement of the MEC item to the disposal point. UXOQCS verifies that material documented as safe (MDAS) is properly documented in a DoD Form 1348-1A.

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WORKSHEET #13
SECONDARY DATA CRITERIA AND LIMITATIONS TABLE

Secondary Data	Data Source	How Data Will Be Used	Limitations on Data Use
Physical profile (geology, soil, surface water, sediment, hydrogeology)	*Historical Records Review, March 2005*	Data will be used to update the CSM and to prepare for fieldwork.	Data are assumed to accurately reflect overall site conditions.
Past site uses	*Historical Records Review, March 2005*	Data will be used to identify the types of MEC potentially present.	Data are assumed to meet quality requirements for history of the site.
Soil, surface water, and sediment data; Screening Level Ecological Risk Assessment and Human Health Risk Assessment	*Historical Records Review, March 2005*	Data will be used to support the CSM.	Data collected are assumed acceptable and were used to determine that soil, surface water, and sediment were not impacted by past practices.
Geophysical mapping and intrusive anomaly investigation data	*Site Specific Final Report MEC Removal Action, March 2010*	Data will be used to support the delineation of the MRS investigation area and to determine UXO support and identification of the types of MEC potentially present.	Data are assumed to meet the quality requirements per USACE guidelines.

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WORKSHEETS #14 AND #16
PROJECT TASKS AND SCHEDULE

The below table outlines the activities to be conducted on the Phase 2 MRS to achieve the project DQOs in WS #11. The major phases involved in the project include site mobilization and preparation, collection and processing of geophysical data, selection of target anomalies, intrusive investigation of anomalies, and demobilization. A detailed presentation of each step is included in WS #17; the complete schedule of events is in Appendix J.

Table 14.1
Definable Features of Work and Associated Tasks

DFW	Activity	Responsible party	Deliverable(s)	Deliverable due date
1	Mobilization	HGL Project and Site Management	N/A	N/A
2	Site Preparation	HGL SUXOS HGL UXOQCS	Daily Production Report, Weekly Report	Per report
			Daily QC Report	Daily updates; final 7 days after completion
3	IVS Construction and Sensor Operation Verification	On-site Geophysicist	IVS Raw data	1 day after activities completed at IVS
			IVS Technical Memorandum and final processed data	7 days after completion
4	Blind Seeding	Project Geophysicist QC Geophysicist	QC Seed Plan, Firewall Plan	Upon completion, approximately 1 month prior to field mobilization
		QC Geophysicist	Production Area Seed Report	Weekly
			Daily UXOQCS Reports	Daily
5	Conduct Detection Survey	On-site Geophysicist Project Geophysicist	Raw data files, field notes	Weekly

Table 14.1 (Continued)
Definable Features of Work and Associated Tasks

DFW	Activity	Responsible party	Deliverable(s)	Deliverable due date
6	Process DGM Data and Target Selection	Project Geophysicist	Weekly Data Deliverable, Access Database	Weekly
			Processed data and target selection	Weekly/upon request
7	Anomaly Reacquisition	Project Geophysicist	Access database with reacquisition results	Weekly
8	Intrusive Investigation (Anomaly Resolution)	HGL SUXOS	Daily Production Report, Weekly Report	Per report; Daily updates; final 7 days after completion
		HGL UXOQCS	Daily QC Report	Daily; final 7 days after completion
		Project Geophysicist	Access database with reacquisition, acceptance sampling, feedback and dig results	Weekly
9	MEC/MPPEH Handling and Certification	HGL SUXOS	DD Form 1348-1A Explosives Usage Records Magazine Data Cards Demolition Summary Sheets Demolition Shot Records MDAS Disposal Documentation	All as an appendix to the SSFR
10	Construction Support	UXO Team Lead	Weekly Report	Each Monday of the following week
11	Demobilization	HGL PM and SUXOS	N/A	N/A

WORKSHEET #17
SAMPLING DESIGN AND RATIONALE FOR MEC-RELATED TASKS

17.0 This worksheet describes the project design and the tasks that will be required to successfully complete field operations during this project and achieve the DQOs described on WS #11. A geophysical instrument assisted surface sweep and DGM survey will be performed within 30.84 acres at Phase 2 and (Figure 4, Appendix I) using the survey methods indicated in Table 17.1. The following subsections specify the technical approach, broken down into a series of DFWs, for completion of the geophysical instrument assisted surface clearance, digital mapping activities, and subsurface investigation at FJNC.

Table 17.1
Survey Methods for FJNC Phase 2 Area

Location	Estimated Acreage	Survey Method
Phase 2 Area (wooded)	15.57	Line and Fiducial DGM
Phase 2 Area (cemetery)	14.52	Real-Time Kinematic (RTK) DGM
Phase 2 Area (cemetery area trees remaining)	0.75	Line and Fiducial DGM

17.1 THREE-PHASE INSPECTION PROCESS

17.1.1 Preparatory Phase

17.1.1.1 The preparatory phase will be completed before beginning each DFW. A meeting will be scheduled in advance of the work activity, if necessary, to ensure that there is sufficient time for any necessary CAs. The following will be completed during this phase:

- Review specifications, references, and plans;
- Check field equipment to ensure that it is appropriate for intended use and has been tested, submitted, and approved;
- Assign responsibilities and ensure that field staff have necessary knowledge, training, expertise, and information to perform jobs;
- Verify arrangements for support services;
- Inspect work area to verify that required preliminary work has been completed;
- Review appropriate activity hazard analyses (AHAs); and
- Ensure that applicable process and procedures have been approved by the contracts officer.

17.1.1.2 The QAPP and operating procedures will be reviewed by the UXOQCS during this phase to ensure that they describe the prequalifying requirements or conditions, equipment, materials, methodology, and QC provisions. Discrepancies between existing conditions and approved plans and procedures will be resolved or CAs will be taken for unsatisfactory and

nonconforming conditions identified during a preparatory phase inspection. This will be verified by the UXOQCS or designee before approval to begin work is granted.

17.1.1.3 The UXOSO will review the Accident Prevention Plan (APP) (Appendix A) and the appropriate AHAs to ensure that applicable safety requirements have been achieved. Preparation phase inspection results will be documented using the Preparatory Phase Checklist and will be summarized in the Daily Quality Control Report (DQCR). The personnel qualifications checklist will be used to ensure that personnel meet or exceed the training standards outlined by DoD, USACE, and OSHA, including applicable hazardous waste operator training. Forms and checklists associated with the completion of the preparatory phase activities are presented in Appendix F.

17.1.2 Initial Phase

17.1.2.1 This phase will be performed when the fieldwork has been initiated for a given DFW. The purpose of this phase will be to accomplish the following:

- Inspect the work in progress for compliance with QC requirements;
- Verify adequacy of QC controls to ensure full contract compliance;
- Establish an acceptable level of workmanship;
- Verify that documentation related to field activities is complete;
- Verify that required personal protective equipment and other safety procedures are in compliance with the QC specifications contained in the APP and AHA; and
- Resolve differences of interpretation that may affect the quality of work.

17.1.2.2 Additional preparatory and initial phases may be conducted on the same work being performed if (1) the quality of ongoing work is unacceptable, (2) there are changes in the on-site production supervision or work crew, (3) work is resumed after a substantial period of inactivity (2 weeks or more), or (4) other problems develop.

17.1.2.3 The UXOQCS will be responsible for ensuring that all discrepancies between site practices and approved plan specifications are identified, documented, and resolved. CAs for unsatisfactory conditions or practices will be verified by the UXOQCS or designee before granting approval to proceed. Initial phase results will be documented on the Initial Phase Checklist and summarized in the DQCR. A copy of HGL Form 15.11, Initial Phase Checklist, is included in Appendix F.

17.1.3 Follow-up Phase

17.1.3.1 This phase will be conducted for each DFW until it has been completed. The purpose of this phase is to ensure compliance with contract requirements and will include the following:

- Verify that the work has been completed in compliance with contract requirements and applicable standards;

- Ensure that the quality of workmanship was maintained and achieved;
- Validate all fieldwork to ensure that no data gaps exist and schedule additional field activities to address any existing data gaps;
- Verify that safety inspections were performed.

17.1.3.2 The UXOQCS is responsible for on-site monitoring of the practices and operations taking place, and for verifying continued compliance with the specifications and requirements of the contract, approved project plans, and procedures. The UXOQCS will oversee and observe activities as specified in the initial inspection and will verify that CAs for unsatisfactory or nonconforming conditions have been taken before granting approval to continue work. Final follow-up phase checks will be conducted, and all deficiencies corrected before starting additional features of work. Final follow-up checks will be documented and summarized in the DQCR.

17.2 DFW 1: MOBILIZATION

17.2.1 The PM will conduct a readiness review with technical staff to ensure that the team has the proper tools, equipment, and safety gear to complete field tasks IAW the UFP-QAPP. Following successful completion of the readiness review, tools, equipment, and safety gear will be sent to the site and personnel will travel to the site. Table 17.2 summarizes the anticipated staffing for the project field team.

Table 17.2
Project Field Team

HGL Team Composition	Subcontractors
SUXOS UXOSO/UXOQCS QC Geophysicist Field Geophysicist UXO Technician III UXO Technician II (3 Each) UXO Technician I (3 Each)	Surveyor MDAS Disposition Security

17.3 DFW 2: SITE PREPARATION

17.3.1 Site preparation will consist of surveying and staking the grid corners, **removing fences before the DGM survey to reduce interference with the DGM teams and their instruments**, and performing a geophysical instrument assisted surface clearance. Vegetation will be removed to improve visibility for detection of surface MPPEH and to reduce interference with the DGM teams and their instruments. Grid corners and site boundaries will be marked with wooden stakes and survey nails or other visible markers using an RTK Global Positional System (GPS) with cm-level accuracy and/or traditional total station surveying if a GPS signal cannot be obtained (Figure 5, Appendix I).

17.3.2 Vegetation removal will be conducted only to the extent required to support the objectives of each grid. The preferred distance from ground level is approximately 6 inches for vegetation clearance. MEC avoidance will be practiced during all vegetation clearance operations. Brush

clearance personnel will be escorted by UXO escort to assist with MEC avoidance. Large pieces of surface metal unrelated to MPPEH will be removed during vegetation removal or identified and located for later removal prior to geophysical data collection.

17.3.3 The geophysical instrument assisted surface clearance will be accomplished within the estimated 30.84-acre Phase 2 boundaries (Figure 4, Appendix I) and according to the procedures described in SOP 506.01 (Appendix G). The surface clearance team will remove all visible metallic items as necessary to reduce the interference with the DGM survey. All MD and/or MEC recovered during the surface sweeps will be dealt with IAW the procedures described in SOP 502.01, 504.01 (Appendix G), and the ESS. Completion of the surface clearance will also allow for the construction contractor to conduct timber harvesting to occur east of Bull Run Firebreak Road.

17.3.4 All surface clearance operations will be performed under the direct supervision of the UXO Technician III team leader. Before any surface removal operations are performed, the members of the MEC removal team will check their analog instrument function using the MPCs listed on WS #12. MEC teams will use basic sweep techniques by forming a sweep line and marking lanes with pin flags or lines to establish 5-foot lanes within each grid, and sweeping the area using analog instrumentation. The SUXOS will determine which technique will be used to mark the sweep boundaries based on site conditions. Individual sweep lanes will be established at a maximum of 5-foot intervals.

17.3.5 Team members will locate surface MPPEH and remove visible metallic items as necessary to reduce the interference with the geophysical survey. The Team Leader will record the locations and photograph any discovered and document information on the items found in the Project database or on the Team Leader Grid Sheet (Appendix F) if electronic records are not accessible. Coordinates will be recorded using a handheld GPS.

17.3.6 The Team Leader will record the following geophysical instrument assisted surface clearance information for each grid surveyed:

- General Grid Information
  - Grid identification
  - Team number
  - Date(s) of removal
  - Sketch of grid conditions
  - Comment
- MEC Information
  - Grid identification
  - Location identification
  - Date found
  - Item type
  - MEC type
  - Photo identification
  - Nomenclature

  - Description
  - Quantity
  - Depth
  - Final disposition
- MD, range-related debris (RRD), and Other Debris Information
  - Grid identification
  - Team number
  - Team leader
  - Date
  - MD/munitions types found
  - Seed items found
  - Total weight of MD in grid
  - Total weight of other debris in grid

17.3.7 Following completion of the grid, the team leader will log the progress on the Grid Status Sheet (Appendix F). Documentation for each grid designated to be surface cleared by the UXO Team Leader will be subjected to verification by the UXOQCS or designee using the MPCs described on WS #12.

17.3.8 *Documentation*: Daily QC Reports, Team Leader Grid Sheet (number and location for MEC only) (or electronic equivalent), Team Leader Grid Sheet (weight of MD, RRD, and other debris) (or electronic equivalent), Grid Drawing Sheet (or electronic equivalent), Project QC database.

17.4 DFW 3: IVS CONSTRUCTION AND SENSOR OPERATION VERIFICATION

17.4.1 A geophysical system verification process will be implemented at the MRS to demonstrate that the instruments and data collection strategies selected for the site function as intended for the duration of the field investigation. Within this process, an IVS will be used to verify the proper functioning of the geophysical systems used during the project. A single main IVS will be constructed for this project IAW SOP 551.01 (Appendix G). If areas at the site cannot be accessed by the person portable single sensor; analog methods will be used and validated at the IVS or an ITS. Three schedule 40 ISOs ranging from small to medium in size will be buried in the IVS along a single line. A “noise strip” will also be located adjacent to the IVS and will be used to determine the background noise level for DGM surveys. IVS items will be buried at approximately three to five times their inner diameters in horizontal, across-track orientations. Items in the IVS will be separated by at least 5 meters.

17.4.2 Documentation: IVS Technical Memorandum.

17.5 DFW 4: BLIND SEEDING

17.5.1 To achieve dynamic monitoring of the quality of the geophysical data collection and target selection process at FJNC, blind QC and QA seeds will be placed throughout the DGM survey areas in the subsurface to ensure each DGM team encounters a minimum of one QC/QA seed item per day. The UXOQCS (or designee) will place QC seed items in accordance with

SOP 500-03 Seed Production Areas (Appendix G). The Government is responsible for the QA seed program. Members of the seed team will have no further role in the collection, processing, or analysis of the geophysical data, or intrusive investigation. QC seed items will be schedule 40 small and medium ISOs. QC seeds will be buried throughout the depth range expected at the site. The QC Seed Plan and Firewall Plan will be delivered to the government prior to mobilization for review and acceptance

17.5.2 *Documentation*: QC Seed Plan; Blind Seed Firewall Plan; Production Area QC Seed tracking log and report; weekly QC seed results (spreadsheet or database table); weekly QC seed results (spreadsheet or database table)., DQCRs, UXOQCS Daily Report

17.6 DFW 5: CONDUCT DETECTION SURVEY

17.6.1 DGM data will be collected over the estimated 30.82 acres at Phase 2, as identified on Figure 4 (Appendix I) to identify the locations of subsurface anomalies (targets). The detection survey will be performed using the EM61-MK2 person portable system as described in SOP 551.01 (Appendix G). Standard collection height will be set to 40 cm and survey lines will be collected using a 0.75-meter line spacing, with survey coverage required to meet the MQO in WS #22. Based on an effective 1-meter sensor footprint of the coil and the standard height, the line spacing should be sufficient to detect potential items of interest. DGM data will be positioned using RTK GPS (or RTS) where applicable and line and fiducial positioning where canopy prevents the use of a GPS.

17.6.2 Areas where vegetation cannot be cleared to allow high quality DGM data to be collected will be considered data gaps and will be surveyed using analog geophysical methods.

17.6.3 A detection survey data usability assessment (DUA) will be completed using the four-step process described in Worksheet #37 following the client's acceptance of the final target list from the EM61-MK2 detection survey.

17.6.4 *Documentation*: Raw DGM data, Field notes, Daily QC Reports, Project QC Database, Detection Survey DUA.

17.7 DFW 6: PROCESS DGM DATA AND TARGET SELECTION

17.7.1 EM61-MK2 person portable data will be processed as described in SOP 551.01 (Appendix G). The data processor will assess the data to identify any areas where the anomaly density is too high to select individual anomalies for intrusive investigation. Areas with excessive anomaly density will be considered for analog removal methods as described in SOP 506.01 (Appendix G).

17.7.2 Anomalies will be identified using a threshold set to 5 times the local average background noise as defined at the IVS. If localized areas at Phase 2 have increased levels of noise due to uneven terrain or soils/geology, the target selection threshold may be adjusted as determined by the project team. Target lists will be generated following the completion of data acquisition. The target selection criteria will be documented in the IVS Technical Memorandum.

17.7.3 If saturated polygons are cleared with analog methods, post-analog DGM methodologies will completed in these areas.

17.7.4 *Documentation:* IVS Technical Memorandum, processed data files and maps, target lists, processing notes, Weekly DGM deliverable.

17.7.5 *Decision point:* Have MQOs been achieved?

17.8 DFW 7: ANOMALY REACQUISITION

17.8.1 Detailed descriptions of the reacquire and anomaly excavation procedures and intrusive results documentation required for this project are included in SOPs 551.01 and 506.01 (Appendix G). All intrusive investigation for DGM targets will be performed using an EM61-MK2 for anomaly reacquisition and hole clearance and RTK GPS (or RTS) or line and tape methods (when RTK is unfeasible) for target location. A 1-meter radius will be searched around each target location on the dig sheet and the peak signal intensity and offset documented. A Schonstedt magnetometer and/or Whites All-Metal detector (or equivalent analog instruments) may be used to pinpoint subsurface anomalies.

17.8.2 *Documentation*: Database of reacquire results, photographs, and DQCRs.

17.9 DFW 8: INTRUSIVE INVESTIGATION (ANOMALY RESOLUTION)

17.9.1 Detailed descriptions of the anomaly excavation procedures and intrusive results documentation required for this project are included in SOP 506.01. A Schonstedt magnetometer and/or Whites All-Metal detector (or equivalent analog instruments) may be used to pinpoint source locations within reacquired anomaly locations. The minimum separation distances presented in the approved ESS will be enforced during all intrusive MEC operations. If multiple teams are working in proximity to one another, the team separation distance specified in the approved ESS will be maintained during intrusive activities.

17.9.2 Detected anomalies will be intrusively investigated by UXO-qualified personnel using either hand digging or mechanical methods (e.g., mini-excavator). During subsurface activities, the UXO technicians will use handheld geophysical instruments to locate and pinpoint anomalies. The UXO technicians will carefully remove the earth overburden to expose the source of a subsurface metallic anomaly, and positively identify the source of the anomaly. Excavations using heavy equipment will be conducted offset laterally for the suspected MEC item or anomaly being investigated and will not be conducted within one foot of the anomaly source. Following this initial mechanical excavation, the excavation team will complete the remaining excavation using handheld tools.

17.9.3 The anomaly resolution requires the intrusive investigation process to conclude once the signal is removed or identified, thus ensuring no MEC or MPPEH is left. Once this determination has been made, additional soil will be removed by hand until the anomaly is located. Excavations will be continued until the anomaly source is resolved. Acceptance sampling (independent hole checks) will be performed by the UXOQCS (or designee), and the project and/or QC geophysicist will use the feedback process during project execution to ensure

the intrusive results are consistent with the geophysical anomaly characteristics. All DGM anomalies on the final dig list will be excavated and resolved.

17.9.4 Once the source of an anomaly has been identified and any necessary MEC operations have been completed, the excavation will be filled in and tamped to the approximate consistency and grade of the surrounding soil and any removed sod will be replaced. To the greatest extent possible, the excavation site will be restored to its original condition

17.9.5 Individual records ("dig sheets") will be maintained and updated to record and account for all materials encountered during intrusive investigations to include MPPEH and non-munitions related items (i.e., "other debris"). These dig sheet entries will be made indicating amount, identification, condition, approximate size, depth, and disposition for items recovered. Dig sheets may be maintained as hard copy or electronic files. In addition to the dig sheet information, representative photographs of the types of MPPEH and other debris encountered will be maintained in the project database.

17.9.6 Analog removal may be used to support DGM methodologies in areas where obstacles prevent DGM coverage (small data gaps) or in high anomaly density areas (saturated polygons). The Government will place QA seeds in small DGM data gaps in accordance with EM 200-1-15 (2018). No QA seeds are planned in saturated response areas as the EM61 will be used to assess the effectiveness of the analog removal. Analog removal will be performed according to the procedures described in SOP 506.01. Analog geophysical instruments will be operationally tested on a test plot to ensure that adequate instrument settings for their tasks are achieved. As anomalies are identified by the instrument operator(s), they will be investigated as detected (mag and dig) or marked for subsequent intrusive investigation (mag and flag). Analog removal will be conducted using handheld sensors – Schonstedt magnetometer and/or Whites All-Metal detector (or equivalent analog instruments). Analog geophysical instruments will arrive on site in a ready state.

17.9.7 When intrusive investigation within a DGM grid is considered complete, the Intrusive Team Leader will document the investigation status before moving to the next grid. Each grid completed by the Intrusive Team Leader will be subjected to QC checks by the UXOQCS and Project Geophysicist using the MPC for the intrusive investigation described on WS #12. The Project and/or Site Geophysicists may also require reinvestigation of any anomaly for which they consider the stated source to be unrepresentative.

17.9.8 *Documentation*: Database of excavation results, acceptance sampling and geophysical feedback results, photographs, and DQCRs.

17.10 DFW 9: MPPEH/MEC HANDLING, CERTIFICATION, AND DISPOSAL

17.10.1 MEC Identification

17.10.1.1 Any MPPEH that cannot be verified to be free of explosive hazards or is suspected to present an explosive hazard will be considered MEC. Any MEC encountered during the geophysical instrument assisted surface clearance will be clearly marked and its position will be recorded. Data regarding type, size, depth, condition, location, etc. of MEC located during the

RA will be recorded and all MEC encountered will be photographed. The team leader (UXO Technician III) will evaluate the item(s) found and immediately report the condition of the item(s) to the SUXOS and UXOSO. The SUXOS and UXOSO must be in agreement on the nature and condition of a MEC item before any action is taken.

17.10.2 MEC Removal

17.10.2.1 If the source of a surface anomaly is considered MPPEH, it will be uncovered sufficiently to obtain a positive identification of the item. If the item is identified as MEC, the SUXOS and UXOSO, will jointly determine whether the item is acceptable to move. After determining if an item is acceptable to move, the SUXOS and UXOSO will determine the most expeditious route for safe movement of the MEC item to a consolidation point. No MEC identified for destruction will be removed outside the project site boundary. Any consolidated shots will be conducted IAW the approved ESS.

17.10.2.2 MEC items not deemed acceptable to move will be blown-in-place (BIP). If a MEC item cannot be safely BIP under the existing conditions, the PM, SUXOS, and UXOSO will be notified, and will determine how to resolve the situation safely.

17.10.3 Disposal of MEC

17.10.3.1 During disposal of MEC and related material, safety will be the primary concern. The primary requirements are to protect personnel, the public, and the environment from fire, blast, noise, fragmentation, and toxic releases. Planned detonation of explosives will be conducted IAW the requirements outlined in the approved ESS.

17.10.3.2 Explosive operations will follow the procedures outlined in the ESS, EM 385-1-97, and HGL SOP 502.01 (Appendix G). Standard electric or nonelectric demolition equipment may be used, including remote firing devices. The UXOSO has the overall responsibility to comply with the minimum requirements listed below and has the authority to upgrade as the situation dictates.

17.10.3.3 Demolition operations will not begin at a work site until all non-essential personnel are outside the minimum separation distances established for the MEC being detonated. Engineering controls may be used to reduce the intentional detonation minimum separation distances. If implemented, these controls will be used IAW the ESS.

17.10.3.4 Disposal operations will be under the direct control of the demolition team leader, who will be an experienced and trained UXO Technician III charged with the responsibility for all demolition activities within the area. The UXOSO will be responsible for training all personnel regarding the nature of the materials handled, the hazards involved, and the necessary precautions to be taken, and will also be present during all on-site disposal operations. The UXOSO will ensure that the appropriate authorities are notified prior to any on-site demolitions. Completion of demolition operations will be evaluated by the SUXOS using the MPCs described on WS #12.

17.10.4 Disposal of MPPEH

17.10.4.1 MPPEH will be processed and disposed of IAW Chapter I, Section 11 of EM 385-1-97. Additionally, site personnel will adhere to HGL SOP 504.01, *MPPEH Inspection and Management* (Appendix G), which establishes overall practices for HGL UXO-qualified personnel inspecting, processing, securing, safeguarding, and managing MPPEH during MEC activities. Certification and disposal of MPPEH and MDAS will be monitored by the UXOQCS using the MPCs described on WS #12.

17.10.4.2 Within, or adjacent to, each grid the UXO Technician III will establish a temporary collection point for MD. Smaller MD items will be placed in plastic buckets or suitable containers. Upon completion of operations in that grid, the material in the temporary collection points will be collected. The UXO Technician III will perform a 100% inspection of the material to ensure that it is free of explosives and other hazardous materials (HAZMATs). The SUXOS will certify the inspection of each item and the OESS or UXOQCS will verify as described in paragraph 17.10.4.4 as the MD is placed in secured containers.

17.10.4.3 MPPEH that is inspected, verified, and certified to be free of explosive hazards will be classified as MDAS. MDAS generated during the project will be stored in a secure area inside locked containers. Once the field investigation is complete, the sealed containers will be shipped for proper disposal. Certification and disposal of MDAS will be monitored by the UXOQCS using the MPCs described on WS #12.

17.10.4.4 The SUXOS will certify and the USACE OESS or UXOQCS will verify that debris is free of explosive hazards. If the OESS is not available, the UXOQCS will sign as the verifier. DD Form 1348-1A will be used as the certification/verification documentation. All DD 1348-1A forms will clearly show the typed or printed names of the SUXOS and OESS/UXOQCS, and the organization, signature, and home and field office telephone numbers for the persons certifying and verifying that the debris is free of explosive hazards. The form will state the following if only MD is being processed:

> *This certifies and verifies that the munitions debris listed has been 100 percent properly inspected and, to the best of our knowledge and belief, is free of explosive hazards.*

17.10.4.5 If range related debris is processed with MD, the form will state the following:

> *This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, free of explosive hazards, engine fluids, illuminating dials, and other visible liquid hazardous, toxic, and radioactive waste (HTRW) materials.*

17.10.4.6 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 USACE / Installation Name / Contractor Name / 001 / Seal's Unique Identification, and subsequent containers will be labeled sequentially. The SUXOS will ensure that a DD Form 1348-1A is completed for each container prior to transfer. The form will contain the following information:

- Location of where material was obtained
- Basic material content (type of metal: for example, steel or mixed)
- Estimated weight
- Unique identification number of each container
- Seal identification number

17.10.4.7 In addition to the DD Form 1348-1A, MDAS shipments will be transferred to the recycler under a chain-of-custody (CoC).

17.10.4.8 All material will be accounted for in the daily and weekly reports. All MDAS will be disposed of at a recycler, where it will be processed through a smelter prior to resale or release IAW all governing regulations. If it is discovered during the material transfer and shipping process that a seal has been broken or the CoC of the material cannot be verified, the material in question will be subject to reinspection following the established MPPEH process. The MDAS subcontractor will provide two documents:

1. **CoC Documentation:** Upon receiving the unopened labeled containers, each with its unique identified and unbroken seal ensuring a continued CoC, and after reviewing and concurring with all provided supporting documentation, the MDAS recycler will sign for having received and agreed with the provided documentation that the sealed containers contained no explosive hazards when received. This document will be signed on company letterhead and state that the contents of sealed containers will not be sold, traded, or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content.
2. **Certification of Destruction Letter:** The MDAS recycler will send notification and supporting documentation verifying that the sealed containers have been smelted and are therefore only identifiable by their basic content. This documentation will be submitted as an appendix to the SSFR.

17.11 DFW 10: CONSTRUCTION SUPPORT

17.11.1 HGL will provide CS IAW the requirements of Defense Explosives Safety Regulation 6055.09 and EM 385-1-97, including Change 1 and errata. CS will commence when the construction contractor begins earthwork or other intrusive construction activities and continue until intrusive activities are completed. IAW the PWS, and regardless of the prevailing MEC risk at the site, HGL CS personnel will be at the project site and available to the construction contractor.

17.11.2 HGL will coordinate the schedule and work hours directly with the construction contractor and as approved by the U.S. Government. HGL will provide immediate feedback to the construction contractor and be available to identify, avoid, or remove any MEC items unearthed or discovered during construction activities.

17.11.3 A minimum of two HGL UXO personnel (SUXOS and UXOSO) will be co-located on site with the construction contractor and will respond to suspected MEC items. All MEC items and any MPPEH items found to contain an explosive hazard after inspection will be destroyed by three personnel. The actual number of CS personnel required will be

determined by on-site requirements (for example, construction schedule, demolition activities, etc.) and subject to U.S. Government approval.

17.12 DFW 11: DEMOBILIZATION

17.12.1 When the SUXOS and UXOQCS have documented that all MEC investigations are complete, the UXOQCS will ensure that all MPPEH and donor explosives are accounted for by conducting a MPPEH/Explosives Records Assessment. MDAS will be properly documented and shipped off site for demilitarization via smelting. Following successful completion of the records assessment, tools, equipment, and safety gear will be shipped from the site and personnel will demobilize.

WORKSHEET #21
FIELD STANDARD OPERATING PROCEDURES

The applicable field SOPs to be used during the RA at the Phase 2 MRS are listed in the below table. Copies of these field SOPs are provided in **Appendix G**.

Reference Number	Title, Revision Date, and/or Number	SOP Originating Organization	Related Equipment Types	Modified for Project? (Y/N)	Comments
500-03	Seed Production Areas	HGL	Analog, EM61-MK2, ISOs, RTK GPS, RTS, measuring tapes	N	See Appendix G
501.01	Explosive Materials Accountability and Management	HGL	--	N	See Appendix G
502.01	Explosive Demolition Operations	HGL	Radios, demolition kit, first-aid equipment, fire extinguisher, sandbags, shovel	N	See Appendix G
503.01	Explosives Storage Inspection and Security	HGL	--	N	See Appendix G
504.01	MPPEH Inspection and Management	HGL	Analog geophysical instrument(s), first-aid equipment, fire extinguisher	N	See Appendix G
506.01	Analog and Digital MEC Clearance Operations	HGL	Analog and digital geophysical instrument(s), first-aid equipment, fire extinguisher, shovel, measuring tapes	N	See Appendix G
509.01	Vegetation Removal	HGL	Hand tools, power tools, and mechanical vegetation equipment	N	See Appendix G
510.01	MEC Anomaly Avoidance Support	HGL	Analog geophysical instrument(s), first-aid equipment, fire extinguisher	N	See Appendix G
511.01	MEC Construction Support	HGL	Analog geophysical instrument(s), first-aid equipment, fire extinguisher	N	See Appendix G
522.01	Remote Mechanical Demilitarization	HGL	Radios, demolition kit, remote saws, first-aid equipment, fire extinguisher, sandbags, shovel	N	See Appendix G
551.01	DGM Using a Geonics EM61-MK2	HGL	EM61-MK2 sensors, RTK GPS, RTS, measuring tapes	N	See Appendix G
552.01	Analog Geophysical Mapping	HGL	Analog geophysical instrument(s), GPS, measuring tapes	N	

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WORKSHEET #22
FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION FOR MEC-RELATED DFWS

22.0 This worksheet describes the field equipment needed for the project and the associated calibration, maintenance, testing, and inspection procedures for that field equipment. This worksheet also documents the field equipment's frequency of activity, acceptance criteria, and CA requirements.

Table 22.1
Surface Clearance, Anomaly Avoidance, Investigation of Data Gaps and Saturated Polygons, Intrusive (Instrument: Analog Sensor)

Measurement Quality Objective	DFW/ SOP Reference	Frequency	Responsible Person/ Report Method/ Verified by	Acceptance Criteria	Failure Response
Instrument Functionality	DFW 2, 4, 7, 8; SOP 552.01	Minimum once daily	Operator/Daily QC Report/UXOQCS	Each operator demonstrates, in a test plot or IVS, positive detection on a daily basis to the presence of a reference item(s)	RCA/CA; CA assumption - remedial training and/or repair or replace instrument, then repeat test.
Anomaly Resolution (analog data gap and saturated polygons)	DFW 8; SOP 506.01	Evaluated for each data gap or polygon (saturated response area)	Field Team Leader/Daily QC Report; Grid Status Records/UXOQCS	For relatively small areas where analog clearance is used (e.g., DGM data gaps), no metal objects will remain that are equivalent to or greater than 1 inch in diameter to a depth of 11 times the item diameter (or width) up to the specified clearance depth of 5 feet. The Government will place QA seeds in accordance with EM 200-1-15 (2018) in small DGM data gaps. 100% of the QA seeds must be detected and removed If relatively larger saturated response areas are cleared with analog methods, post-analog DGM methodologies will completed over the entire polygon area and the residual signal intensity for the EM61-MK2 will be less than the target selection threshold	RCA/CA; CA assumption - area fails; re-clear area or specific region based on RCA.

Table 22.1 (Continued)
Surface Clearance, Anomaly Avoidance, Investigation of Data Gaps and Saturated Polygons, Intrusive
(Instrument: Analog Sensor)

Measurement Quality Objective	DFW/ SOP Reference	Frequency	Responsible Person/ Report Method/ Verified by	Acceptance Criteria	Failure Response
Geodetic Equipment Functionality	DFW 2, 4, 7, 8; SOP 552.01	Daily	Field Team Leader/Daily QC Report; Grid Status Records/UXOQCS	Measured position of control point will be within 10 meters of ground truth (Differential GPS (DGPS) in woods)	RCA/CA; CA assumption - redo affected work.

Table 22.2
Detection Survey (Instrument: EM61-MK2)

Measurement Quality Objective	DFW/ SOP Reference	Frequency	Responsible Person/ Report Method/ Verified by	Acceptance Criteria	Failure Response
Geodetic Equipment Functionality	DFW 3, 6 / SOP 551.01	Daily	Operator/DQCR/ UXOQCS	Measured position of control point within 10 cm of ground truth (RTK GPS or RTS).	RCA/CA; CA assumption – redo affected work.
Geodetic Internal Consistency (grids with line and fiducial positioning)	DFW 2 / SOP 551.01	Each 1-acre grid	Grid setup team/logbook/UXOQCS and Project Geophysicist	Grid corners internally consistent within 30 cm (1 ft) on any leg or diagonal.	RCA/CA; CA assumption – redo affected work (corner placement, data collection, or data processing).
Geodetic accuracy	DFW 2/ SOP 551.01	For points used more than once, repeat occupation of each point used, either monthly (for frequently used points) or before re-use (if used infrequently)	Project Geophysicist/ Project QC database/ QC Geophysicist	Project network must be tied to HARN, CORS, OPUS or another recognized network. Project control points that are used more than once must be repeatable to within 5 cm.	RCA/CA; CA assumption - reset points not located at original locations or resurvey point.
Initial DGM positioning accuracy	DFW 3/ SOP 551.01	Once prior to start of dynamic data acquisition	Field team Leader/ IVS Technical Memorandum/ Project or QC Geophysicist	Derived positions of IVS items are within 25 cm of the ground truth locations for RTK GPS, 50 cm offset for line and fiducial positioning methods	RCA/CA; CA assumption – make necessary repairs and re-verify.
Initial Dynamic Detection Repeatability	DFW 3/ SOP 551.01	Once prior to start of dynamic data acquisition	Field team Leader/ IVS Technical Memorandum/ Project or QC Geophysicist	Peak response > 75% of minimum expected response	RCA/CA; CA assumption – make necessary repairs and re-verify.

Table 22.2 (Continued)
Detection Survey (Instrument: EM61-MK2)

Measurement Quality Objective	DFW/ SOP Reference	Frequency	Responsible Person/ Report Method/ Verified by	Acceptance Criteria	Failure Response
Instrument Function Test	DFW 3, 6/ SOP 551.01	Beginning and end of each day	Project Geophysicist/ running QC summary/ QC Geophysicist	Response within 20% of baseline static spike response (comparison with the mean static spike minus mean static background of the first day's average).	RCA/CA; CA assumption - make necessary repairs and re-verify. Day's dataset fails unless seed item is mapped that day with repeatable anomaly characteristics.
Ongoing positioning precision	DFW 6/ SOP 551.01	Beginning and end of each day	Project Geophysicist/ running QC summary/ QC Geophysicist	Derived positions of IVS items are within 25 cm of the ground truth locations for RTK GPS, 50 cm offset for line and fiducial positioning methods	RCA/CA; CA assumption - day's dataset fails unless seed item is mapped that day with repeatable anomaly characteristics.
Ongoing Dynamic Detection Repeatability	DFW 6/ SOP 551.01	Beginning and end of each day	Project Geophysicist/ running QC summary/ QC Geophysicist	Peak response > 75% of minimum expected response	RCA/CA; CA assumption - day's dataset fails unless seed item is mapped that day with repeatable anomaly characteristics.
Target Selection	DFW 6/ SOP 551.01	Per grid or area or dataset	Project Geophysicist/ running summary/ QC Geophysicist	All dig list targets are selected according to thresholds established in the IVS Memorandum	RCA/CA
In-line measurement spacing	DFW3, 6/ SOP 551.01	Verified for each data collection day using existing UX Detect tools based upon sensor center position	Project Geophysicist/ running QC summary/ QC Geophysicist	98% ≤ 25 cm between successive measurements	RCA/CA; CA assumption – redo affected work until acceptance criteria is met.

Table 22.2 (Continued)
Detection Survey (Instrument: EM61-MK2)

Measurement Quality Objective	DFW/ SOP Reference	Frequency	Responsible Person/ Report Method/ Verified by	Acceptance Criteria	Failure Response
Coverage	DFW 6/ SOP 551.01	Verified for each survey grid using existing UX Detect tools based upon sensor center position	Project Geophysicist/ running QC summary/ QC Geophysicist	> 95% coverage of each 1-acre grid at 0.75-meter line spacing and 98% coverage at 1 m line spacing excluding site-specific access limitations (e.g., obstacles, unsafe terrain)* If gaps are present that are not related to site-specific access limitations (e.g., obstacles, unsafe terrain) and the data analyst and USACE geophysicist agree that the data surrounding the gap indicates there is no potential for the smallest target of interest to exist above the depth of detection, the gap will not be recollected with DGM or analog methods.	RCA/CA; CA assumption - gaps require fill-in lines with DGM or analog methods to achieve required coverage.
Dynamic Detection positioning of QC seeds	DFW 6/ SOP 551.01	One per team per day based on expected production rate	QC Geophysicist/ QC Seed Production Area Tracking Log/ Lead agency QA Geophysicist	100% positioning offset is <=35 cm + ½ line/sensor for digital positioning systems (72.5 cm) 100% positioning offset is <=50 cm + 1/2 line spacing for fiducially positioned data (87.5 cm)	RCA/CA; CA assumption - day's dataset fails unless seed item is mapped that day with repeatable anomaly characteristics.

Table 22.2 (Continued)
Detection Survey (Instrument: EM61-MK2)

Measurement Quality Objective	DFW/ SOP Reference	Frequency	Responsible Person/ Report Method/ Verified by	Acceptance Criteria	Failure Response
Dynamic Detection signal repeatability of QC seeds	DFW 6/ SOP 551.01	One per team per day based on expected production rate	QC Geophysicist/ QC Seed Production Area Tracking Log/ Lead agency QA Geophysicist	Peak response > 75% of minimum expected response	RCA/CA; CA assumption - day's dataset fails unless seed item is mapped that day with repeatable anomaly characteristics.
Valid position data	DFW 3, 6/ SOP 551.01	Per measurement	Field Team Leader/ running QC summary/ Project Geophysicist	RTK GPS only; GPS status flag indicates fix and confirmation that fix should be indicative of DOP < 4.0	RCA/CA CA assumption - interpolate positions for minor (< 3 meters) fluctuations along straight lines (path before and after gap indicates line was straight); longer out-of-spec data rejected.

* Polygons will be drawn to exclude obstacles only if the Oasis Montaj coverage tool calculates less than 95% coverage at 0.75 m line spacing or less than 98% coverage at 1 m line spacing.

Table 22.3
Intrusive Investigation

Measurement Quality Objective	DFW/ SOP Reference	Frequency	Responsible Person/ Report Method/ Verified by	Acceptance Criteria	Failure Response
Instrument Function Test	DFW 7/ SOP 551.01	Beginning and end of each day	Project Geophysicist/ running QC summary/ QC Geophysicist	Response within 20% of baseline static spike response (comparison with the mean static spike minus mean static background)	RCA/CA
Anomaly Resolution for DGM targets	DFW 8/ SOP 506.01 SOP 551.01	By grid or number of targets.	UXOQCS	90% confidence < 1% unresolved anomalies. Accept on zero.	RCA/CA
Geodetic Equipment Functionality	DFW 8 / SOP 551.01	Daily	Operator/DQCR/ UXOQCS	Measured position of control point within 10 cm of ground truth (RTK GPS or RTS).	RCA/CA; CA assumption – redo affected work.

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WORKSHEET #29
PROJECT DOCUMENTS AND RECORDS

29.0 The following is a list of site records that should be used and maintained for each site investigation and for the project as a whole, and the personnel responsible for generating and verifying the records. All records should be maintained in the HGL project files for a minimum of five years.

29.1 PROJECT DOCUMENTS AND RECORDS FOR MEC-RELATED TASKS

29.1.0 All final document files, including reports, figures, and tables, will be submitted in electronic format (both Microsoft Office and portable document format [.pdf]). Any document files, logs, including reports, figures, and tables will be made available to the on-site USACE OESS upon request from the OESS.

29.1.1 GIS Electronic File Management

29.1.1.1 A project-specific GIS will be used to store and manage all relevant geospatial-related data and information. HGL will manage and maintain project data and update the CSM in GIS IAW DID HNC-006.02, EM 200-1-2, EM 1110-1-1200, EM 200-1-15, and Engineer Regulation 1110-1-8156. The final GIS deliverable will include all documentation, reports, meeting minutes, databases, etc., created developed or modified under this task order in original and .pdf format. GeoSpatial data activities will include the following:

- Maintain and update project GIS data within the project boundaries.
- Perform civil surveys IAW EM 200-1-15 and HNC DID-006.02.

29.1.2 DGM Electronic File Management

29.1.2.1 DGM data files will be delivered IAW the requirements in EM 200-1-15 (USACE, 2018). All DGM data will be transferred via Safe File Access Exchange, email, or ShareFile site, if possible, given the available internet connection. If the large size of the data files makes the process cumbersome, the data will be transferred on an external hard drive.

29.1.2.2 DGM data files will be named appropriately, QC checked, and processed according to the date or grid collected. Full coverage DGM data will be split or consolidated into individual survey units for storage and target selection, although initial QC checks for all data, with the exception of coverage, will be performed by date. All pertinent target information will be exported from the survey unit results databases for consolidation in an Access database. Daily QC files (i.e., IVS, static and function checks) will be stored in separate database tables and folders from the production data, although they will also be named and organized by date in their respective folders.

29.1.2.3 Table 29.1 below lists the data quality documentation prepared to support the RA.

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Table 29.1
Project Documents and Records for MEC-Related Tasks

Document/Record	Purpose	Primary Generator (1)	Completion/ Update Frequency	Format/Storage Location/Archival	Delivery/Availability
UXOSO Logbook	Record daily events (e.g., team make-up, areas worked, tasks competed, production, record of items found)	HGL UXOSO	Daily	Hard Copy/On site during fieldwork, then Project File/HGL SharePoint	Available to USACE on request
Geophysical Instrument Assisted Surface Clearance Memorandum	Records completion of surface clearance for geophysical activities	HGL PM	Once	.DOCX or .pdf/Project File/ HGL SharePoint	Available to USACE on request
QC Seed Plan	Describes intended seed types and locations for QC seeds to be placed	HGL QC Geophysicist	Once, prior to seeding	.DOCX/On site during seeding and in secure folder on HGL network (limited to QC personnel)/ HGL-Denver Office	Via e-mail and with Final Removal Action QAPP
QC Seed Firewall Plan	Describes methods used to limit QC seed information to QC personnel	HGL QC Geophysicist	Once, prior to seeding	.DOCX/Project File/HGL SharePoint	Via e-mail and with Final Removal Action QAPP (Appendix H)
Daily Status Reports	Report notable events to project team	HGL SUXOS	Daily	.DOCX or .PDF/Project File/ HGL SharePoint	Via e-mail, and included with SSFR
Daily QC Report	Report QC events to project team	HGL UXOQCS	Daily, when QC events occur	.DOCX or .pdf/On site during fieldwork, then Project File/HGL SharePoint	Via e-mail, and included with SSFR
Weekly Geophysical Deliverable	Report of DGM production and QC results	HGL Project Geophysicist/QC Geophysicist	Weekly	.ACCDB/GDB/MAP/r61/m61/XYZ /Project File/ HGL Denver Office	Via SAFE or ShareFile or email; final version with SSFR
Team Leader Logbook(s)	Record important team-specific events	HGL Team - Team Leader(s)	Daily	Hard Copy/On site during fieldwork, then Project File/HGL SharePoint	Available on request

Table 29.1 (Continued)
Project Documents and Records for MEC-Related Tasks

Document/Record	Purpose	Primary Generator (1)	Completion/ Update Frequency	Format/Storage Location/Archival	Delivery/Availability
Field Change Request Form	Record non-critical (i.e., minor) deviations from the QAPP (*"non-critical" deviations are defined as those that will not impact project objectives*)	HGL PM	As needed	.DOCX or .pdf/Project File/ HGL SharePoint	Via e-mail, and included with SSFR
RCA	Document MPC failures and causes, and corrective actions taken, actions taken to prevent recurrence, and actions taken to monitor effectiveness of corrective action	HGL UXOQCS/ QC Geophysicist	If MPC failures are noted	.DOCX or .pdf/Project File/ HGL SharePoint	Via e-mail, and included with Data Usability Assessment (DUA) and SSFR
Photograph Log	Documents all photographs taken and video recorded to document work and/or site conditions, and to record MEC items recovered	HGL SUXOS	As needed	.JPG/On site during fieldwork, then Project File/HGL SharePoint	Available on request
Production Area QC Seeding Report	Documents seed types, depths, locations, and orientations	HGL QC Geophysicist	Once, following completion of seeding	.DOCX and .XLSX or .ACCDB/ QC seed information stored in secure folder on HGL's network (limited to QC personnel)/HGL Denver Office	Data via email

Table 29.1 (Continued)
Project Documents and Records for MEC-Related Tasks

Document/Record	Purpose	Primary Generator (1)	Completion/ Update Frequency	Format/Storage Location/Archival	Delivery/Availability
IVS Technical Memorandum	Documents the results of the initial IVS tests	HGL Project Geophysicist	Once, following initial IVS test (EM61-MK2)	.DOCX/Project File/HGL SharePoint	Via e-mail, and included with SSFR
Grid Sheets	Record the completion status of all grids	HGL UXOQCS	Daily	Hard Copy or .pdf/Project File/Geophysical Database/ HGL SharePoint	Upon request
Seed Tracking Log (DGM)	Document seed placement and record recovery	HGL UXOQCS and HGL QC Geophysicist	As seeds are detected/ recovered	.Geosoft database or .XLSX or .ACCDB / QC Geophysicist's PC/ HGL SharePoint	Via e-mail/Available on request
Data Usability Assessment (DUA)	Document the results and verification / validation for the detection survey and intrusive investigation with regard to DQOs.	HGL Project and QC Geophysicist / HGL PM/ UXOQCS/ USACE QA Geophysicist/ USACE PM / OESS	Once after final processed DGM data and target selection and once after intrusive investigation	.DOCX/Project File/ HGL SharePoint	Via e-mail, and included with SSFR
Reacquisition Results	Record location and pre-excavation response of reacquired DGM anomalies	Reacquisition Team	During reacquisition of DGM anomalies	.ACCDB/On site during fieldwork, and Project File/Geophysical Database/HGL SharePoint	Via ftp site during project; included with SSFR
Intrusive Investigation Results	Record results of intrusive investigation, including DGM anomaly source description, characteristics, and coordinates	Intrusive Team Leader(s)	During intrusive investigation of DGM anomalies	Hard Copy/On site during fieldwork, and Project File/Geophysical Database/HGL SharePoint	PDF and data included with SSFR

Table 29.1 (Continued)
Project Documents and Records for MEC-Related Tasks

Document/Record	Purpose	Primary Generator [1]	Completion/ Update Frequency	Format/Storage Location/Archival	Delivery/Availability
Analog Clearance Grid Sheets	Document the completion of analog removal (surface or subsurface) and record the results of the removal.	Intrusive Team Leader(s)	At least daily during analog removal activities	Hard Copy/On site during fieldwork/Geophysical Database/ HGL SharePoint	PDF and data included with SSFR
Analog QC data	Documents QC metrics for analog surveys	UXOQCS	At least weekly during DGM collection	.ACCDB, .gdb, or .pdf/Project File/Geophysical Database/HGL Denver Office	Via ftp site during project; included with SSFR; available on request
Anomaly Resolution Results	Record results of anomaly resolution QC checks	Intrusive Team Leader(s)	During anomaly resolution QC checks	Hard Copy/On site during fieldwork, and Project File/ Geophysical Database/HGL SharePoint	PDF and data included with SSFR
Weekly DGM Data Deliverable	Document the results of DGM surveys	HGL Project Geophysicist	Weekly during DGM data collection	*.r61, *.m61, or .CSV (raw data); .GDB, .XYZ, and .MAP (processed data)/Geophysical Database/ Project File/ HGL SharePoint	Via FTP site or external hard drive during project; included with SSFR

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

WORKSHEET #29 (CONTINUED)
PROJECT DOCUMENTS AND RECORDS

Record	Generation	Verification
Quality Assurance Documents and Records		
Readiness reviews	PM	UXOQCS/ Program QA Manager
Management reviews (minor nonconformance)	PM	Program QA Manager
Management reviews (major nonconformance)	Program Manager	Program QA Manager
Field sampling audits	Audit Lead	Program QA Manager
Deliverables		
Project planning documents, including QAPP, Work Plan, Project Management Plan, Site Safety and Health Plan, Community Relations Plan, QA Surveillance Plan	PM	Program QA Manager
Project deliverables	PM	Program QA Manager
Telephone logs, emails, faxes, and correspondence	All project staff	PM
Permits	SUXOS/Field Team Leader	PM
Site maps	Graphics Staff	PM

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WORKSHEETS #31, #32, AND #33
ASSESSMENTS AND CORRECTIVE ACTION FOR MEC-RELATED TASKS

MEC Assessments:

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

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Actions	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions
Fieldwork Readiness Review	Once before mobilization	Internal	HGL	PM	PM	PM	Program Manager
H&S Assessment	Once during field activities	Internal	HGL	Project H&S Manager, or designee	UXOSO	UXOSO	Project H&S Manager and SUXOS
Site Preparation Assessment	Following completion of brush cutting, if required, and grid placement	Internal	HGL	Project Geophysicist (grid locations) and Site Geophysicist (adequacy of brush clearing)	SUXOS	SUXOS	Site Geophysicist
Geophysical Instrument Assisted Surface Clearance Assessment	Following completion of surface clearance	Internal	HGL	SUXOS	SUXOS	SUXOS	SUXOS
DGM Data Deliverable Assessment	Weekly	Internal	HGL	USACE Geophysicist	Project Geophysicist	Project Geophysicist	USACE Geophysicist
MPPEH/ Explosives Records Assessment	Once prior to demobilization	Internal	HGL	SUXOS	SUXOS	SUXOS	SUXOS

WORKSHEETS #31, #32, AND #33 (CONTINUED)
ASSESSMENTS AND CORRECTIVE ACTION FOR MEC-RELATED TASKS

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Actions	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions
Review Geospatial Data	For each GIS data submittal	External (see Quality Assurance Surveillance Plan [QASP])	HGL/USACE	Applicable USACE PDT Members	GIS Manager	GIS Manager	PM
Field Activities	See QASP	External (see QASP)	HGL/USACE	Applicable USACE PDT Members	PM and relevant personnel	SUXOS and other relevant personnel	UXOQCS and HGL Geophysicist
Geophysical Surveys	See QASP	External (see QASP)	HGL/USACE	USACE Geophysicist	PM and Project Geophysicist	Project Geophysicist	USACE Geophysicist

WORKSHEETS #31, #32, AND #33 (CONTINUED)
ASSESSMENTS AND CORRECTIVE ACTION FOR MEC-RELATED TASKS

MEC Corrective Action:

Based on the findings of project assessments above, CA may be required. A "corrective action" is defined as an action taken by a project to eliminate the cause(s) of nonconformity in order to prevent recurrence. For assessment findings that require CA, deficiencies will be documented and communicated to the appropriate project personnel. Internal documentation will be maintained as part of the project records and will be made available to the client as required to explain the deficiency and its correction. CA will then be implemented and a follow-up assessment will be performed to verify the results of the CA. Procedures for handling UFP-QAPP deviations during each type of assessment are summarized in the table below.

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Time Frame of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Time Frame for Response
Fieldwork Readiness Review	Internal e-mail	PM	3-5 business days	Internal e-mail	PM	3-5 business days
Preparatory, initial, and follow-up inspections	Internal e-mail	PM, SUXOS	1-3 business days	Follow-up inspection	PM SUXOS	24 hours after notification
H&S Assessment	Written assessment report	SUXOS, PM	3-5 business days	Letter or memo	Project H&S Manager	24 hours after notification
QAPP Compliance and MEC Operations Assessment	Written assessment report	PM, SUXOS, UXOQCS	3-5 business days	Letter or memo	PM	3-5 business days
Site Preparation Assessment	Internal e-mail	SUXOS	1-3 business days	Internal e-mail	Site Geophysicist and Project Geophysicist	24 hours after notification
Geophysical Instrument Assisted Surface Clearance Assessment	Internal e-mail	SUXOS	24 hours	Internal e-mail	SUXOS	24 hours after notification

WORKSHEETS #31, #32, AND #33 (CONTINUED)
ASSESSMENTS AND CORRECTIVE ACTION FOR MEC-RELATED TASKS

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Time Frame of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Time Frame for Response
Seeding Assessment	E-mail	Seed Team Lead	24 hours	E-mail and/or RCA	QC Geophysicist and USACE Geophysicist	24 hours after notification
Fieldwork Readiness Review	Internal e-mail	PM	3-5 business days	Internal e-mail	PM	3-5 business days
DGM Data Deliverable Assessment	Internal e-mail, SOP checklist(s) noting deficiency	Project Geophysicist and QC Geophysicist	1-5 business days	Internal e-mail and/or RCA	Project/QC Geophysicist	24 hours after notification
Geophysical Surveys	CA Requests, Geophysical QA Forms	PM and Project Geophysicist	1-5 business days (immediately if serious deficiency)	E-mail or appropriate QA Form with responses	Lead Organization and Design Center PMs, and USACE Project Geophysicist	1-2 business days

WORKSHEET #34
DATA VERIFICATION AND VALIDATION INPUTS

34.0 This worksheet lists the inputs that will be used during data verification and validation. Inputs include planning documents, field records, and laboratory records. Data verification is a check that all specified activities involved in collecting and analyzing samples have been completed and documented and that the necessary records (objective evidence) are available to proceed to data validation. Data validation is the evaluation of conformance to stated requirements, including those in the contract, methods, SOPs, and the QAPP.

Item	Description	Verification (completeness)	Validation (conformance to specifications)
	Planning Documents/Records		
1	Approved QAPP	**X**	
2	Contract	**X**	
3	Field SOPs	**X**	
	Field Records		
5	Field logbooks	**X**	**X**
6	Equipment calibration records	**X**	**X**
9	**Intrusive MEC Field Records**		
9a	Dig Sheets	**X**	**X**
9b	Team Leader Grid Sheet	**X**	
9c	Grid Drawing Sheet	**X**	
9e	DD Form 1348-1A	**X**	**X**
9f	Demolition Summary Sheet	**X**	**X**
9g	MDAS disposal documentation	**X**	**X**
9h	Explosives Usage Record	**X**	**X**
9i	Demolition Shot Record	**X**	**X**
9j	Intrusive Results	**X**	**X**
10	**Geophysics Field Records**		
10a	Weekly Geophysical DGM Deliverable	**X**	**X**
10b	Production Area QC Seeding Report or QC Seed Tracking Log	**X**	**X**
10c	Field logbooks	**X**	**X**
10d	Sensor Test Results (Detection Survey)	**X**	**X**
10e	IVS Construction Records	**X**	**X**
11	Relevant correspondence	**X**	**X**
12	Change orders/deviations	**X**	**X**
13	Field audit reports	**X**	**X**
14	Field CA reports	**X**	**X**
	Geophysics Electronic Data		
15	Raw data files	**X**	**X**
16	Converted data files	**X**	**X**
17	Data Processing files (Detection Survey)	**X**	
18	Instrument calibration records	**X**	**X**

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WORKSHEET #35
DATA VERIFICATION PROCEDURES FOR MEC-RELATED TASKS

35.0 "Verification" is a completeness check that is performed before the data review process is conducted to determine whether the required information is available for validation. It involves a review of all data inputs to ensure that they are present. This step of the data review process answers whether or not the required data inputs are present. "Validation" is performed to identify and qualify data that do not meet the MPCs specified on WS #12. Data requiring validation are summarized on WS #34. The information in these tables shows what data inputs are required for data validation and the processes used to conduct the validation.

Activity and Records Reviewed	Requirements/ Specifications	Process Description/Frequency	Responsible Person	Documentation
General MEC Field Documentation	QAPP	Verification only; Confirm documentation is complete for each day of field activities and any required signatures are present.	UXOQCS	UXOQCS DQCR
			SUXOS	Daily Status Reports
			SUXOS	Team Leader Logbook(s)
			SUXOS	Field Change Request Form
			UXOQCS/HGL Project Geophysicist	RCA
			UXOQCS	Photographic Log
		Verification; Confirm documentation is complete for each day of field activities and any required signatures are present.	UXOQCS	DQCR
			UXOQCS	Surface Clearance Seeding QC Tracking Log
		Validation; Ensure the results of all relevant MPCs are attained and correctly documented in the deliverable.	UXOQCS	Analog Removal Seeding QC Tracking Log
General Geophysics Documentation	QAPP	Verification only; Confirm documentation is complete for each day of field activities and any required signatures are present.	HGL Project Geophysicist	Field logbooks
		Verification; Confirm Weekly DGM Data Deliverables on file cover entire duration of field effort. Validation; Ensure the results of all relevant MQOs are attained and correctly documented in the deliverable.	HGL Project Geophysicist / QC Geophysicist	Weekly DGM Data Deliverable Final Data Archive (for each delivered survey unit)
DFW 3: IVS Construction and Sensor Operation Verification	QAPP; SOP 551.01	Verification; Confirm documentation is complete, including dates and applicable signatures. Validation; Initial IVS surveys have been conducted according to SOP 551.01. All specifications have been achieved, or exceptions noted. If appropriate, corrective actions have been completed.	HGL Project Geophysicist	IVS Technical Memorandum
			USACE Geophysicist	Written acceptance of IVS Technical Memorandum

WORKSHEET #35 (CONTINUED)
DATA VERIFICATION PROCEDURES FOR MEC-RELATED TASKS

Activity and Records Reviewed	Requirements/ Specifications	Process Description/Frequency	Responsible Person	Documentation
DFW 4: Blind Seeding	QAPP; SOP 500-03	Verification; Confirm documentation is complete, including dates and applicable signatures. Validation; Seeding has been conducted according to SOP 500-03 and the Blind Seed Plan. All specifications have been achieved, or exceptions noted. If appropriate, corrective actions have been completed.	HGL QC Geophysicist	Production Area QC Seeding Report or QC Seed Tracking Log
			Seed Team Lead	Production Area QC Seeding Report or QC Seed Tracking Log
DFW 5: Conduct Detection Survey	QAPP; SOP 551.01	Verification only; Confirm each week that report includes QC test results summary, list of RCAs/Corrective Action Reports (CARs), and Field Work Variances (FWVs) and their approval statuses weekly, at minimum.	HGL QC Geophysicist	Weekly DGM Data Deliverable
		Verification only; Confirm documentation is complete, weekly, at minimum. Validation; MQOs have been achieved, with any exceptions noted. If appropriate, corrective actions have been completed.	HGL Project/QC Geophysicist	Weekly DGM Data Deliverable
DFW 6: Process DGM Data and Target Selection	QAPP; SOP 551.01	Verification; Confirm documentation is complete weekly, at minimum. Validation; MQOs have been achieved, with any exceptions noted. If appropriate, corrective actions have been completed.	HGL QC Geophysicist	Weekly DGM Data Deliverable
		Verification only; Confirm each week that deliverable includes list of RCAs/ CARs and FWVs and their approval statuses weekly, at minimum.	HGL QC Geophysicist	Weekly DGM Data Deliverable
		Verification; Confirm records complete weekly, at minimum. Validation; MQOs have been achieved for seed detection, with exceptions noted. RCA/CAR and corrective actions have been completed, if appropriate.	HGL QC Geophysicist	Weekly DGM Data Deliverable
		Verification only; Confirm weekly deliverables are complete and approved.	HGL QC Geophysicist	Weekly DGM Data Deliverable
		Verification; Confirm submittal is on time, complete, and fully documents dynamic data usability Validation; Confirm MQOs have been achieved, particularly regarding QC and QA seed detection, with any exceptions noted; RCAs/CARs and corrective actions have been completed, if appropriate.	USACE Geophysicist	DGM QA Form (Data Submittal)

WORKSHEET #35 (CONTINUED)
DATA VERIFICATION PROCEDURES FOR MEC-RELATED TASKS

Activity and Records Reviewed	Requirements/ Specifications	Process Description/Frequency	Responsible Person	Documentation
DFW 7: Anomaly Reacquisition	QAPP; SOP 551.01	Verification; Checking by DGM remapping or verification checking with original instrument of anomaly footprint after excavation. Validation; Ensure the source of anomaly footprint has been resolved to standards set in QAPP.	UXOQCS	Database, Acceptance Sampling, Feedback Results, Photographs, QC Daily Reports
DFW 8: Intrusive Investigation (Anomaly Resolution)	QAPP; SOP 551.01	Verification; Confirm that Intrusive Results are on file listing items recovered from all investigated anomalies and acceptance and feedback process has been performed. Validation; Ensure dig sheet data are complete and adequately describe the dig results, including the correct item type, MEC type, nomenclature, description, quantity, and post dig response, for all listed items; ensure that items "left in place" are clearly noted and described; ensure that anomalies not investigated are clearly noted and explained.	UXOQCS HGL Project Geophysicist / QC Geophysicist	Intrusive Results
Explosives Storage and Transport	SOP 501.01	Verification; Confirm that DD Form 1348-1As are on file spanning the duration of the project. Validation; Ensure all MDAS handled and transported off site is accounted for and that the CoC for those transfers is correctly documented.	SUXOS and UXOQCS	DD Form 1348-1A
		Verification; Verify that Explosives Usage Records are on file for all demolition operations conducted during the project. Validation; Ensure the record of each demolition event agrees with the related Magazine Data Card entries.	SUXOS	Explosives Usage Record
		Verification; Verify that the inventory records are on file for all magazines spanning the duration of the project. Validation; Ensure the record of each demolition event agrees with the related Explosive Usage Records; ensure that there is no remaining inventory of donor explosives.	SUXOS	Magazine Data Card

WORKSHEET #35 (CONTINUED)
DATA VERIFICATION PROCEDURES FOR MEC-RELATED TASKS

Activity and Records Reviewed	Requirements/ Specifications	Process Description/Frequency	Responsible Person	Documentation
Demolition Operations	SOP 502.01	Verification; Verify that Demolition Summary Sheet is on file for demolition operations conducted during the project. Validation; Ensure all MEC destroyed by demolition and all demolition events are listed.	SUXOS	Demolition Summary Sheet
		Verification; Verify that the shot records are on file for all demolition operations conducted over the duration of the project. Validation; Ensure the record of each demolition event agrees with the related dig sheet or Magazine Data Card entries.	SUXOS	Demolition Shot Record
DFW 9: MEC/MPPEH Certification, Handling and Disposal	QAPP; SOP 504.01	Verification; Verify that MDAS Disposal Documentation have been received and are on file for all MDAS shipped off site during the project. Validation; Ensure disposal documents account for all shipments of MDAS transported off site and they certify the disposal of the material IAW project requirements.	SUXOS	MDAS disposal documentation

WORKSHEET #37
DATA USABILITY ASSESSMENT FOR MEC

37.0 The DUA is an evaluation based on the results of data verification and validation in the context of the overall project decisions or objectives. The assessment determines whether the project execution and resulting data meet the project DQOs (see WS #11) for MEC-related tasks. All types of data (e.g., surface clearance, DGM, intrusive, etc.) will be considered with the ultimate goal of assessing whether the final, qualified results support the decisions to be made with the data. The following sections summarize the processes to determine whether the collected data are of the right type, quality, and quantity to support the environmental decision-making for the project and describes how data quality issues will be addressed and how limitations of the use of the data will be handled.

37.1 SUMMARY OF USABILITY ASSESSMENT PROCESSES

37.1.1 Data gaps may be present if (1) data are not collected, (2) data are not evaluated with regard to the necessary parameters, or (3) data are determined to be unusable. The need for further investigation or corrective action will be determined on a case-by-case basis, depending on whether data can be recovered, extrapolated from other data, and/or whether the missing data are needed based on the results of other recorded data. Once completed the data usability report will be included as an appendix to the SSFR.

37.1.2 DUAs will be completed at two stages during the project: (1) after DGM data collection and target selection and (2) following the completion of the intrusive investigation. The completed DUAs will be included in the final report.

37.1.3 The following individuals will participate in the DUA:

(1) USACE PM
(2) HGL PM
(3) Project QA manager
(4) Project Geophysicist
(5) QC Geophysicist
(6) Field Geophysicist (lead)
(7) USACE Geophysicist
(8) SUXOS
(9) UXOQCS
(10) Technical Manager
(11) Other technical personnel as necessary

37.1.4 The following documents will be reviewed as part of the DUA:

(1) QAPP
(2) Contract specifications
(3) QASP
(4) DQCRs
(5) Weekly QC Reports

(6) Weekly DGM Data Deliverable
(7) IVS Technical Memorandum
(8) Target lists
(9) Intrusive information
(10) Analog removal grid (or area) records

37.1.5 The DUA will follow a four-step process:

(1) Review the project objectives and sampling design:
   a. Are the DQOs (WS #11) still applicable?
   b. Are the underlying assumptions in the DQOs still valid?
   c. If the DQOs have been changed, have the changes been documented?
   d. Is the sampling design consistent with project objectives?
(2) Review the data verification and validation outputs:
   a. Have the data been verified and validated as described on WS #35?
   b. Are there impacts from non-conformance on data usability?
(3) Document data usability, update the CSM, and draw conclusions:
   a. Have the DQOs been achieved?
   b. Can the data be used as intended, considering implication of deviations and corrective actions?
   c. Are there limitations on data use?
   d. What new information can we add to the CSM?
   e. Update the CSM and document usability conclusions in the data usability summary report.
(4) Document lessons learned and make recommendations:
   a. Could the DQOs, MPCs, or sampling design have been improved for similar future studies?
   b. Summarize lessons learned and make recommendations for changes.

37.1.6 During data validation (WS #35 and #36), non-conformances will be documented, and data will be qualified accordingly. All data are usable as qualified by the relevant HGL personnel, with the exception of rejected data. The data are considered usable if the relevant MPCs are achieved and both the verification and validation steps are considered to have yielded acceptable data. During verification and validation steps, data may be qualified by the person validating the data. Qualifiers are typically intended to indicate minor QC deficiencies, which will not affect the usability of the data. All qualifiers will be documented in the Data Usability Report and SSFR. When major QC deficiencies are encountered, data will be rejected and, in most cases, will not be considered usable for making project decisions. Where applicable, project data will be checked to ensure that values and any relevant qualifiers are appropriately

transferred to the project electronic database. Deviations from the UFP-QAPP will be reviewed to assess whether corrective action is warranted and to assess impacts on achievement of DQOs.

37.2 USABILITY ASSESSMENT DOCUMENTATION

37.2.1 Results will be reported for quality assessment in the Detection Survey Data Usability Report completed after EM61-MK2 data collection and interpretation (Table 37.1) and the MEC Data Usability Report (Table 37.2), which will be completed after intrusive investigation of the survey area(s). Each Data Usability Report will document the Usability Assessment based on the four-step process described above. The assessment will include whether each data element has been verified and validated according to WS #35, whether the DQOs (WS #11) and MPCs (WS #12) have been attained, and whether the data can be used as intended.

Table 37.1
Data Usability Assessment for Dynamic EM61-MK2 Data

STEP 1: PROJECT OBJECTIVES AND SAMPLING DESIGN			
Evaluation	**Yes/No**		**Comments (1)**
Are the relevant DQOs, MPCs, and MQOs for dynamic data still applicable?			
If relevant DQOs, MPCs, or MQOs for dynamic data have changed, are changes documented?			
Is the dynamic sampling design consistent with project objectives?			
STEP 2: REVIEW THE DATA VERIFICATION AND VALIDATION OUTPUTS			
Activity	**DFW 3 and 4: (3) IVS Construction and Sensor Operation Verification and (4) Blind Seeding**		
Data Output/ Record	**Verified? (Y/N)**	**Validated? (Y/N)**	**Briefly Describe How the Data Output Supports Verification and/or Validation of the Activity (2)**
IVS Technical Memorandum: EM61-MK2			
Production Area QC Seed Report			
Activity	**DFW 5 and 6: (5) Conduct Detection Survey and (6) Process DGM Data and Target Selection**		

Table 37.1 (Continued)
Data Usability Assessment for Dynamic EM61-MK2 Data

Data Output/ Record	Verified? (Y/N)	Validated? (Y/N)	Briefly Describe How the Data Output Supports Verification and/or Validation of the Activity (2)
DGM Data Deliverable(s)			
DGM QC Deliverable(s)			
RCA/NCR(s)			
FCR(s)			
Weekly Geophysical QC Reports			
Seed Tracking Log			
IVS Technical Memorandum (Target Selection Criteria)			
STEP 3: DOCUMENT DATA USABILITY, UPDATE CSM AND DRAW CONCLUSIONS			
Evaluation	**Yes/No**	**Comments (1)**	
Have the relevant DQOs/MPCs for dynamic data been met?			
Can the dynamic data be used as intended?			
Are there limitations on dynamic data use?			
Is there new information to be added to the CSM and, if so, does the CSM need to be updated?			

Table 37.1 (Continued)
Data Usability Assessment for Dynamic EM61-MK2 Data

STEP 4: DOCUMENT LESSONS LEARNED AND MAKE RECOMMENDATIONS		
Evaluation	**Yes/No**	**Comments (1)**
Should the DQOs, MPCs, or sampling design be updated for future delivery units?		
Are there other recommendations for future delivery units?		

(1) Comments should be added as required to clarify the conclusions of the evaluation steps. References should be included to records, if appropriate.
(2) References should be included to records, if appropriate.

Table 37.2
MEC Data Usability Report

STEP 1: REVIEW PROJECT OBJECTIVES AND SAMPLING DESIGN			
Evaluation	**Yes/No**	**Reference(1)**	**Comments(2)**
Are the DQOs and MPCs still applicable?			
Are the underlying assumptions in the DQOs and MPCs still valid?			
If DQOs or MPCs have been changed, are the changes documented?			
Is the sampling design consistent with project objectives?			
STEP 2: REVIEW THE DATA VERIFICATION AND VALIDATION OUTPUTS AND EVALUATE CONFORMANCE TO MPCs (Data Inputs listed on Worksheet #34)			
Evaluation	**Yes/No**	**Reference(1)**	**Comments(2)**
Have the data been verified?			
Have the data been validated?			
STEP 3: DOCUMENT DATA USABILITY, UPDATE THE CSM, AND DRAW CONCLUSIONS			
Evaluation	**Yes/No**	**Reference(1)**	**Comments(2)**
Have the DQOs been achieved?			
Can the data be used as intended?			
Are there limitations on data use?			
Has the CSM been updated with any new information?			
STEP 4: DOCUMENT LESSONS LEARNED AND MAKE RECOMMENDATIONS			
Evaluation	**Yes/No**	**Reference(1)**	**Comments(2)**
Could the DQOs, MPCs, or sampling design have been improved for similar future studies?			
Have lessons learned and recommendations been documented?			

(1) The reference field lists the primary location in the SSFR or DUA where related data are presented, along with any sections of the report where the validation of that data are discussed.
(2) The comments field presents a brief explanation of any issues. Note that any such issues may be further explained in other parts of the DUA.

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APPENDIX A
ACCIDENT PREVENTION PLAN

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APPENDIX A
ACCIDENT PREVENTION PLAN

REMOVAL ACTION
FORT JACKSON NATIONAL CEMETERY
COLUMBIA, SOUTH CAROLINA

Prepared for:

U.S. Army Corps of Engineers
U.S. Army Engineering and Support Center, Huntsville

Contract No. W912DY-17-D-0004
Delivery Order No. W912DY19F0217

August 2019

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EMERGENCY CONTACT INFORMATION

In case of emergency or unplanned situation, contact the appropriate responder from the list below. This list precedes this Accident Prevention Plan for quick reference.

- In emergency situations, contact the site Point of Contact (POC) who will then contact the appropriate response teams.
- If a serious, life threatening emergency arises, contact emergency personnel before contacting the site POC.

EMERGENCY TELEPHONE NUMBERS AND PROJECT CONTACTS

Emergency Medical Care		
Hospital: Prisma Health Richland Hospital 5 Medical Park Rd Columbia, SC 29203	Emergency 911 or (803) 751-4444 Non-emergency (803) 434-7000	
National Poison Control Center	(800) 222-1222	
National Response Center Environmental Emergencies	(800) 424-8802	
Federal Occupational Safety and Health Administration (OSHA) Emergency Hotline	(800) 321-6742	
Emergency Numbers		
Fire Fire Department – Columbia Fire Department	Emergency Non-emergency	911 (803) 545-3700
Police Richland County Sheriff's Department	Emergency Non-emergency	911 (803) 576-3000
USACE		
USACE Contracting Officer	Jeffrey Henderson	(256) 895-3953
USACE Contracting Officer's Representative (COR)	Amy Doss	(256) 895-1979
Fort Jackson National Cemetery		
Director	Gene Linxwiler	Gene.Linxwiler@va.gov
Assistant Director	Robert Bryson	Robert.Bryson@va.gov
HGL Contacts		
Health and Safety 24/7 Emergency Number		(800) 341-3647
HGL Program Manager	Janardan Patel	(703) 736-4509
HGL Project Manager	Derek Anderson	(706) 372-5138
Corporate Quality Management Representative	Neil Feist	(256) 714-5808
Senior UXO Supervisor (SUXOS)/UXO Safety Officer (UXOSO)	To Be Determined (TBD)	TBD
Corporate Health and Safety Director	Stephen Davis Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP)	(865) 659-0499
Project CIH/Safety and Health Manager (SHM)	Edie Scala-Hampson CIH, Certified Hazardous Materials Manager (CHMM)	(847) 409-6384
HGL Corporate Occupational Physician *WorkCare 24-hour hotline nurse	Dr. Peter Greaney, MD	(714) 978-7488, ext. 114 *(888) 449-7787
WorkCare 24/7 Incident Intervention service (First aid and injury management guidance)	To be contacted for all work-related injuries and illnesses.	(888) 449-7787

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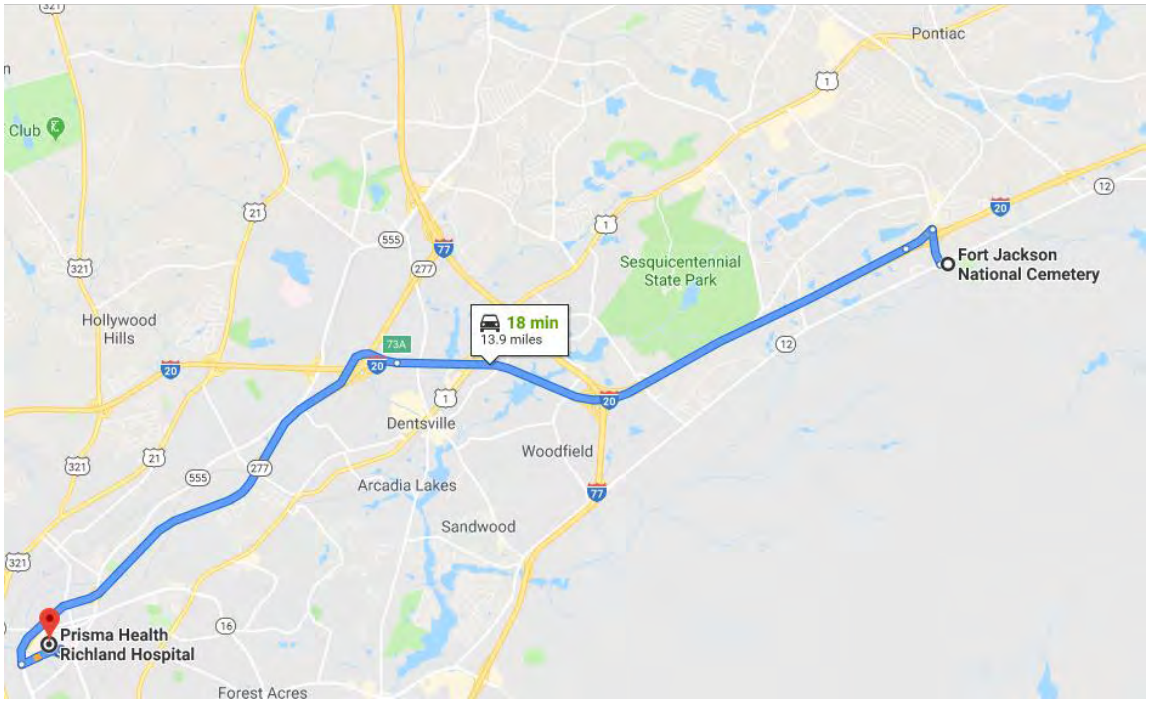
Directions to Prisma Health Richland Hospital

The Prisma Health Richland Hospital is located at 5 Medical Park Rd, Columbia, SC 29203

From the Fort Jackson National Cemetery on Percival Road: Approximately 18 minutes

- Head southwest on SC-12 W toward S-40-52/Clemson Rd/State Rd S-40-2033 – 404 feet
- Turn right onto S-40-52/Clemson Rd/State Rd S-40-2033 – 0.4 miles
- Sharp left to merge onto I-20 W toward Columbia – 0.4 miles
- Merge onto I-20 W – 6.3 miles
- Take exit 73A to merge onto SC-277 S toward Columbia – 5.9 miles
- Turn left onto Harden Street Extension (signs for Bull St/SC-277 S) – 0.5 miles
- Turn left onto Broad St – 210 feet



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LIST OF ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AHA	activity hazard analysis
ANSI	American National Standards Institute
APP	Accident Prevention Plan
CDC	Centers for Disease Control and Prevention
CDHS	Corporate Director of Health and Safety
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CFR	Code of Federal Regulations
CHMM	Certified Hazardous Materials Manager
CIH	Certified Industrial Hygienist
COR	Contracting Officer's Representative
CPR	cardiopulmonary resuscitation
CS	Construction Support
CSP	Certified Safety Professional
CWM	chemical warfare materiel
DA	Department of the Army
dBA	A-weighted decibels
DDESB	Department of Defense Explosives Safety Board
DEET	N,N-Diethyl-m-toluamide
DFW	definable feature of work
DGM	digital geophysical mapping
DoD	U.S. Department of Defense
ECT	equivalent chill temperature
EM	Engineer Manual
EMS	emergency medical service
EZ	Exclusion Zone
°F	degrees Fahrenheit
FJNC	Fort Jackson National Cemetery
GDA	government designated authority
H&S	health and safety
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCP	Hazard Communication Program
HGL	HydroGeoLogic, Inc.
HSP	Health and Safety Program
IAW	in accordance with
IDW	investigation derived waste
m	meter

MD	munitions debris
MDAS	material documented as safe
MEC	munitions and explosives of concern
MPPEH	material potentially presenting an explosive hazard
NCR	Nonconformance Report
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PM	Project Manager
POC	point of contact
PPE	personal protective equipment
QA	quality assurance
RAC	risk assessment code
SDS	Safety Data Sheet
SHM	Safety and Health Manager
SOP	standard operating procedure
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SUXOS	Senior Unexploded Ordnance Supervisor
TBD	to be determined
TLV	threshold limit value
TSM	tailgate safety meeting
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer
WBGT	wet-bulb globe temperature

ACCIDENT PREVENTION PLAN ACKNOWLEDGMENT

I have read, understand, and agree to abide by the provisions as detailed in this Accident Prevention Plan prepared by HGL. Failure to comply with these provisions may lead to disciplinary action that may include dismissal from the work site, termination of employment or, for subcontractors, termination of the work contract.

Printed Name	**Company**	**Signature**	**Date**

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1.0 SIGNATURE SHEET

1.1 PLAN PREPARED BY

Dusty Easton Digitally signed by Dusty Easton
DN: cn=Dusty Easton, o=HGL, Inc., ou, email=deaston@hgl.com, c=US
Date: 2019.05.17 16:28:28 -05'00'

Date: _____

Dusty Easton
MMRP QC and Safety Manager
HydroGeoLogic, Inc.
(256) 970-2109

1.2 PLAN APPROVAL

Janardan J Patel Digitally signed by Janardan J Patel
DN: cn=Janardan J Patel, o=HGL, ou=ECD, email=jpatel@hgl.com, c=US
Date: 2019.05.20 08:15:55 -04'00'

Date: May 20, 2019

Janardan Patel
Program Manager
HydroGeoLogic, Inc.
(703) 736-4509

1.3 PLAN CONCURRENCE

Scala-Hampson, Edie Digitally signed by Scala-Hampson, Edie
Date: 2019.05.17 16:15:55 -05'00'

Date: _____

Edie Scala-Hampson CIH, CHMM
Project CIH
HydroGeoLogic, Inc.
(847) 409-6384

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2.0 BACKGROUND INFORMATION

This Accident Prevention Plan (APP) and accompanying Site Safety and Health Plan (SSHP) (Attachment A1) describe the safety program that will be implemented during the Removal Action at the Fort Jackson National Cemetery, Columbia, South Carolina (site location maps are provided in Appendix J of the Quality Assurance Project Plan [QAPP]). This APP was prepared in accordance with (IAW) U.S. Army Corps of Engineers (USACE) Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual, Appendix A, Minimum Basic Outline for APPs, and Data Item Description HNC-001.

The purpose of this APP is to establish the site-specific safety and health procedures, practices, and equipment to be used to protect field personnel from potential hazards associated with project site activities that may be suspect of containing munitions and explosives of concern (MEC). The APP assigns responsibilities, establishes standard operating procedures (SOPs), and provides contingency plans for situations that may arise during field activities. The project involves the following:

- Mobilization/demobilization
- General site work
- MEC clearing and grubbing
- MEC avoidance – survey escort
- DGM collection
- MEC subsurface clearance
- MEC scrap inspection and handling
- MEC movement within the project area
- MEC disposal
- MPPEH processing
- Vehicle operations

All activities involving work in areas potentially containing unexploded ordnance (UXO) hazards will be conducted in full compliance with USACE, Department of the Army (DA), and U.S. Department of Defense (DoD) safety standards, and with state and local safety requirements regarding personnel, equipment, and procedures.

2.1 CONTRACT TEAM

HydroGeoLogic, Inc. (HGL) (Corporate Office)
11107 Sunset Hills Road
Suite 400
Reston, Virginia 20190
(703) 478-5186

2.2 CONTRACT NUMBER

W912DY-17-D-0004

2.3 PROJECT NAME

Removal Action at Fort Jackson National Cemetery, Columbia, South Carolina.

2.4 PROJECT

The objective of this project is to remove MEC and MPPEH, to include MD at Fort Jackson National Cemetery (FJNC) to enable these areas to be rendered usable for cemetery construction development and follow-on construction support (CS).

2.4.1 Project Description

FJNC was established in 2008 following the transfer of land by the U.S. DoD to the National Cemetery Administration. The transferred land is on the north border of Fort Jackson and was previously used for field training exercises. Portions of FJNC overlap with former safety fans of 1950's era mortar ranges, and small arms range fans.

2.4.2 Description of Work to be Performed

The HGL Team will perform a clearance utilizing intrusive investigation techniques to remove MEC and MPPEH material from the cemetery construction footprint. The clearance area will be identified by establishing a temporary grid network over the cemetery construction footprint.

2.4.3 Project Map

The location of the project site is shown on Figure 2.1.

2.4.4 Equipment to be Used

Major equipment to be used during the project consists of:

- Pickup trucks or equivalent
- Handheld global positioning system
- DGM equipment
- Analog geophysical detectors
- Hand tools
- Remote firing device for demolition

2.4.5 Anticipated High Risk Activities

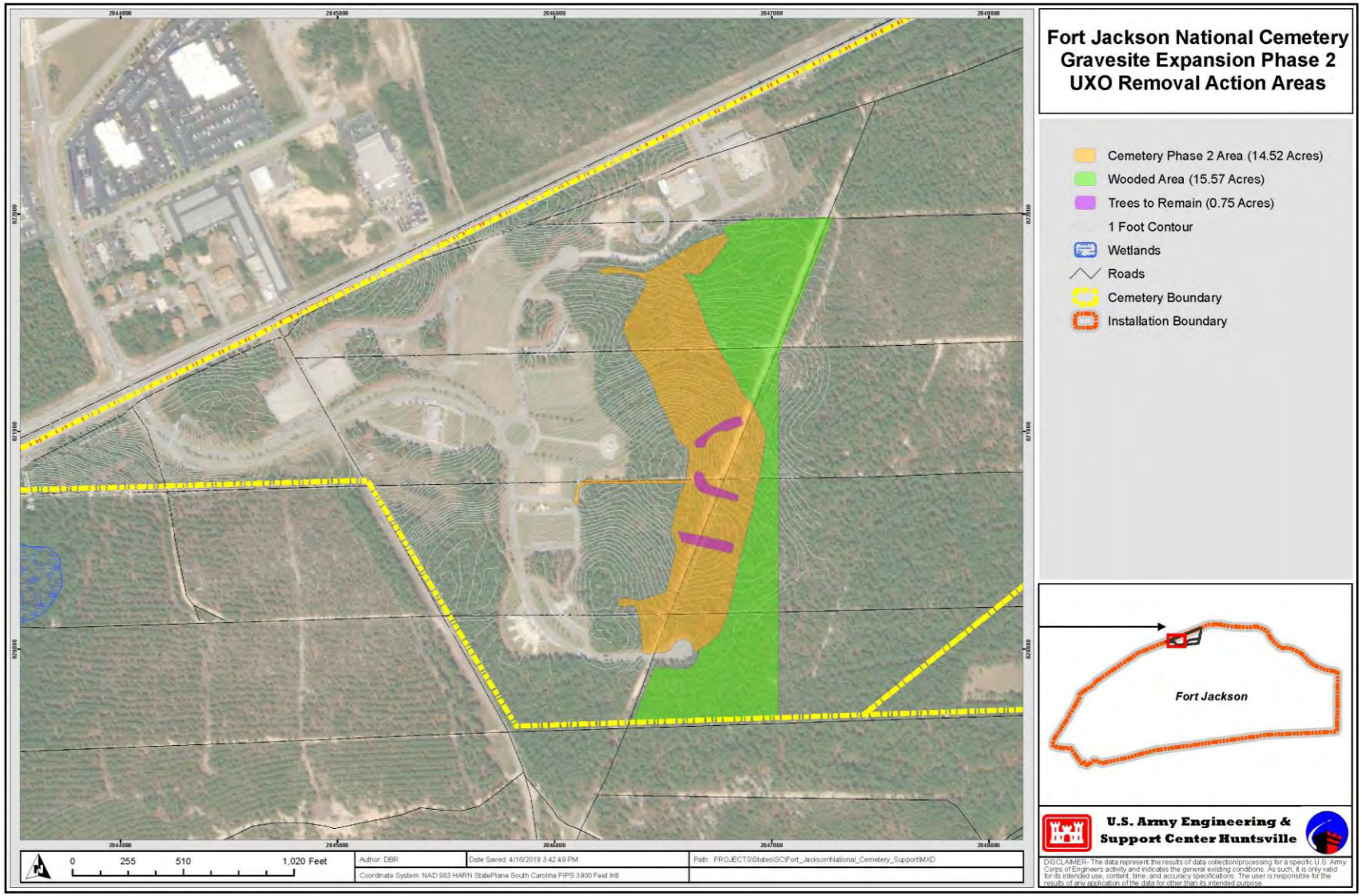
Anticipated high risk activities are intrusive investigation of MEC/MD and demolition of MEC. These risks are managed with proper techniques, procedures, and UXO-trained personnel.

2.5 MAJOR PHASES OF WORK AND HAZARDOUS ACTIVITIES

Activity hazard analysis (AHA) forms for each planned activity are presented in Attachment A2 of this APP. A detailed description of field activities rationale and procedures are presented in the QAPP.

- Mobilization/demobilization
- General site work
- MEC avoidance – survey escort
- Vegetation removal
- DGM collection
- MEC subsurface clearance
- MEC scrap inspection and handling
- MEC movement within the project area
- MEC disposal
- MPPEH processing
- Vehicle operations

Figure 2.1 Project Map



OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 2018

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

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

Form approved OMB no. 1218-0176

Establishment name HydroGeologic, Inc.

City Reston State VA

Identify the person				Describe the case		Classify the case											
						CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Enter the number of days the injured or ill worker was:		Check the "Injury" column or choose one type of illness:					
(A) Case No.	(B) Employee's Name	(C) Job Title (e.g., Welder)	(D) Date of injury or onset of illness (mo./day)	(E) Where the event occurred (e.g. Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch)	Death	Days away from work	Remained at work		Away From Work (days)	On job transfer or restriction (days)	(M) Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All other illnesses
								Job transfer or restriction	Other recordable cases								
						(G)	(H)	(I)	(J)	(K)	(L)	(1)	(2)	(3)	(4)	(5)	(6)
					Page totals	0	0	0	0	0	0	0	0	0	0	0	0

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

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

Page 1 of 1

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

Figure 2.2 OSHA Forms 300 and 300A

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Year 2018

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

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	0	0
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
0	0
(K)	(L)

Injury and Illness Types

Total number of... (M)			
(1) Injury	0	(4) Poisoning	0
(2) Skin Disorder	0	(5) Hearing Loss	0
(3) Respiratory Condition	0	(6) All Other Illnesses	0

Establishment information

Your establishment name HydroGeologic, Inc.

Street 11107 Sunset Hills Road, Suite 400

City Reston State Virginia Zip 20190

Industry description (e.g., Manufacture of motor truck trailers)
Remediation Services

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

OR North American Industrial Classification (NAICS), if known (e.g., 336212)
5 6 2 9 1 0

Employment information

Annual average number of employees 300

Total hours worked by all employees last year 600,000

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Scott Schulein — Company executive

COO — Title

703-478-5188 — Phone

Date

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave. NW, Washington, DC 20210. Do not send the completed forms to this office.

Figure 2.2 OSHA Forms 300 and 300A (Continued)

3.0 STATEMENT OF SAFETY AND HEALTH POLICY

3.1 CORPORATE SAFETY AND HEALTH POLICY

HGL
HydroGeoLogic, Inc
Exceeding Expectations

HGL's Commitment to Employee Health and Safety

HydroGeoLogic, Inc. (HGL) is committed to providing safe and healthful working conditions for our employees, as well as protecting our subcontractors, the communities where we work, and the environment. HGL promotes sound safety practices based on the identification and control of Occupational Health and Safety risks where our employees work. We do this by effective project and task planning; by staffing our projects with knowledgeable and skilled professionals; by carefully selecting our subcontractors and business partners; by executing projects according to approved plans; by monitoring performance, and by reviewing and updating programs and procedures annually and when new potential risks are identified. As an organization, HGL is dedicated to:

- Implementing a health and safety management system in conformance with ANSI standard Z10 American National Standard for Occupational Health and Safety Management Systems.
- Protecting the safety and health of our employees through anticipation, recognition and control of hazards in the workplace. We assess the hazards of each new task, identify effective hazard controls, document the hazard controls, train personnel on hazard controls, and monitor work in progress to verify that hazard controls are implemented and are effective.
- Complying with applicable health and safety regulations and client requirements everywhere we operate.
- Ensuring our commitment to employee health and safety is an integral aspect of our culture and our services.
- Enabling and encouraging all personnel to report incidents and potentially unsafe conditions and to stop work, as needed, to prevent accidents.
- Investigating incidents, identifying effective improvements, and tracking completion of improvement actions to minimize the probability of future incidents.
- Measuring and reviewing our progress, at the senior management level, monthly and annually and striving for continuous improvement.

HGL applies the following principles to all of its work:

- All levels of management are responsible and accountable for providing the resources and leadership required to ensure a positive and safe work environment.
- Working safely is a condition of employment.
- Safety and the prevention of injuries is everyone's responsibility.
- Training and supporting employees to perform their work safely is essential.

By integrating health and safety considerations into all aspects of HGL's business, we protect our employees and clients while achieving sustainable growth and productivity.

Peter S. Huyakorn
Peter S. Huyakorn, Ph.D.
President

2/1/2019
Date

3.2 HEALTH AND SAFETY PROGRAM GOALS

The HGL Team considers worker safety a priority and has established a goal of zero incidents throughout the company. The HGL Team strives to provide the education and tools required to deliver a safe and compliant work environment for its employees, project personnel, subcontractors, and the general public as the nature of the work allows. The Health and Safety Program (HSP) includes written policies and procedures; new employee orientation; project-specific training, refresher training, and customized classes; a project-specific medical monitoring program, worker exposure monitoring; an incident reporting system that includes reporting and evaluating near misses; review and approval of subcontractors' health and safety (H&S) performance prior to hiring; and annual management-level H&S performance goals and objectives.

3.3 SAFETY PROGRAM OBJECTIVES

The HGL Team's safety program goals, safety performance objectives, and accident experience objectives are as follows:

- The written safety program as reflected in the APP, SSHP, and AHAs will conform to the standards and expectations of the HGL Team, meet client needs and expectations, and comply with applicable regulations and consensus standards required by USACE EM 385-1-1.
- Permanent and temporary staff assigned to work at HGL Team sites will have read, understood, been given the opportunity to question, and signed off on these safety program documents. The HGL Team and subcontractor staff will be briefed by the appropriate safety and health official before starting new or nonroutine tasks on the field conditions to be faced, the tasks to be performed, the hazards expected, and the control methods that will be used to eliminate or control those hazards to an acceptable level of risk.
- No employee or subcontractor will be allowed to work on a task unless they have been trained and/or certified IAW regulatory requirements and approved for safety-related responsibilities by the Site Safety and Health Officer (SSHO)/UXO Safety Officer (UXOSO).
- Safety equipment will be inspected within the frequency prescribed by the manufacturer, this APP, regulatory and consensus standards, and EM 385-1-1. These inspections will be documented.
- The goal is for this project to proceed without accidents and injuries. This goal can be achieved if work is planned, the employees are properly equipped and trained, and management provides proper leadership and support.

3.4 CONTRACTOR ACCIDENT EXPERIENCE

All HGL offices have received National Safety Council Perfect Record and "Occupational Excellence" Awards for our most recent safety performance. HGL had zero lost time injuries in 2018.

HGL qualified for the National Safety Council awards by demonstrating our ability to implement actions discussed in our H&S policy statement, such as including safety in task planning, staffing our projects with knowledgeable and skilled personnel, selecting good subcontractors, and by managing our work to ensure that it is conducted safely. HGL achieved a rate of lost time injuries and illnesses that was less than one-half of the average for similar companies, as reported by the Bureau of Labor Statistics. Companywide, HGL had no recordable injuries in 2018. This excellent safety performance was achieved through the diligent efforts of our management teams to identify and control hazards and through the prudent execution of our work by project personnel.

HGL takes great pride in the Perfect Record awards because they reflect HGL's successful teamwork in preventing serious work-related injuries and illnesses and achieving our goal of continuous improvement. HGL also takes pride in these awards because they distinguish the company from competitors.

HGL has successfully implemented a safety management system including management involvement, hazard recognition, hazard control, and employee input. The safety management system has been used to develop and implement our safety and health program and manage risks by defining responsibilities, practices, procedures, processes, resources and setting objectives. Occupational Safety and Health Administration (OSHA) 300 and 300 A forms are included as Figure 2.2.

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4.0 RESPONSIBILITIES AND LINES OF AUTHORITY

The HGL Team will manage H&S activities on this project IAW its corporate H&S procedures and project-specific documents.

The HGL Team's HSP is detailed in the Corporate H&S Manual, available in print or electronically, and implemented/overseen by the HGL Team's Corporate Director of Health and Safety (CDHS), Stephen Davis, Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP). HGL Team managers and employees are expected to conduct business in compliance with governmental environmental and safety regulations, client programs, and company policies and procedures. The "rules of construction" for subcontractors apply, as specified in 29 Code of Federal Regulations (CFR) 1926.16.

4.1 ULTIMATE AUTHORITY

This section provides information on the project team, particularly those with worker H&S responsibilities, Competent Persons, and the lines of authority for implementing this APP/SSHP. The HGL Team has ultimate responsibility for the implementation and enforcement of the HSP for our own employees, all sub-contractors and all others on HGL Team worksites.

All HGL Team members and subcontractor staff have stop-work authority, i.e., the authority to temporarily stop work if they observe an unsafe act or condition.

Job Responsibilities

HGL, as the prime contractor, will manage H&S activities on this project IAW its corporate H&S procedures and project specific documents. HGL's HSP is detailed in the Corporate H&S Manual, available in print or electronically, and implemented/overseen by HGL's CDHS, Stephen Davis, CIH, CSP.

4.2 IDENTIFICATION AND ACCOUNTABILITY OF PERSONNEL RESPONSIBLE FOR SAFETY

Key project personnel include the following:

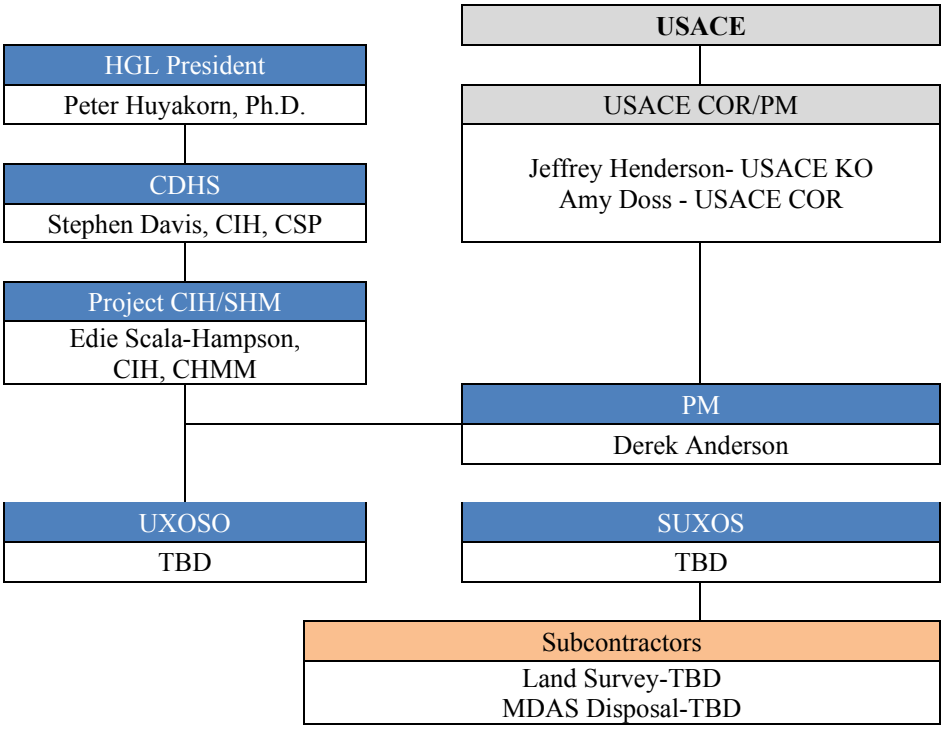
- Project Manager (PM): Derek Anderson
- HGL Team Senior UXO Supervisor (SUXOS): to be determined (TBD)
- HGL Team UXOSO: TBD
- CDHS: Stephen Davis, CSP, CIH
- Project CIH/Safety and Health Manager (SHM): Edie Scala-Hampson, CIH, Certified Hazardous Materials Manager (CHMM)

HGL's Occupational Medicine Physician is Peter Greaney, MD, President of WorkCare, Inc.

Applicable certifications for key field project personnel responsible for safety are included in Attachment A3 of the APP.

HGL Team policies and procedures regarding noncompliance with safety requirements follow Human Resources Policy No. 45, *Performance Improvement Plan Policy*, which involves a three-step process of identification, performance improvement, and employment action. Employees who violate a company policy, whose actions pose a threat to co-workers, whose actions constitute harassment, or who violate the law may have their employment terminated without following the HGL Team Performance Improvement Policy.

The lines of authority and communication for this task order are presented on Figure 4.1. The PM has the overall responsibility for this project and will execute the contract in a manner consistent with this APP/SSHP and other contract-specific requirements. The PM will coordinate with the SUXOS, UXOSO, and SHM/CDHS to complete the work in a manner consistent with this APP/SSHP.



Notes:

COR – Contracting Officer's Representative
MDAS – material documented as safe
QA – quality assurance

Figure 4.1 Lines of Authority

The SUXOS directs site activities IAW the approved QAPP, the APP/SSHP, and all federal, state, and local laws and regulations. The SUXOS is responsible for maintaining contact with the PM and the HGL Team SHM/CDHS for matters regarding project H&S. The SUXOS reports to the PM.

The UXOSO will monitor and confirm that operations are conducted IAW this APP/SSHP, USACE requirements, and OSHA regulations. The UXOSO communicates with the PM on

technical matters during execution of project activities but reports directly to the SHM/CDHS or Project CIH on functional issues regarding safety.

4.2.1 All Personnel

Each person is responsible for completing tasks in a safe manner and for reporting any unsafe acts or conditions to the UXOSO. All persons on site are responsible for continuous adherence to the APP/SSHP provisions during the performance of project work. All employees/personnel have the authority and responsibility to stop work on the site if an imminent hazard is observed. Even when a hazard is not imminent, employees/personnel should intercede if unsafe behavior or conditions are observed.

All HGL Team and subcontractor personnel are required to read and acknowledge their understanding of this APP by signing the APP acknowledgment form of this document and by cooperating with project management to ensure a safe work site.

4.2.2 Program and Project Manager

The HGL Team PM is the single point of contact (POC) with the USACE Contracting Officer's Representative (COR)/PM. The HGL Team PM has overall responsibility for the H&S of personnel on the project, including:

1) Ensuring the project team adherence to company policy and this APP/SSHP;
2) Confirming the proper review and distribution of H&S documents;
3) Communicating with the UXOSO/CDHS for any variances or modifications in a timely manner;
4) Verifying that HGL Team personnel assigned to the project:
    a. Are current participants in the medical surveillance program,
    b. Have a current (within the last calendar year) respiratory fit test (if applicable), and
    c. Have completed required safety and health training.
5) Determining that subcontractors have submitted required H&S documents to the SSHO/UXOSO; and
6) Maintaining and reporting records of exposure hours and work-related accidents, injuries, and illnesses of HGL Team and subcontractors.

4.2.3 Certified Industrial Hygienist/Corporate Health and Safety Director

The SHM/CDHS and/or Project CIH will advise the PM and UXOSO on safety and health issues that may have an impact on project operations, and provide technical assistance to the project team, based upon a review of the APP/SSHP and contributing documents. The SHM/CDHS or Project CIH is also responsible for reviewing and approving the APP/SSHP, suggesting modifications to the APP/SSHP, and reviewing and approving all changes and updates suggested by the field team. In addition, the SHM/CDHS and/or Project CIH is responsible for the following:

- Providing general safety and health program administration;
- Conducting field safety and health audits for APP/SSHP conformance;
- Establishing air monitoring parameters based on expected contaminants;
- Establishing employee exposure monitoring notification programs;
- Establishing random and for cause drug and alcohol testing, as warranted;
- Providing technical assistance to the PM and the SUXOS/UXOSO;
- Investigating significant incidents, illnesses, and near-misses; and
- Providing support for evaluation of subcontractor actions as they pertain to protecting the safety and health of workers and the public.

4.2.4 Occupational Medicine Physician

The occupational physician's responsibilities include the following:

- Performing medical surveillance as directed by 29 CFR 1910.120;
- Determining if medical clearance per 29 CFR 1910.120 is needed on an annual or biennial basis;
- Providing medical review officer services for drug and alcohol test results review;
- Providing clinical consultation to injured employees before they go to an emergency room and consulting with treating physicians as necessary;
- Maintaining contact with injured employees to determine if there are issues or barriers to rapid healing, rehabilitation, and return to full duty status; and
- Providing technical support as needed for determination of project-specific medical monitoring.

4.2.5 Subcontractor Management and Personnel

The management organization of each subcontractor is responsible for the compliance of its personnel with applicable laws and regulations, applicable provisions of the HGL Team's APP, and site-specific SSHPs, and its own safety and health programs and AHAs. Subcontractors are directly responsible for the safety and health of their personnel. The HGL Team will communicate significant site hazards and recommended controls to the subcontractors; review and comment on H&S-related document submissions; and verify that subcontractor staff are qualified to safely complete their tasks. The HGL Team will monitor activities to confirm that subcontractors are performing their operations IAW the provisions of the HGL Team's APP/SSHP, relevant HGL Team AHAs, and the subcontractors' AHAs and contract documents. The HGL Team has the ultimate responsibility for the implementation of this APP/SSHP for its own employees, all sub-contractors and all others on the worksite. This includes the strict enforcement of the plan.

The APP/SSHP requirements that apply to HGL Team personnel (for example, training, substance abuse screening, and incident reporting) also apply to subcontractors and their field personnel.

Additional subcontractor safety responsibilities are detailed in Section 5.0.

4.2.6 On-Site Personnel and Visitors

A Site Entry Log for visitors will be maintained on site (Appendix F of the QAPP). Only authorized visitors, as described in EM 385-1-97, Section I.2.G.02 shall be allowed inside the Exclusion Zone (EZ) during operations. All persons entering the site during site operations must first sign in and be given a site hazard briefing. Any other visitors shall not enter the site while operations requiring an EZ are being conducted. Visitors will not be allowed within the regulated work areas without authorization from the SUXOS and the knowledge of the UXOSO.

4.2.7 Unexploded Ordnance Safety Officer

The UXOSO will be present at all times when field activities are being performed. The UXOSO will provide day-to-day safety and industrial hygiene support, provide site safety orientations, oversee air monitoring and training, confirm appropriate personal protective equipment (PPE) selection, conduct tailgate safety meetings (TSMs), conduct daily site safety inspections, confirm work zone delineations, verify training and medical clearances of on-site personnel, and report activities to the HGL Team PM and SHM/CDHS. Specific tasks assigned to the UXOSO include:

- Verifying that the APP/SSHP and AHAs are followed by the HGL Team and subcontractors;
- Verifying the training and medical clearances of HGL Team on-site personnel;
- Verifying that the specified PPE is available and used;
- Participating in accident/incident and near-miss investigations;
- Reviewing pertinent safety and health documentation from the field for compliance with this APP/SSHP;
- Updating and reviewing AHAs, as indicated;
- Developing a schedule for safety observations and inspection checklists;
- Establishing appropriate site control zones and controlling the entry and exit points;
- Conducting or presenting initial site training;
- Conducting and documenting regular update training (TSMs);
- Conducting site safety inspections (Section 7.1);
- Monitoring the field team for signs of thermal stress, fatigue, and exposure symptoms;
- Monitoring site weather conditions (heat, cold, inclement weather) and implementing hazard controls as needed;
- Knowing emergency procedures, evacuation routes, shelters, and telephone numbers;
- Reporting all near-miss, injury, illness, and vehicle accidents or incidents to the PM and SHM/CDHS within 24 hours, and confirming that an Accident Investigation Form is completed;

- Holding a safety stand-down meeting to conduct training at any time a deviation or degradation of safety warrants a review;
- Seeking guidance from the SHM/CDHS when unanticipated conditions develop; and
- Stopping work if any operation threatens worker or public safety or health.

The UXOSO is the main contact in any on-site emergency situation. The UXOSO is responsible for facilitating and coordinating the field implementation of the APP/SSHP and has the responsibility and authority to halt or modify hazardous activities or working conditions. The UXOSO has the authority to request (IAW the chain of command) removal from the site any person who refuses to comply with the APP/SSHP or whose behavior endangers his or her own safety, or the safety of others. Should the UXOSO become aware that a subcontractor's employee is not following the APP/SSHP, the UXOSO will notify the most senior member of the relevant subcontractor's field team and require that the subcontractor begin immediate corrective actions. The 30-hour OSHA card for the UXOSO/SSHO will be provided once selected.

4.2.8 SUXOS

The SUXOS is ultimately responsible for all MEC operations during project activities. The SUXOS acts as the field team UXO supervisor and is directly responsible for all MEC activities. The SUXOS is responsible for the following:

- Ensuring compliance with applicable DoD, DoD Explosive Safety Board (DDESB), USACE, federal, state, and local laws and regulations;
- Planning, coordinating, and supervising all on-site munitions response and operational range clearance activities;
- Supervising MEC teams;
- Assisting in development of project planning documents;
- Reviewing all field reports (for example, daily reports, audits) and approving MEC team reports;
- Evaluating, with the UXOSO, the risk of movement of MEC within a munitions response site or operational range and providing approval for movement when the risk of movement is determined to be acceptable; and
- Coordinating with the UXOSO in establishing planned ingress, egress, and routine vehicle footpath routes within the project area to avoid MEC hazards.

The SUXOS has the responsibility and authority to halt or modify any working condition and to remove from the site any person who refuses to comply with the APP/SSHP or whose behavior endangers his or her own safety or the safety of others. Should the SUXOS become aware that a subcontractor is not following the APP/SSHP, the SUXOS will notify the subcontractor and require that the subcontractor begin immediate corrective actions.

4.3 UXOSO 30 HOUR TRAINING

The UXOSO will have official OSHA 30-hour training. The UXOSO will be present at all times when field activities are being performed. If the UXOSO has to be off site for any reason the Alternate UXOSO or Designated Representative will provide and fulfill the same roles and responsibilities. The Alternate UXOSO or Designated Representative must meet the same qualifications/training requirements as the UXOSO/SSHO.

The UXOSO will provide day-to-day safety and industrial hygiene support; provide site safety orientations, oversee air monitoring, training and confirming appropriate PPE selection; conduct TSMs; conduct daily site safety inspections; confirm work zone delineations; verify training and medical clearances of all on-site HGL Team personnel; and report activities to the PM and SHM/CDHS. The UXOSO is the main contact in any on-site emergency. The UXOSO is responsible for facilitating and coordinating the field implementation of the APP/SSHP and has the responsibility and authority to halt or modify hazardous activities or working conditions. The UXOSO has the authority to request (IAW the chain of command) the removal from the site any person who refuses to comply with the APP/SSHP or whose behavior endangers his or her own safety, or the safety of others. Should the UXOSO become aware that a subcontractor's employee is not following the APP/SSHP, the UXOSO will notify the most senior member of the relevant subcontractor's field team and require that the subcontractor begin immediate corrective actions.

The UXOSO will oversee and conduct the job steps, such as briefings, training, and inspections involved with safety. Specific tasks assigned to the UXOSO include:

- Verifying the APP/SSHP and AHAs are followed by the HGL Team and subcontractors;
- Verifying the training and medical clearances of HGL Team on-site personnel;
- Verifying that the specified PPE is available and used;
- Participating in accident/incident and near-miss investigations;
- Reviewing pertinent safety and health documentation from the field for compliance with this APP/SSHP;
- Updating and reviewing AHAs, as indicated;
- Developing a schedule for safety observations and inspection checklists;
- Establishing appropriate site control zones and control the entry and exit points;
- Conducting or presenting initial site training;
- Conducting and documenting regular update training (TSMs);
- Conducting site safety inspections;
- Monitoring the field team for signs of thermal stress, fatigue, and exposure symptoms;
- Monitoring site weather conditions (heat, cold, inclement weather) and implementing hazard controls as needed;
- Knowing emergency procedures, evacuation routes, shelters and telephone numbers;

- Reporting all near-miss, injury, illness, and vehicle accidents or incidents to the PM and SHM/CDHS within 24 hours, and confirming that an Accident Investigation Form is completed;
- Holding a safety stand-down meeting to conduct training at any time a deviation or degradation of safety warrants a review;
- Seeking guidance from the SHM/CDHS when unanticipated conditions develop; and
- Stopping work if any operation threatens worker or public safety or health.

4.4 COMPETENT AND QUALIFIED PERSONS

A Competent Person, as defined by 29 CFR 1926.651(k)(1), is required to supervise activities requiring excavation and trenching, fall protection, scaffolding, permit-required confined space entry, and lockout/tagout.

EM 385-1-1 also has additional requirements for competent persons for: cranes and rigging, trainers, rescuers, equipment operators, Hazardous, Toxic, and Radioactive Waste competent persons (lead, asbestos control, radiation), site safety and occupational health, hazardous energy, PPE selection use and maintenance, and health hazard evaluation and control of chemical, physical and biological agents.

The SSHO will meet the administrative, educational, experience and training requirements detailed in Section 01.A.17.a-d of EM 385-1-1. The SSHO will have completed 40 hours of hazardous, toxic and radioactive waste training that meets 29 CFR 1910.120/29 CFR 1926.65 requirements for 40-hour initial, three days of supervised field experience, 8-hour supervisor training, and annual 8-hour refreshers. SSHOs will maintain competency through having taken 8 hours of documented formal, on-line, or self-study safety and health related coursework every year. The SSHO will also have official OSHA 30-hour Construction safety training. Subcontractors will provide licensing/qualifications of equipment operators and provide letters on company letterhead stating the competency on the equipment for which they are qualifying and the name of the qualified person.

4.5 RISK MANAGEMENT PROCESS

A Risk Management Process/Plan is required for every project. Detailed project-specific hazards and controls are provided by AHAs for each activity (definable feature of work [DFW]).

AHAs will be used to document a risk management process/plan by which the steps (procedures) required to accomplish a work activity/task are outlined and the actual/potential hazards of each step are identified. Safety measures, precautions and controls will be identified and put into place to reduce the level of hazard for each step. The risk assessment code (RAC) assigned to the entire activity is the highest RAC of all the steps in the AHA.

AHAs are intended to be created by the contractor field crews/workers performing the work, with the assistance of others (SSHO/UXOSO, SUXOS, sampling lead, etc.) as needed. They are living documents and are intended to be created in the field and updated (by the workers) as needed.

Once accepted, the AHA will updated in the field by the field crews so that it constantly reflects current equipment, personnel, conditions, PPE, etc. Government designated authority (GDA) acceptance of changes made to an AHA is not necessary as long as changes do not increase original RAC level for the activity, requirements are being met, and a copy is made available upon request.

4.6 ACTIVITY SPECIFIC AHA ACCEPTANCE

No work will begin on an activity (DFW) until the initial AHA has been accepted by the GDA.

4.7 COMPETENT PERSON REQUIREMENTS

No work will be performed unless the competent person (UXOSO) or the designated alternate competent person is present on the job site.

4.8 NONCOMPLIANCE WITH SAFETY REQUIREMENTS

The HGL Team's policies and procedures regarding noncompliance with safety requirements follow its Human Resources Policy No. 45, *Performance Improvement Plan Policy*, which involves a three-step process of identification, performance improvement, and employment action. Intentional or egregious acts that pose a threat to co-workers or violate legal requirements, may trigger immediate termination without following the HGL Team performance improvement policy.

4.9 LINES OF AUTHORITY

The lines of authority and communication for this task order are presented in Figure 4.1. The PM has the overall responsibility for this project and will execute the contract in a manner consistent with this APP/SSHP and other contract-specific requirements. The PM will coordinate with the SUXOS, SSHO/UXOSO, and SHM/CDHS to complete the work in a manner consistent with this APP/SSHP.

The SUXOS directs site activities IAW the approved QAPP, the APP/SSHP, and all Federal, state, and local laws and regulations. The SUXOS is responsible for maintaining contact with the PM and the HGL SHM/CDHS for matters regarding project H&S. The SUXOS reports to the PM.

The SSHO/UXOSO will monitor and confirm operations are conducted IAW this APP/SSHP, USACE requirements, and OSHA regulations. The SSHO/UXOSO communicates with the PM on technical matters during execution of project activities but reports directly to the SHM/CDHS or Project CIH with functional issues regarding safety.

4.10 MANAGEMENT ACCOUNTABILITY

Written H&S goals are developed annually for members of the senior, office, and project management team. The goals are designed to advance development of the HSP, involve all levels of employees, proactively address H&S issues, and reinforce accountability for staff H&S with the

management team. Management personnel are held accountable for completion of these goals and compensation is tied to the success of an individual's performance in meeting the goals.

The HGL Team holds managers and supervisors accountable for safety through implementation of H&S procedure number 1 "Health and Safety Management System" and corporate policy number 7 "Employee Performance Appraisals." Managers and supervisors' safety-related responsibilities are listed in H&S procedure 1 and the following is a partial list of those expectations:

- Be a role model for safety;
- Actively participate in H&S activities at all levels;
- Promptly address any unsafe conditions or unsafe acts;
- Report all accidents, incidents and near misses; and
- Implement disciplinary procedures as warranted, for those violating safety rules.

5.0 SUBCONTRACTORS

Subcontractors report to the HGL Team PM and SUXOS. Subcontractors conducting fieldwork on HGL Team projects will conform to the requirements of the HGL Team APP/SSHP. Subcontractors will review and accept the HGL Team APP/SSHP and prepare their own safety AHAs for presentation to the HGL Team PM at least 10 days before site mobilization. All AHAs must be reviewed/accepted by the government. The subcontractor must meet the requirements of this APP/SSHP and provide safety equipment and safeguards suitable for the tasks and hazards involved. Subcontractors must provide to their personnel the appropriate safety and health hazards and controls information for their project tasks.

The identified subcontractor personnel responsible for safety are listed in Table 5.1. The subcontractors' field supervisors and competent persons are responsible for performing daily safety inspections of their operations (29 CFR 1926.20[b][2]). A copy of this inspection report will be submitted to the UXOSO each day. All subcontractors for the following definable feature of works/activities are not known at this time, but additional information will be submitted to the APP for acceptance prior to the start of any activity listed.

All subcontractors and suppliers will receive training on MEC recognition and UXO safety precautions before beginning activities at the site. All subcontractors will be given a daily safety briefing and will be escorted at all times by a UXO technician while on site. Each subcontractor must do the following:

- Provide documentation for each on-site worker of successful completion of applicable training;
- Provide documentation of medical approval on an as-needed basis before the worker arrives on site;
- Provide all PPE required by their employees (subject to the provisions of 29 CFR 1910.132[h]);
- Provide awareness-level training to affected employees and other subcontractor workers regarding any material, equipment, or operation that may pose a hazard;
- Conduct any required industrial hygiene monitoring for their workers;
- Participate in the daily TSMs and in routine site inspection activities;
- Report immediately all unsafe conditions, faulty equipment, incidents, and close calls to the UXOSO so that lessons learned can be discussed at TSMs. All deficiencies must be tracked on the Safety and Health Deficiency Tracking Log (Appendix F of the QAPP) through resolution; and
- Document that all equipment brought to the site is new or in like-new condition, is inspected before use and routinely during use, and is maintained in safe working order.

5.1 LIST OF SUBCONTRACTORS AND SUPPLIERS

Table 5.1
Subcontractor List

Expertise	Subcontractor Name	Field Superintendent*
Land Survey	TBD	TBD
MDAS Disposal	TBD	TBD

Notes:

*Amend the title of the subcontractor's lead employee as needed.

IDW – investigation derived waste
MDAS – material documented as safe
QA – Quality Assurance
TBD – to be determined

5.2 SAFETY RESPONSIBILITIES OF SUBCONTRACTORS AND SUPPLIERS

Subcontractors report to the HGL Team PM and the SUXOS. Subcontractors conducting fieldwork on HGL Team projects shall establish an effective safety program applicable to their work and employees. Subcontractors will review and accept the HGL Team's APP/SSHP and prepare their own safety AHAs for presentation to the HGL Team's PM at least 10 days before site mobilization. All AHAs must be reviewed/accepted by the GDA. At a minimum, the subcontractor must meet the requirements of this APP/SSHP and provide safety equipment and safeguards suitable for the tasks and hazards involved. Subcontractors must provide the appropriate safety and health hazards and controls information for their project tasks to their personnel.

The identified subcontractor personnel responsible for safety are listed in Table 5.1.

The subcontractor's field supervisor(s) and competent person(s) are responsible for performing daily safety inspections of their operations (29 CFR 1926.20[b][2]). A copy of this inspection report will be submitted to the HGL Team's SSHO each day.

Each subcontractor must:

- Provide documentation for each on-site worker of successful completion of applicable training;
- Provide documentation of medical approval on an as-needed basis before the worker arrives on site;
- Provide all PPE required by their employees for this project [subject to the provisions of 29 CFR 1910.132(h)];
- Provide awareness-level training to affected HGL Team employees and other subcontractor workers regarding any material, equipment, or operation that may pose a hazard;
- Conduct any required industrial hygiene monitoring for their workers;
- Participate in the daily TSMs and in routine site inspection activities;

- Report immediately all unsafe conditions, faulty equipment, incidents, and close calls to the HGL Team's SSHO/UXOSO so that lessons learned can be discussed at TSMs. All deficiencies have to be tracked on the Safety and Health Deficiency Tracking Log through resolution; and
- Document that all equipment brought to the site are new or in like new condition, are inspected before use and routinely during use, and maintained in safe working order.

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6.0 TRAINING

6.1 SAFETY INDOCTRINATION AND TAILGATE MEETINGS

Before beginning fieldwork, field personnel assigned to this project will participate in an initial meeting with the PMs, SUXOS, and UXOSO to review and discuss the APP/SSHP and sign the APP acknowledgment form located at the beginning of this document. All new personnel assigned to the project after the initial safety meeting will review the APP, receive site-specific H&S training, and sign the APP acknowledgement page.

The following subjects will be discussed during the initial safety indoctrination:

- Lines of authority, organization, and responsibilities
- Communication methods and cell phone access locations
- Site facilities, locations of utilities, access/egress, and work zones
- Site contaminants
- Phases and sequence of work, equipment, and chemicals required
- Potential physical and chemical hazards, hazard controls, and safe work practices
- Potential weather-related hazards, controls, and monitoring
- Lifting and material handling (if applicable)
- Required PPE
- Decontamination procedures
- Evacuation routes, emergency response plan, places of safe refuge, route to hospital
- Emergency notifications
- Emergency contact information
- On-site persons certified in first aid and cardiopulmonary resuscitation (CPR)
- Spill kits, first aid kits, fire extinguishers
- MEC awareness (if applicable)
- Fire prevention
- AHAs

The UXOSO will conduct a safety briefing for all HGL Team and subcontractor site personnel at least weekly and more often as appropriate based on-site activities and changing tasks or conditions. These briefings will be used as an opportunity to address site-specific safety issues, refresh workers on specific procedures, address new hazards and controls, and discuss any lessons learned. An example of the Safety Meeting Training Log is included in Appendix F of the QAPP.

Topics to be discussed at the daily TSM include the following:

- Day's activities
- Potential H&S issues
- Changes in activities and operations
- Changes in conditions
- Weather conditions and heat/cold stress or other precautions

- Methods of risk reduction
- Required PPE for each task
- New MEC hazards or ordnance identification
- Recent significant incidents
- Biological hazards
- Changes to the SSHP
- Completion of Pre-Task Safety and Health Analyses worksheet, as needed
- Other applicable information that will increase safety awareness on the project

Employee feedback regarding H&S will also be solicited. Documentation of each TSM and safety meeting will be retained.

6.2 MANDATORY TRAINING AND CERTIFICATES

UXO personnel working at this site have completed U.S. Military explosive ordnance disposal or an accredited UXO training program that details procedures for evaluation and disposal of MEC IAW Technical Paper 18, Chapter 3. In addition to the training listed above, workers will have successfully completed the following:

- A 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) course and have 3 days of documented supervised field experience;
- An 8-hour HAZWOPER refresher training course on an annual basis;
- An 8-hour HAZWOPER supervisor course (for example, SUXOS, UXOSO, UXO Quality Control Specialist [UXOQCS], and UXO Technician III);
- An OSHA 30-hour construction safety course and earned a Department of Labor Construction Safety Course Completion Card (for UXOSO); and
- A first aid/CPR/automated external defibrillation course every 2 years (minimum 2 personnel on site).

The UXOSO and SUXOS will review site-specific emergency action procedures as a part of the site safety orientation training and periodically as a component of site indoctrination and TSMs. All site personnel will be trained in the emergency response procedures. This training will include the following:

- Identification of the emergency coordinator(s) and contacts;
- Procedures for emergency communications and notifications;
- Procedures for contacting emergency services;
- Locations of functioning communication devices for personnel not equipped with cellular telephones and for personnel working in areas with limited or no cellular telephone reception;
- Locations of communication service marshaling areas;
- Locations of emergency telephone contact lists;

- Locations of emergency medical facilities;
- Site emergency evacuation procedures;
- Locations of emergency evacuation rally points and safe refuge areas; and
- Identification of trained first aid and CPR providers.

Required training, qualification, and medical clearance documentation for field personnel will be provided to U.S. Army Engineering and Support Center, Huntsville (CEHNC) once personnel have been determined and prior to mobilization.

6.3 PERIODIC SAFETY AND HEALTH TRAINING AND PROJECT-SPECIFIC TRAINING

The SHM organizes and/or conducts annual 8-hour HAZWOPER refresher training. The HGL Team also has developed an 8-hour HAZWOPER supervisory training course that must be completed by supervisors and SSHOs. In addition to the above training, OSHA SSHOs also have 30-hour Construction or General Industry training. Records of due dates, certifications, 30-hour OSHA training cards and 3-day supervised on the job training are maintained in the H&S certifications and training database. Additional competent person and qualified person training is given per OSHA and construction standards which includes, fall protection awareness and fall protection competent person, confined space entry. Periodic retraining/recertification dates are maintained in the HGL Team Training and Certification database and monitored to ensure up to date certificates are maintained.

Topics covered in the annual training include:

- 29 CFR1910.120 overview;
- HGL Team's Safety and Health Program;
- Content of Medical Surveillance Program;
- Haz Com standard;
- Hazards (Chemical, Biological and Physical);
- Site controls;
- PPE selection and use;
- Confined spaces/trenching and excavation;
- SSHP contents;
- Roles and responsibilities;
- Leadership and supervision;
- Emergency response;
- Spills;
- Air monitoring equipment;
- Respiratory protection;
- Lessons learned and work experience; and
- OSHA recordables and incident review.

6.4 EMERGENCY RESPONSE TRAINING

The UXOSO will conduct a detailed safety indoctrination presentation on all site risks and the workplace HSP before work commences on the project site each day and at other times when new site workers arrive. Topics will include the following:

- Requirements and responsibilities for maintaining safe and healthful work environment;
- General safety and health policy and procedures;
- Employee and supervisor responsibilities for reporting all accidents;
- Emergency response plans and procedures for obtaining medical treatment;
- Procedures for reporting and correcting unsafe conditions or practices;
- Specific job hazards and the means to mitigate the risks;
- Names of and contact information for those responsible for safety program administration;
- Site hazards, hazard recognition, and symptoms of excessive exposure to site hazards;
- Proper use of required PPE;
- Safe use of engineering controls and equipment on the project site;
- Temporary site facilities;
- Equipment storage;
- Planned parking areas;
- Explosive storage (when required);
- Public traffic routes; and
- Access and egress to the work site and rally points (USACE EM 385-1-1, Section 04.A.01).

In addition, the UXOSO will provide detailed safety training in the following areas to workers exposed to the hazards described:

- **Chemical hazard communication.** If chemicals are brought onto the job site, employees potentially exposed to their hazards will receive appropriate safety training. This training will include the details of the chemical hazard communication program (HCP) described in the accompanying SSHP.
- **Fire prevention and response.** The UXOSO will conduct training sessions on measures to prevent fires and procedures for suppressing fires. Employees will receive training in the use of fire extinguishers to fight incipient fires.

The UXOSO will confer with the CDHS to determine an appropriate schedule for retraining employees in site-specific safety topics. Annual or more frequent refresher sessions will be required. Daily safety briefings will be conducted by the UXOSO for site personnel prior to the

start of each day's activities. Such sessions will be used to discuss anticipated risks and safe practices to mitigate hazards. The UXOSO also will conduct appropriate safety briefings for visitors and vendor representatives who will be on the site for short periods. The topics covered will be determined by the nature of the potential hazards to which they will be exposed.

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7.0 SAFETY AND HEALTH JOBSITE INSPECTIONS

7.1 RESPONSIBILITIES FOR DAILY SITE SAFETY INSPECTIONS

7.1.1 Personnel responsible for site safety inspections

Job site safety and health inspections (reviews and audits) can be conducted by UXOSO, quality control officers, PMs and the SHM/CDHS, Project CIH, or SHM/CDHS designee. The following reviews will be performed:

- The UXOSO will inspect the job site daily or more often if warranted by ongoing activities. Findings will be documented on the Daily Project Safety Inspection Report (Appendix F of the QAPP.) and the results posted on the project bulletin board.
- The PMs or SHM/CDHS may conduct unannounced job site safety audits.

All safety deficiencies identified during the inspection processes will be tracked until closed on the Safety and Occupational Health Deficiency Tracking Log, which will be retained in the field or facility office. The log will include:

- Date deficiency is identified,
- Description of deficiency,
- Name of person responsible for correcting deficiency,
- Projected resolution date, and
- Date resolved.

7.1.2 Inspector training qualifications

The UXOSO assigned to the project will meet the qualifications of DDESB Technical Paper 18 and EM 385-1-1.

7.1.3 Frequency of inspections

Site safety inspections will be conducted daily and recorded on a Project Safety Inspection Report (Appendix F of the QAPP).

Portable Fire Extinguishers

The UXOSO is responsible for performing monthly inspections of and obtaining annual service for portable fire extinguishers that are not mounted on vehicles or equipment. The inspections will be documented on the inspection tag on each extinguisher. Vehicle and equipment operators are responsible for the daily inspection of fire extinguishers on vehicles or equipment.

First Aid Kits

First aid kits will be inspected monthly by the UXOSO or his/her designee. A seal may be placed on first aid kits to allow for less frequent inspections. If the seal is not broken, then an inspection is not required for up to three months.

Eyewash

An emergency eyewash unit capable of delivering at least 0.4 gallon of water per minute for 15 minutes or more shall be located immediately adjacent to employees who handle hazardous or corrosive materials, such as treatment plant operational chemicals. The emergency eyewash units will be inspected monthly by the UXOSO. The inspection will be documented on the inspection tag on each eyewash station.

7.1.4 Inspector Forms

See Appendix F of the QAPP for Site Safety Inspection Log forms.

7.1.5 Deficiency Tracking System

All unsafe conditions, faulty equipment, incidents, and close calls will be immediately reported to the HGL Team's SSHO so that lessons learned can be discussed at TSMs. All deficiencies will be tracked on the Safety and Health Deficiency Tracking Log through resolution. All safety deficiencies identified during the inspection processes shall be tracked until closed on the Safety and Occupational Health Deficiency Tracking Log (Appendix F of the QAPP). which will be retained in the field or facility office. The log will include the following:

- Date deficiency is identified,
- Description of deficiency,
- Name of person responsible for correcting deficiency,
- Projected resolution date, and
- Date resolved.

7.2 EXTERNAL INSPECTIONS

USACE or regulatory agencies may perform inspections or audits of field H&S practices at any time. The HGL Team PM and SHM/CDHS will immediately be notified when a regulatory agency inspector requests access to a work site for a compliance inspection.

The COR will immediately be notified by the HGL Team PM of any regulatory agency inspection. The inspection should not be delayed because of non-availability of the COR or his/her designee. If a citation is issued to the HGL Team or its subcontractors, a copy of the citation will be submitted to the USACE COR along with a corrective action plan.

8.0 MISHAP REPORTING AND INVESTIGATION

8.1 EXPOSURE DATA (MAN-HOURS WORKED)

The HGL Team PM is responsible for reporting and maintaining records of all exposure and accident experiences incidental to the work, including those of subcontractors, and reporting this information to USACE. At a minimum, these records will include exposure work hours and equivalents as prescribed by 29 CFR 1904. This exposure data will be provided to USACE using the USACE Prime Contractor Monthly Record of Work-Related Injuries/Illnesses and Exposure Form.

8.2 MISHAP INVESTIGATIONS, REPORTS, AND LOGS

8.2.1 Personnel Responsible for Completing Investigations

Project personnel are required to report near misses, injuries, illnesses, and incidents to the UXOSO and SUXOS immediately. The UXOSO will summon/arrange appropriate medical care if required. If an employee is injured or ill, WorkCare should be contacted as soon as practical, **(888) 449-7787**, after emergency care (if needed) has been initiated. The HGL Team emergency number, (**800) 341-3647**, should be used for after-hours reporting. The HGL Team has coordinated with the local medical facilities regarding the type of work being conducted at the installation.

Except for rescue and emergency measures, the accident scene will not be disturbed until it has been released by the UXOSO and the investigation is complete. This means that the accident scene will be left as it was immediately after the accident occurred. Except for injured personnel, nothing at the scene will be moved, straightened up, thrown away, or cleaned. Photographs of the incident site will be taken, and any independent witness statements will be recorded as soon as safely possible. Witnesses are to be isolated and questioned separately if possible.

On-site management personnel will investigate near misses, injuries, illnesses, and incidents and accidents to identify unsafe acts or conditions that occurred or existed at the time of the accident. Corrective actions will be determined and implemented to prevent a recurrence of the incident, and responsibility for implementation of corrective actions will be assigned. The final report and required forms will be submitted to the HGL Team PM for signature and forwarded to the USACE COR. When required, the Preliminary Accident Notification form will be completed and provided to the COR and USACE PM. The Preliminary Accident Notification form will be used to collect and document the initial notification while the mishap is being investigated and details obtained for the ENG Form 3394 submission. ENG Form 3394 (Appendix F) will be completed and submitted to the COR within five working days of the completion of the investigation into the incident.

In the event an accident results in an employee being sent to a doctor, a medical assessment/work capacity form will be completed by the attending physician on the date of treatment and will state one of the following conditions:

- Employee may return to full duty work
- Employee may return to limited duty (with type of limitations)

- Employee is unable to return to work

A copy of the completed medical assessment/work capacity report must accompany the completed accident reports.

At the discretion of the COR, the HGL Team will provide a face-to-face briefing of all lost workday accidents to the USACE within five days of the accepted ENG Form 3394. HGL Team management, the UXOSO, and others deemed necessary will be present at the briefing.

8.2.2 Immediate Notification Requirements and Mishap Reporting

A mishap is any unplanned, undesired event that occurs during the course of work being performed. The SUXOS will immediately notify the HGL Team PM, SHM/CDHS, and others as required by the HGL Team's incident reporting policy. All mishaps occurring incidentally to an operation, project, or facility shall be reported, investigated and analyzed. In addition, HGL is required to report property damage (exceeding $5,000 is recordable), days away injury/illness, restricted/transfer injuries. The SSHO/UXOSO will complete and submit the HGL Team Incident Report form within 24 hours as directed by the HGL Team's HSP Incident Reporting Policy. The HGL Team PM will report incidents to the COR and USACE PM as soon as the facts are known, but no longer than 24 hours after the incident. The appropriate forms to be completed are in Appendix F of the QAPP and include the following:

- Automobile Accident Report
- HGL Team Incident Report
- ENG Form 3394 – USACE Accident Investigation Report (submitted within 5 days)
- Personnel Accident Notification Form

Subcontractors and other non- HGL Team employees will report all close calls, equipment property damage, injuries, or illnesses. The subcontractor's safety personnel shall investigate and analyze the incident so that the situation can be corrected. A copy of the subcontractor's investigation report will be made available to the HGL Team PM. The PM will then forward the report to the SHM/CDHS.

Immediate notification to the USACE through the HGL Team PM is required for:

- A fatal injury;
- An Arc flash incident;
- One or more individuals becoming ill or having a medical condition that is suspected to be related to a site condition, or a hazardous or toxic agent on the site.
    - OSHA must be contacted for: all work-related fatalities, all work-related in-patient hospitalizations of one or more employees and all work-related amputations and eye loss.
    - Employers must report work-related fatalities within 8 hours of finding out about it. For any in-patient hospitalization, amputation, or eye loss, employers must report the incident within 24 hours of learning about it.

  - The CDHS is responsible for contacting OSHA;
- The hospitalization of one or more people resulting from a single occurrence; and/or
- Property damage of $500,000 or more.

The HGL Team Program Manager will notify USACE immediately when the following injury classifications have been made:

- A permanent total disability
- A permanent partial disability

8.2.3 Notification to COR of Completed Corrective Actions

Work, field testing, laboratory testing, or materials not conforming to the specifications or contract requirements, including non-compliances and deficiencies identified by USACE will be documented on a Nonconformance Report (NCR). At a minimum, the NCR will detail the nonconforming conditions, recommended corrective action(s), and disposition of the corrective action(s). The HGL Team will immediately correct any non-compliances or deficiencies identified by USACE. The NCR will remain open until the nonconforming condition has been satisfactorily resolved and verified as acceptable by USACE. RMS3, the government's Resident Management System will be used to track non-conformances/deficiencies. Deficiency tracking and corrective maintenance will be discussed during scheduled progress meetings, which will ensure that the list of non-conformances/deficiencies is kept up to date. During these meetings, discussions will be held on the inspection, addition, re-inspection, and ultimate removal of items from the deficiency list. Meeting minutes will be recorded, and copies of the minutes will be given to USACE.

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9.0 PLANS REQUIRED BY THE USACE SAFETY MANUAL

The following sections address the plans required by USACE in the *Safety and Health Requirements Manual* (USACE, 2014).

9.1 FATIGUE MANAGEMENT PLAN

Excessive Work Hours

Due to the inherent risk associated with specific MEC operations (i.e., digging or demolition work), the maximum proposed number of hours that the Contracting Officer may approve for such individual MEC personnel will be that such individual MEC personnel shall be limited to a 60 hour workweek consisting of a maximum of 48- hours of MEC field operations. No single workday for such individual MEC personnel shall exceed ten (10) hours (total work hours). Twenty-four (24) hours must separate each workweek for individual MEC personnel; however, work schedules of individual MEC personnel or teams may be staggered (e.g., working in shifts, etc.) to continue project work as needed. These work restrictions apply only to MEC personnel performing digging or demolition work.

The Fatigue Management Plan will be completed as part of the APP/SSHP whenever work hours:

- Exceed 10 hours a day for more than 4 consecutive days;
- Exceed 50 hours in a 7-day work week;
- Exceed 12 hours a day for more than 3 consecutive days; or
- Exceed 58 hours a week for sedentary (to include office) work.

Operator work hour limitations are as follows:

Equipment Operators: Operators of equipment such as hoisting equipment and draglines, mobile construction equipment, electrical power systems, hydropower plants, industrial manufacturing systems, hydraulically operated equipment, powered vessels, and boats, shall not be permitted to exceed 12 hours of duty time in any 24-hour period, including time worked at another occupation. A minimum of 8 consecutive hours of rest between shifts in a 24-hour period is required.

Motor Vehicle Operators: Operators of motor vehicles, while on duty, shall not operate vehicles for a continuous period of more than 10 hours in any 24-hour period. Moreover, no employee, while on duty, may operate a motor vehicle after being in a duty status for more than 12 hours during any 24-hour period. *A minimum of 8 consecutive hours shall be provided for rest in each 24-hour period.*

For each project effort, the UXOSO is responsible for adjusting the workday duration within these limits. The following factors will be considered by the UXOSO for adjusting the workday duration:

- Time of year (for example, reduce workday duration because there is less daylight in winter).

- Temperature/weather (for example, reduce workday duration when the temperature is very cold, very hot, or very windy).
- Type of work (for example, reduce workday duration for personnel involved in physically demanding phases of work).
- Individual personnel limitations (for example, reduce workday duration for personnel with minor head colds, suffering from temporary effects of allergies, or showing signs of heat stress).

9.2 EMERGENCY RESPONSE PLANS

Pre-planning measures to avoid personal injury or exposure include employee training, fire and explosion prevention and protection, chemical spill and discharge prevention and protection, and safe work practices. If an emergency situation occurs, site personnel will assess the situation and decide if they have the equipment, supplies, PPE and tools to respond to, contain, or clean up the incident. If any aspect of an emergency response effort is missing, the SSHO/UXOSO will announce a site evacuation (emergency action) to the rally points detailed in the emergency action plan. Emergency response plans include the following:

- Emergency response team organization
- Communication means and protocols
- An evaluation of likely emergencies
- Staff training and capabilities
- Emergency response equipment
- A determination of likely emergencies that can be handled using internal resources and a list of likely emergencies needing outside emergency assistance
- Steps to summon and coordinate outside emergency responders
- Cleanup actions necessary after the immediate emergency has been contained
- Provisions for a critical review of actual emergency response activities against the activities specified for that type of emergency in the emergency response plan
- Changes to the written plan and a briefing to site personnel on the changes

Emergency action plans limit site employee activities to the following:

- Emergency recognition
- Emergency notification inside the site and with outside emergency responders
- Communication means and protocols
- An evaluation of likely emergencies
- Staff training and capabilities
- Steps to coordinate with outside emergency responders on site

- Evacuation routes and rally points
- Cleanup actions necessary after the immediate emergency has been contained
- Provisions for a critical review of actual emergency actions against the actions specified for that type of emergency in the emergency action plan
- Changes to the written plan and a briefing to site personnel on the changes

9.2.1 Procedures and Tests and Contingency Plan for Fire and Severe Weather

Upon mobilization to the project site, the SUXOS and UXOSO will verify that personnel have an effective means of communications (cellular telephone or two-way radio) from every work area on the site. Before project fieldwork commences, the provisions for emergency response will be confirmed. Emergency communication equipment will be tested, and the routes to local medical facilities will be confirmed to be accessible and practical. A designated site emergency assembly point will be established, and its location communicated to the field team during the initial site safety orientation.

If an emergency arises, the first persons to recognize the situation must take the appropriate immediate response. The field crew will contact emergency response services by calling 911 (or the location-specific emergency communication system), and then immediately notify the UXOSO of the incident. The authority to order personnel to evacuate the area rests with the SUXOS, UXOSO, or a qualified USACE representative.

If site evacuation is required, a continuous, uninterrupted horn will be sounded for approximately 10 seconds using air horns in the work area or a vehicle horn. Continuous communication will be maintained between the site and the main office. Personnel will evacuate to a designated safe, upwind location, and the crew leader will perform a head count. Once the head count has been performed, the UXOSO will be provided a status report of the event. Emergency alert systems will be tested periodically.

During any on-site emergency, work activities in the affected area will cease until the emergency is brought under control.

The UXOSO or designated on-site personnel will be responsible for checking weather conditions at a minimum of twice daily. When there are warnings or indications of impending severe weather (heavy rains, thunderstorms, damaging winds, tornados, hurricanes, floods, lightning, etc.), weather conditions will be monitored using a weather station that is part of the National Oceanic and Atmospheric Administration weather radio all hazards network or similar notification system. Appropriate precautions will be taken to protect personnel and property from the effects of severe weather. A safe place of refuge will be discussed during the TSMs.

Thunder and lightning storms, hail, high winds, tornados, and hurricanes may occur. Fog and lighting may also pose potential problems in the work area. If lightning is observed, all work involving load handling equipment or drill rigs, work on elevated platforms or scaffolding, roofing activities, tree trimming activities, or work in open areas will stop. The proximity of the storm to the operation being performed will be determined.

Explosive and MEC operations must cease if lightning approaches within 10 miles of the project location. Once lightning is seen, the number of seconds until thunder is heard will be counted. The number of seconds will be divided by 5 to determine the distance to where the lightning occurred. If lightning is 10 miles away or less, work should stop until 30 minutes after the last audible thunder or visible flash of lightning.

Work will cease if fog limits visibility during situations where accurate vision is required (that is, driving, work around power lines, measuring, equipment spotting, and precise equipment operations).

The weather will be monitored routinely. It may be necessary to halt certain hazardous operations or stop work altogether to allow the situation to pass. The UXOSO must decide what operations, if any, are safe to perform based on existing and anticipated conditions. In the case that immediate shelter is required, all personnel will go to the designated meeting location and wait until hazardous conditions pass.

9.2.2 Spill Plans

Personnel will maintain the following equipment and materials on site for use during spill response activities:

- Spill control materials
- Shovels and assorted hand tools

Potential spill events include those of vehicle and equipment fuels, oils, and other fluids that may occur during fueling operations or because of equipment leaks. Materials that may cause contamination will be present in radiators, fuel tanks, hydraulic reservoirs, fuel cans, and oil cans. To prevent leaks, the following measures will be taken:

- Vehicles and equipment will be inspected daily and immediately taken out of service in the event of leaks.
- Cans containing fuels or oils will be labeled and stored appropriately.
- Nonemergency maintenance of heavy equipment or vehicles will not be performed on site. In the event that on-site equipment maintenance is required, precautions such as buckets and plastic sheeting will be used to so that contaminants are not released to the environment.

Waste stockpiles and other potential spills are not anticipated on this project.

If a hazardous material spill is observed at the site, the cause of the spill will be addressed (if possible) as soon as it is safe to do so. After addressing the cause, spill control materials will be applied to the spill if appropriate. The UXOSO will then be notified, and he/she will assess the magnitude and potential impact of the spill, including if the material represents a reportable quantity. Hazardous materials spills in excess of 1 gallon will be reported through the chain of command. Fuels or oils spilled in excess of 100 pounds or 25 gallons will immediately be reported through the project chain of command and to the appropriate fire department. The fire department

will be called to assist with spills that cannot be safely handled by on-site personnel. Chain of command reporting will require the UXOSO to notify the HGL Team PM and the CDHS. The PM will notify the COR.

If a spill occurs during fueling operations, the vehicle tank will be capped, and the fuel dispensing device moved away from the equipment. Spill control materials will be applied to the spill (usually kitty litter), and the solidified spill will be dug up and transferred to 55-gallon metal open-top drums. The drums will be labeled with the location, date, time, and contents.

For other spills that can safely be handled by on-site personnel, the spilled material will be cleaned up when it is safe to do so as follows:

- The spill area will be approached from upwind.
- The spilled material will be identified based on the source of the material (fuel tank, labeled container, etc.). The Safety Data Sheets (SDSs) will be reviewed by the SUXOS and/or UXOSO. The potential hazards will be evaluated to determine the proper personal protection levels, methods, and equipment necessary for response.
- The spill area will be evacuated, isolated, and secured, if necessary.
- Work zones will be set up.
- Spill containment will initially be made without entering the immediate hazard area. Priority will be given to prevent the spilled material from entering any streams, ditches, or sewers.
- Entry to the spill area for cleanup will be made by personnel with the PPE, training, methods, and equipment necessary to perform the work. Spill cleanup and collection typically involves shoveling or excavating the affected soil into drums or larger containers.
- The spilled material will be stored for disposal. Disposal options will depend on the amount and type of material.

9.2.3 Firefighting Plan

In the event of a fire or explosion, the UXOSO will notify the nearest fire department and emergency medical service (EMS), contact the HGL Team PM, and escort the response personnel to the location of the fire or explosion. The UXOSO will determine the extent of the fire; use available on-site fire extinguishers (Type 2A:10BC) on incipient stage fires only and provide emergency first aid as needed. Site personnel will not fight fires containing explosives. The responding fire department personnel will be informed of the nature of the fire and whether explosives are present.

9.2.4 Posting of Emergency Telephone Numbers

To facilitate the quick retrieval of information in the event of an emergency, a summary that includes emergency contact information and a map showing the route from the project site to the

hospital has been placed at the front of this APP. A copy of this emergency information will be kept in all field vehicles and posted on bulletin boards in on-site offices (as applicable).

9.2.5 Man Overboard Ship

Not applicable since there will be no boats, vessels, or skiffs used at the project under the current scope of work.

9.2.6 Plan for the Prevention of Drug and Alcohol Abuse

The HGL Team implements a Substance Abuse Deterrence Program in support of its corporate drug-free workplace policy and will enforce the requirements of a drug-free workplace. The program is designed to maintain a safe workforce and prohibits the following:

- Engaging in any drug activity that is prohibited by federal, state, or local law. This includes, but is not limited to, the possession, use, manufacture, distribution, or sale of illegal drugs at any time or at any place.
- Working under the influence of alcohol or illegal drugs.

The deterrence program includes post-offer/pre-employment drug testing, random testing for safety-sensitive employee groups, testing for cause, and testing after an accident when it appears that the employee is under the influence.

The deterrence program includes post-offer/pre-employment drug testing, testing for cause, random testing and post-accident testing when it appears that substance intoxication caused or contributed to the accident.

9.3 SITE SANITATION PLAN

The HGL Team will maintain hygienic sanitation provisions during the duration of this project. General requirements for a temporary, mobile field crew include the following:

- Drinking water – Bottled drinking water will be provided on site for all personnel.
- Washing and toilet facilities – At a minimum, temporary toilet facilities will be available on the site. Hand washing supplies such as soap, towels, or anti-microbial gels will be available on site.
- Waste Disposal – Investigation derived waste (IDW) generated during the field activities will be classified, handled, and disposed of IAW the waste management procedures outlined in the QAPP following applicable federal, state, and local regulations. Disposable materials (not classified as hazardous) such as latex gloves, used PPE, aluminum foil, and paper towels will be placed and sealed in plastic garbage bags for disposal with sanitary waste from the site.

9.4 MEDICAL SUPPORT

The HGL Team occupational medical care provider will be available to provide patient specific information in case medical treatment is needed. For injuries or illnesses requiring EMS, notification via the 911 system or equivalent system will be made by personnel at the scene. Emergency response personnel will determine the best course of treatment and the medical treatment facility where this will occur. Personnel may be transported to the nearest medical treatment facility as determined by EMS personnel.

For non-emergencies the WorkCare 24-hour support hotline should be contacted.

Qualified first aid and CPR providers may treat minor injuries on site. Two field team members (HGL Team or subcontractor) must be trained to render both CPR and First Aid. The HGL Team and its subcontractor(s) qualification relating to CPR and first aid training will be provided in the SSHP. Each HGL Team first aid/CPR certified employee is part of the HGL Team Bloodborne Pathogens Exposure Control Program.

A first aid kit (meeting American National Standards Institute [ANSI] Z308.1 content guidelines), including necessary protection against bloodborne pathogens, will be available in project vehicles or on site. An adequate supply of fresh potable water for emergency eye wash purposes or portable emergency eyewash will be available.

If additional treatment beyond first aid is required, the injured personnel will be transported to the identified emergency medical care facility. If the injury is not serious or if the ambulance response time is excessive, the injured party may be transported by the SUXOS to the nearest emergency room using an HGL Team field vehicle. The Emergency Information Sheet and the map and directions indicating the fastest route to the hospital emergency room will be retained in each field vehicle. In all cases, the SUXOS will accompany injured HGL Team workers to the hospital or medical care facility.

9.5 BLOODBORNE PATHOGEN PLAN

Qualified first aid and CPR providers may treat minor injuries on site. Two field team members (HGL Team or subcontractor) must be trained to render both CPR and first aid. If first aid response is necessary, all biological materials will be assumed to be infectious and universal precautions will be taken. First aid and CPR trained staff will wear PPE (nitrile gloves, eye protection, masks) dependent on exposure anticipated and will wash hands immediately after removal of gloves. Each HGL Team first aid/CPR certified employee is part of the HGL Team Bloodborne Pathogens Program, which includes a Post Exposure Control Plan if exposed to bloodborne pathogens. The post exposure control plan covers instructions to seek medical attention within 2 hours and has provisions for a confidential medical examination and follow-up with WorkCare for the Hepatitis B vaccine series.

A first aid kit, including necessary protection against bloodborne pathogens, will be available in project vehicles. An adequate supply of fresh potable water for emergency eyewash purposes or a portable emergency eyewash will be available.

9.6 EXPOSURE CONTROL PLAN

As a general policy blood and related body fluids must be assumed to be infectious and must be treated as such. Contact with these fluids should be prevented through the prudent implementation of "universal precaution" such as PPE and disinfection.

Gloves will be worn when there is a potential for hand contact with blood, or other potentially infectious material, mucous membranes, and non-intact skin and when handling or touching contaminated items or surfaces. Disposable (single use) gloves, such as nitrile or examination gloves, should be replaced as soon as practical if they are torn, punctured, or if their ability to function as a barrier is compromised. Safety glasses and/or goggles are to be worn if there is any potential for splashing or other exposure to contaminated materials. A breathing barrier is in the Bloodborne pathogen kit, if it is necessary to perform rescue breathing.

After contact with a potentially infectious material, thoroughly wash hands, face, and any other body parts that may have been contaminated with disinfectant soap or alcohol wipes as soon as possible after the incident. Disinfect all contaminated equipment or materials as soon as reasonable using a bleach solution, alcohol or similar. Items that cannot be disinfected must be bagged and discarded.

Immediately after an incident in which an employee may have been exposed to blood or other potentially infectious body fluids, the responsible manager or designee must do the following:

- Immediately contact the CDHS and the HGL Team's medical incident response service when an exposure incident occurs.
- Immediately investigate the exposure incident and document findings.
- Ensure involved employees understand and follow universal precautions.
- Assist H&S staff in identifying employees that may have been occupationally exposed to blood or related body fluids.

9.7 AUTOMATIC EXTERNAL DEFIBRILLATOR PROGRAM

Automatic External Defibrillators are not applicable to this project site.

9.8 LAYOUT PLANS

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

9.9 ACCESS AND HAUL ROAD PLAN

Not applicable. Access and haul roads are not within the scope of this project.

9.10 HEARING CONSERVATION PROGRAM

Noise will be generated from the use of equipment and tools. Hearing loss resulting from occupational exposure to noise can be prevented through the use of hearing protection measures.

As part of the criteria for the HGL Team Hearing Conservation Program, audiometric testing of personnel will be conducted biannually, and American Conference of Governmental Industrial Hygienists (ACGIH) (ACGIH, 2018) threshold limit values (TLVs) will be used as the minimum for instituting hearing protection. Personnel will wear hearing protection when working with or around operating equipment or power tools that generate noise at 85 A-weighted decibels (dBA) or above—levels that require a person to raise his/her voice to carry on a conversation at a distance of 3 feet. Warning signs will be posted in areas where noise greater than 85 dBA necessitates the use of hearing protection. The use of headphones for entertainment purposes is prohibited.

9.11 RESPIRATORY PROTECTION

Respiratory protective equipment and real-time monitoring are not required for this project. If implemented, the level of respiratory protection selected will be based on real-time air monitoring of the work environment.

The HGL Team will use the following administrative and engineering controls to minimize the need for respiratory protection on site:

- Air monitoring for exposure will be performed in work areas to determine whether levels of gases, vapors, and dusts are within published exposure limits (as required).
- Personnel will be positioned upwind to avoid working in dusts and released vapors when possible.
- Water will be used to control dust (as required).
- Natural ventilation will be used to reduce or eliminate exposures to dusts, gases, and vapors (as required).

The HGL Team does not anticipate the use of respirators for the project.

9.12 HEALTH HAZARD CONTROL PROGRAM INCLUSIVE OF BIOLOGICAL HAZARD REVIEW

The Health Hazard Control Program for this site consists of:

- Exposure Monitoring/Air Sampling Program;
- AHAs;
- Hazard/risk analysis;
- PPE; and
- Standard safety procedures, work practices, and engineering controls; and
- Biological hazards.

9.12.1 Exposure Monitoring/Air Sampling Program

Air monitoring will be conducted if a CIH determines that airborne overexposure is reasonably likely, after engineering or administrative controls have been implemented, for employee overexposure to airborne hazardous materials. The HGL Team's preferred approach is to monitor with direct-reading instruments. The exposure monitoring program specified for this project is detailed in Section 7.0 of the SSHP and in applicable AHAs.

Airborne exposure monitoring accomplishes the following objectives:

- Provides data that the SSHO/UXOSO uses to select the proper PPE, work practices, and engineering controls used at the site.
- Measures real-time concentrations of volatile organic compounds, in the breathing zone, so that the SSHO/UXOSO knows if and when levels may potentially exceed the Air Monitoring Action Levels.
- Identifies sources of vapor releases.

The ionization detectors are inspected and tested prior to use in the field. The instruction manual is available for field equipment so that trouble-shooting and routine repairs can be conducted in the field. Also, the manufacturer's relative response tables for specific chemicals are reviewed to determine the accuracy and reporting of concentrations. For photoionization detectors leased from an equipment vendor, the electron volt of the lamp will be confirmed before use and documented in the logbook. The SSHO/UXOSO also will record the daily air monitoring results and calibration information in the logbook.

All air monitoring equipment used will be maintained IAW manufacturer's instructions. Calibration checks will occur before each use. Instrument calibration will be conducted in a clean environment similar to the actual work environment in terms of temperature, pressure, humidity, and background noise. Before actual use, each instrument will be allowed sufficient time to warm up and will be "zeroed" as applicable. Any equipment that is out of calibration will be documented on the Safety and Occupational Health Deficiency Tracking Log.

If excessive dust is generated, air monitoring for dust will be conducted. Air monitoring will then be used to determine the need for more aggressive control methods.

The site-specific exposure monitoring requirements and action levels are detailed in Section 7 of the SSHP.

9.12.2 AHAs

The process for developing AHAs is discussed in Section 2.0 of the SSHP. The HGL Team's SUXOS and SSHO/UXOSO will review activities and work environments to identify hazards not addressed in the relevant AHAs. The SUXOS, supervisor and or SSHO will keep subcontractor personnel informed of changing conditions and any new hazards and requirements.

9.12.3 Hazard/Risk Analysis

The anticipated hazards and the recommended control measures are presented in Section 2.0 of the SSHP. Exposure may occur through inhalation, skin absorption or physical contact, to a chemical or biological agent. Acceptable limits are specified in the current ACGIH guideline, "TLVs and Biological Exposure Indices, 2018" published DA or DoD Exposure Limits, or by OSHA. In cases where there is a conflict between these occupational exposure limits, the more stringent will generally apply.

The HGL Team's overall approach is to reduce and/or eliminate hazards when possible and feasible. If a hazard cannot be eliminated, then the National Institute for Occupational Safety and Health (NIOSH) hierarchy of controls should be applied, with substitution and engineering controls used preferentially over administrative controls and PPE. The NIOSH hierarchy is as follows:

1. Elimination
2. Substitution
3. Engineering controls
4. Administrative controls
5. PPE

9.12.4 PPE

The HGL Team's PPE Program is detailed in the HGL Team HSP Procedure 06 and specific PPE requirements are in Section 15.13 of the SSHP. A summary includes the following minimum work clothing requirements.

Employees will wear clothing suitable for the weather, however minimum requirements for work will be a short-sleeved shirt, long pants (excessively long or baggy pants are prohibited) and leather work shoes. If analysis determines that safety-toed or other protective footwear is necessary, they will be worn. Safety footwear must meet ASTM F2413 standards.

Eye and face protection shall be worn as determined by an analysis of the operations being performed.

Hearing protection will be worn by all those exposed to high noise level activities (noise in excess of 85 dBA). A good rule of thumb is to wear hearing protection when normal conversation cannot be heard at arm's length. Hearing protection will have a minimum noise reduction rating of 25 dBA.

Head protection will be worn when head hazards exist. Hard hats will comply with ANSI Z89.1 and be worn with the brim facing forward.

High visibility apparel will be worn by all workers exposed to vehicular or equipment traffic. The apparel will comply with ANSI/Industrial Safety Equipment Association 107, Class 2.

Specified gloves will be worn by those involved in activities that expose the hands to cuts, abrasions, punctures, burns and chemical hazards.

9.12.5 Standard Safety Procedures

The HGL Team will implement practices to eliminate, or reduce, the risk of exposure to recognized site hazards through work practices and engineering controls. The site-specific control measures are presented in Section 9.0 of the SSHP.

9.12.6 Biological Hazard Review

Personnel will be made aware during the initial site safety orientation of the various biological hazards that may be encountered while working at the sites, including ticks, poisonous insects (for example, fire ants, chiggers, and disease-bearing mosquitoes), poison oak, and snakes. Appropriate preventative measures will be employed to minimize potential exposure to biological hazards, including designating a field member to watch for biological hazards. Table 9.1 shows the biological hazards for the site.

The UXOSO will be responsible for instructing personnel in avoiding or minimizing exposure to biological hazards. The keys to avoiding biological hazards are awareness of one's surroundings and general knowledge of the habits of various species that may present a threat. In general, the vertebrates will escape to avoid human contact when encountered. Reptiles will often seek out warm sunny locations in morning hours and during cold weather. A reconnaissance of the site work area should be conducted every morning to identify the presence of potential threat species of plants, insects, and animals. Clearing vegetation and soil excavation near burrows can potentially disturb reptiles or hornet's nests in proximity to personnel. Extra care and caution should be exercised in any work area that disturbs vegetation or soil, or when entering any vegetated area where one cannot directly see the ground surface at all times.

The work sites may contain ticks, venomous snakes, venomous spiders, and venomous insects, such as wasps and hornets. Venomous snakes, insects and spiders are generally reclusive, and the greatest potential for exposure arises when personnel are opening containers, structures, buildings, and well casings; handling idle equipment; or moving construction material stockpiles.

Table 9.1
Biological Hazards

Ticks		

Snakes		
Cottonmouth	**Copperhead**	**Coral Snake**

Table 9.1 (continued)
Biological Hazards

Snakes Continued		
Pigmy Rattlesnake	**Timber Rattlesnake**	**Eastern Diamondback**
Spiders		
Black Widow	**Brown Recluse**	
Biting and Stinging Insects		
Scorpion	**Wasp**	**Mosquito**
Chigger	**Fire Ant**	

Table 9.1 (continued)
Biological Hazards

Allergenic Plants		
Pacific Poison Oak	**Stinging Nettle**	**Poison Ivy**

Biting and Stinging Insects

Workers should keep alert for bee and wasp activity and avoid wearing bright clothing and scented toiletries when working outside. Be wary of areas around structures where bees and wasps may live. If bee or wasp activity is noted, the area should be avoided if possible. The use of insect repellants containing N,N-Diethyl-m-toluamide (DEET) is not effective in preventing stings. Anyone can have an allergic reaction to a bee sting, even if they were stung before with no reaction. Allergic reactions to bee stings may include swelling around the lips and eyes, rapid development of a rash, difficulty breathing, or signs of shock (pale skin, rapid pulse, and fainting). If any of these symptoms occur, call 911 immediately. Individuals who have had a previous reaction should notify the UXOSO before fieldwork begins and carry a "bee-sting kit," EpiPen®, or Ana-Kit. All personnel will immediately report stings to the UXOSO.

Bee or wasp nests should not be allowed to form near structures and areas where personnel will continue to have a need for access. If stung, personnel should wash the bite area with soap and water, apply a cool compress to the area, elevate the area on a pillow, and make a paste of baking soda and water for itching.

Mosquitoes

Mosquitoes are bothersome and may carry diseases, such as the West Nile and Zika Viruses. They are attracted by heat, sweat, body odor, and carbon dioxide. Site personnel should wear protective clothing and insect repellent containing DEET. Insect repellent should be reapplied at least every 4 hours. The following suggestions should provide some protection from mosquitoes (OSHA, 2016):

- Review the hazards associated with the West Nile Virus and Zika Virus through exposure to mosquito bites periodically during the TSMs. Zika virus prevention is an important issue because contracting this virus during pregnancy appears to pose a significant risk of neurological birth defects including microcephaly. Infection appears to be much less dangerous for healthy adults. Get regular updates on transmission and controls from: Centers for Disease Control and Prevention (CDC)—www.cdc.gov/zika/.

- Review the power point training and Zika handout at the links below. https://hydrogeologic.sharepoint.com/sites/hglcentral/lib/Documents/Health%20and%20Safety/Health%20and%20Safety%20Training/Zika%20slides%20condensed%20from%20OSHA%20slide%20deck%20September%202016.pdf.
- Document the briefing and the topics covered. Standard tailgate forms can be used as long as the form documents the topics covered. Have all participants sign the form to ensure training on Zika virus has been conducted.
- If using sunscreen, apply sunscreen first and then insect repellent.
- Take extra precautions like Thermocell units and head nets (as long as they do not interfere with visual acuity).
- Increase protective measures when working at dawn, dusk, and in the early evening.
- Reduce the area of exposed skin when working outdoors. Long-sleeved shirts with sleeves rolled down are recommended; however, it should be understood that mosquitoes may bite through thin clothing. To avoid mosquitoes, personnel should evaluate the actual Level D clothing worn; for example, heavy long-sleeved work shirts and heavy dungarees/jeans may mitigate mosquito bites. The use of a disposable coverall, such as Tyvek®, may further reduce the risk of mosquito bites.
- Use an insect repellent containing approximately 30 percent DEET. Use the repellent according to the manufacturer's directions provided on the container. Frequent reapplication or saturation is not necessary for repellent containing DEET to be effective. Avoid prolonged and excessive use of DEET. Caution: some individuals may be sensitive to DEET—always read and follow label directions. After returning from outdoor field activities, wash treated skin with soap and water.
- Use commercially prepared "clothing and gear" insect repellants containing 0.5 percent permethrin when additional protection against mosquitoes is necessary. These repellants, such as Repel Permanone™, are available in the sporting goods departments at major retailers. Clothing and gear insect repellants are not for use on skin. Use the repellent according to the manufacturer's recommendations provided on the container.
- Avoid using fragrances.
- Prevent accumulation of water, which can provide breeding grounds for mosquitoes.

The Zika virus is primarily transmitted through mosquitoes but may also be spread via bloodborne (contact) transmissions and sexual transmission (partner to partner). Only 1 in 5 infected individuals develop signs and symptoms which include fever, rash, joint and muscle pain, headaches and red or pink eyes. Symptoms begin to occur between 2 and 7 days after exposure, are usually mild, and can last up to a week. The Zika virus has been detected in South Carolina and field personnel should be aware of the symptoms and take preventative measures.

Bees, Hornets, and Wasps

Contact with stinging insects like bees, hornets, and wasps may present a hazard to site personnel. Exercise extreme caution whenever site and weather conditions increase the risk of encountering stinging insects.

With these things in mind and with the high probability of contact with stinging insects, all site personnel will comply with the following safe work practices:

- If a worker knows that he is hypersensitive to bee, wasp or hornet stings, he must inform the SUXOS or UXOSO (as applicable) prior to participation in site activities.
- All site personnel will be watchful for the presence of stinging insects and their nests and will advise the SUXOS or UXOSO (as applicable) if observed.
- Flag any nests located on-site and notify site personnel of its presence.
- If stung, immediately report the incident to the SUXOS or UXOSO to obtain treatment and to allow the SUXOS or UXOSO (as applicable) to observe the bite victim for signs of allergic reaction.

Black Widow Spiders

The black widow spider is not usually aggressive; females can become aggressive if agitated when guarding her egg sac. They live in a variety of natural and domestic habitats such as under rocks and wooden boards, and in dense plant growth. The female spider is glossy black approximately 1-inch long, and marked with a characteristic red hourglass on the underside of the abdomen. The male, which is rarely seen, is smaller and has four pairs of red marks along the sides of the abdomen. Young black widow spiders are tan-to-gray in color and have orange and white "racing stripes" on their abdomens.

Black widow spider venom affects the nervous system and causes pain in the lymph nodes. Other symptoms of a severe bite include nausea, elevated blood pressure, sweating, tremors, and increased white blood cell counts. The wound may appear as a bluish red spot, surrounded by a whitish area. Victims of a black widow bite may exhibit the following signs or symptoms:

- Sensation of pinprick or minor burning at the time of the bite
- Appearance of small punctures (sometimes none are visible)

After 15 to 60 minutes, the victim feels intense pain at the site of the bite. The pain quickly spreads and is followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, and poor coordination, dilated pupils, and generalized swelling of the face and extremities.

Brown Recluse Spiders

Brown recluse spiders have soft bodies, generally sandy or tan in color with light brown abdomens, about ¼- to ½-inch long. The legs are long, delicate grayish to dark brown, and covered with short, dark hairs. The leg span is about the size of a half-dollar.

The spider's most distinguishing characteristic is the existence of three pairs of eyes arranged in a semicircle on the forepart of the head and a dark, normally, all spiders have 4 pairs of eyes; 8 eyes total. There is a violin-shaped, marking immediately behind the semicircle of eyes. The neck of the violin points toward the abdomen.

The spider may be found in sheltered corners among debris, in woodpiles, under loose bark and stones. Hands, underarms, lower abdomen, and the ankles are the areas of the body most likely to be bitten. A bite may go unnoticed for six to eight hours before a reddening, swelling, and blistering area around the wound starts to appear. A severe bite can produce an area of dead skin tissue that may require surgery. Victims of a recluse bite may exhibit the following signs or symptoms:

- Blistering at the site of the bite, followed by a local burning at the site 30 to 60 minutes after the bite.
- Formation of a large, red, swollen, pustule lesion with a bulls-eye appearance.
- Systemic affects may include a generalized rash, joint pain, chills, fever, nausea and vomiting.
- Pain may become severe after eight hours, with the onset of tissue necrosis.

There is no effective first aid treatment for black widow or brown recluse bites. Except for very young, very old or weak victims, spider bites are not considered to be life threatening. Medical treatment must be sought to reduce the extent of damage caused by the injected toxins. If the spider can be retrieved, take it with the patient to medical treatment. If venomous spiders are suspected or known to be on site, the SUXOS or UXOSO (as applicable) will brief the site personnel as to their identification and avoidance. As with stinging insects, site personnel should report to the SUXOS or UXOSO (as applicable) if they locate these spiders on site or notice any type of bite while involved in site activities.

Allergenic Plants

The best preventative measure for poisonous plants is recognition and avoidance. Three or five leaves radiating from a stem is the rule of thumb for identifying pacific poison oak. Pacific poison oak is a woody vine or shrub that grows as a tall shrub in direct sunlight and as a climbing vine in shaded areas, attaching to trees, fence posts, power poles, or other vertical structures; or it may be low-lying.

Stinging nettles have many hollow stinging hairs on the leaves and stems, which act like hypodermic needles, injecting histamine and other chemicals that produce a stinging sensation upon contact. Nettles have soft green leaves, strongly serrated margins and bear small, greenish or brownish flowers.

Poison ivy is a vine that attaches to trees, fence posts, power poles, or other vertical structures; or it may be low-lying. This species has three almond-shaped leaves which can range in color from light green to dark green, turning bright red in the fall. The leaflets of mature leaves are somewhat shiny. Each leaflet has a few or no teeth along its edge and the leaf surface is smooth. Poison ivy flowers from May to July and the yellowish- or greenish-white flowers are typically inconspicuous and are located in clusters of up to 3 inches above the leaves.

All of these plants can produce a delayed allergic reaction. Nearly everyone is allergic or capable of becoming allergic. The plant tissues have an oleoresin, which is active in live, dead, and dried plants. The oleoresin may be carried through smoke, dust, contaminated articles, and the hair of animals. Additionally, when operating a chainsaw to clear brush in the winter or early spring, sawdust may contain enough oleoresin to cause a severe rash. Symptoms usually occur 24 to 48 hours after exposure, resulting in rashes that itch and blister. Should exposure to these plants occur, wash/rinse the affected area within one-half hour after contact, using Technu™, rubbing alcohol, Neutrogena™ acne wash/skin cleanser or similar product. Do not scrub. Do not use soap with lotions or emollients, as this will cause spreading of the allergenic plant oils. Seek medical attention as necessary. The use of disposable gloves and Tyvek® coveralls or barrier creams (applied in advance of exposure), and care in laundering clothing (segregating clothing) worn on site can help prevent skin contact with these plants.

The best defense in dealing with these plants is preventing the direct physical contact that can lead to allergic reaction. This can be accomplished through the use of a skin barrier. Effective barriers include clothing (which should be handled carefully when laundering) and/or barrier cream.

The irritants can also be transported in smoke if these plants are burned and can be released into the air and when these plants are ground up such as in mowing or mulching. These exposures may affect the respiratory tract and the skin.

Venomous Snakes

South Carolina has six species of venomous snakes. These species include the cottonmouth, copperhead, coral snake, pigmy rattlesnake, timber rattlesnake, and the Eastern diamondback rattlesnake.

Cottonmouth

Cottonmouths are relatively large heavy-bodied snakes that reach lengths between 30 and 48 inches. Their coloration ranges from olive to brown to black and the young have wide, dark crossbands. The adult's coloration is dark, so the banding pattern is usually not apparent. Cottonmouths occupy marshes, swamps, and most other aquatic environments in the Coastal Plain and eastern Piedmont. They closely resemble many of the water snakes, but they behave differently when confronted. Like other members of the pit viper family, they may shake their tail when aggravated. They are likely to stand their ground while opening their mouth and exposing the light lining of their mouth.

Copperhead

Copperheads are usually not aggressive, and their bite is very rarely lethal. Like most members of the pit viper family, the Copperhead is a heavy-bodied snake. These snakes range between 24 and 36 inches in length and they are covered in hour-glass shaped crossbands which vary in coloration among different populations. The crossbands may be copper, pinkish, reddish brown, or orange. Copperheads are found state-wide in forests and sometimes in fields. The tips of the tails of young Copperheads are yellow and they flick them back and forth in a manner that attracts prey.

Coral Snake

Coral snakes in North America are most notable for their red, yellow/white, and black colored banding. In some regions, the order of bands usually, but not always, distinguishes between the non-venomous mimics and coral snakes native to North America. Do not rely on the order of color bands to positively identify this species of snake. They can be found in pine and scrub oak sandhill habitats but sometimes inhabit hardwood areas and pine flatwoods that undergo seasonal flooding.

Pigmy Rattlesnake

The pigmy rattlesnake is a small species with adults usually growing to 16-24 inches in total length including the tail. At midbody, the rows of dorsal scales usually number 23. The dorsal pattern consists of a series of oval or subcircular spots with reasonably regular edges. The spots on the flanks are mostly round and not much higher than they are wide. Juveniles have a color pattern that is similar to the adults, although it may be paler or more vividly marked, and the tip of the tail is yellow. This snake inhabits flatwoods, sandhills, mixed forests, and floodplains, and is also found near lakes and marshes.

Timber Rattlesnake

Timber Rattlesnakes are not aggressive and are sometimes reluctant to bite. If this snake is encountered, leave it alone. Its venom is highly toxic and can be fatal. Timber Rattlesnakes range in size between 3 and 5 feet. The coloration of this species is blackish, yellowish, pinkish, or grayish with dark, bent, cross bands aligned along the dorsal length of its body. A reddish dorsal stripe runs between the crossbands and it has a black tail. Timber Rattlesnakes typically inhabit wooded areas, nearby fields, rock ledges and rock outcroppings found throughout the state.

Eastern Diamondback Rattlesnake

The Eastern diamondback rattlesnake is the heaviest, though not the longest, venomous snake in the Americas and the largest rattlesnake. Maximum reported lengths for this species reach 8 feet but specimens of this size are rare. Scalation on this species typically includes 29 rows of dorsal scales at midbody. On the head, the rostral scale is higher than it is wide and contacts two internasal scales. The color pattern consists of a brownish to olive ground color, overlaid with a series of 24-35 dark brown to black diamonds with slightly lighter centers. The belly is cream colored, with diffused, dark mottling along the sides. This snake inhabits upland dry pine forest, pine and palmetto flatwoods, marshes and swamp forest and wet prairies during dry periods. In many areas, it may use burrows made by gophers and gopher tortoises during the summer and winter.

Snake Bite First Aid Treatment

If bitten, a person's physical reaction to the venom is aggravated by fear, anxiety, the amount of venom injected, and the speed of absorption of venom into the victim's circulation; the size of the victim; protection provided by clothing (including shoes and gloves); how quickly the victim receives antivenom therapy, and the location of the bite.

It should be noted that the American Red Cross does not advocate the use of snakebite kits for snakebite injuries; rather, experience has shown that the victim has a better chance of recovery

without permanent damage when the site of the wound is immobilized, and the victim rushed to the closest emergency medical facility (preferably within 30 minutes).

What to Do if Bitten by a Venomous Snake

According to the American Red Cross, these steps should be taken:

1. Wash the bite with soap and water.
2. Immobilize the bitten area and keep it lower than the heart.
3. Get medical help.

If a Victim is Unable to reach Medical Care within 30 Minutes.

1. Allow bite to bleed freely for 15 to 30 seconds.
2. Cleanse and rapidly disinfect area.
3. Wrap leg/arm rapidly with 3 to 6-inch ACE bandage past the knee or elbow joint. Leave fang marks open. Apply suction cup extractor (if available) immediately. Wrap bandage no tighter than one would for a sprain.
4. Apply extractor until there is no more drainage from fang marks. The extractor can be left in place 30 minutes or more if necessary. It also aids in keeping the venom from spreading by applying a negative pressure against the tissue where the venom was initially deposited.
5. If an extractor is not available: Apply direct pressure over bite using a 4H4-gauze pad folded in half twice. Tape in place with adhesive tape.
6. Soak gauze pad in Betadine™ solution if available.
7. Strap gauze pad tightly in place with adhesive tape.
8. Overwrap dressing above and below bite area with ACE or crepe bandage.
9. Wrap ACE bandage as tight as one would for a sprain; not too tight.
10. Check for pulse above and below elastic wrap; if too tight, unpin and loosen.
11. Immobilize bitten extremity, use splinting if available.
12. Transport victim to nearest hospital or medical facility as soon as possible.
13. Try to identify (ONLY if safe to do so) the offending snake.

What NOT to Do if Bitten by a Venomous Snake

1. DO NOT permit removal of pressure dressings or ACE bandage until at a facility that is ready and able to administer antivenin. As soon as the dressings are released, the venom will spread. The hospital at this time must be prepared to administer the antidote (antivenin).
2. Do not eat or drink anything unless approved by medical sources.
3. Do not engage in strenuous physical activity.
4. Do not apply oral (mouth) suction to bite.

5. Do not cut into or incise bite marks with a blade.
6. Do not drink any alcohol or use any medication.
7. Do not apply either hot or cold packs.
8. Do not apply a narrow, constrictive tourniquet such as a belt, necktie or cord.

Protective Measures for Snakes

- Learn to identify poisonous snakes. The site-specific safety training will review this information.
- Observe areas before being seated, placing hands and feet. Observe where to place feet when exiting a vehicle.
- Avoid rock piles, crevices, and brushy areas. If movement of materials (such as rocks or brush) is necessary, use a remote means to initially relocate the material. Prior to entering an area, look and listen carefully.
- Do not place hands into holes, crevices, debris, or anyplace that may hide a snake.
- Never handle snakes that appear to be dead.
- Do not attempt to capture or kill ANY snakes.

9.13 HAZARD COMMUNICATION PROGRAM

This HCP was developed to meet the requirements of the OSHA Hazard Communication Standard, Title 29 CFR 1910.1200 and 1201, including the 2012 amendments based on the Globally Harmonized System. OSHA requires that employers make information available to employees about hazardous chemicals that they may be exposed to in the workplace. This information includes toxicology, physical and chemical hazards, means of detection, and protection against exposure.

For hazardous chemicals brought to the site, the HGL Team makes this information available to staff members through a written HCP, lists of chemicals in use, current copies of SDSs, container labeling, and staff training.

As a part of the HCP, the project UXOSO is responsible for the following:

- Establishing a chemical inventory with SDSs of each chemical product to be used and stored on site. Bringing current SDSs for each hazardous chemical as they are introduced to the site.
- Developing and maintaining a comprehensive list of hazardous chemicals introduced to the job site, and making it accessible to all staff on the site.
- Reviewing the SDSs, which accompany incoming shipments, and maintaining the SDSs in project files on site.
- Contacting the source of the hazardous chemicals if the SDSs are not complete or if an SDS is not supplied with an initial shipment.

- Labeling temporary and permanent hazardous chemical containers.
- At multi-employer sites, informing the other employers of the location of the written HCP and copies of SDSs for the site.
- Communicating with other employers (for example, owner, contractors, and subcontractors) to obtain information about the location of their written HCPs, labeling programs, and SDSs, and, if applicable, information on the hazardous chemicals they may produce or introduce to the job site that employees may potentially be exposed to onsite.

9.14 PROCESS SAFETY MANAGEMENT PLAN FOR HIGHLY HAZARDOUS CHEMICALS

A Process Safety Management Program is not applicable IAW 29 CFR 1910.119 and the Safety and Health Requirements Manual (USACE, 2014) under the current work scope, as no highly hazardous chemicals will be used.

9.14.1 HAZARDOUS CHEMICALS

The only anticipated chemical hazards expected during site activities are fuels and oils brought on site for equipment use and maintenance. All site personnel will follow the procedures and precautions outlined in the appropriate SDS for the appropriate use and storage of these materials. The SDS binder will be kept in the UXOSO site vehicle and will be available to all employees on request. Chemical warfare materiel (CWM) is not expected to be found on this site. Should CWM be found on the site, the HGL Team will secure the site, withdraw to an upwind safe position, and contact USACE.

9.15 LEAD ABATEMENT PLAN

Not applicable. Lead hazards are not anticipated for this project.

9.16 ASBESTOS ABATEMENT PLAN

Not applicable. Asbestos hazards are not anticipated for this project.

9.17 RADIATION SAFETY PROGRAM

Not applicable. This type of work will not be performed under the current work scope.

9.18 ABRASIVE BLASTING PLAN

Not applicable. Abrasive blasting is not within the scope of this project.

9.19 HEAT STRESS MANAGEMENT

Heat Stress

In hot environments, the following guidelines will be followed to prevent heat-related injury.

a. Drinking water will be made available to employees, and employees will be encouraged to frequently drink small amounts (for example, 1 cup every 15 to 20 minutes). The water will be kept reasonably cool by use of coolers with ice.

b. Toolbox training will include training on the symptoms of heat-related problems, contributing factors to heat-related injuries, and prevention measures.

c. When possible, work will be scheduled for cooler periods during the day.

d. A buddy system will be established to encourage fluid intake and watch for symptoms of heat-related injury.

e. The UXOSO will monitor those individuals who have had a previous heat-related illness, are known to be on medication, or exhibit signs of possibly having consumed large amounts of alcohol in the previous 24 hours for signs or indicating symptoms of heat-related illness.

f. Breaks in shaded or air-conditioned areas will be taken at intervals to prevent harmful heat stress.

g. Individuals who are not acclimatized will be allowed additional breaks. The period and number should be determined by the UXOSO and provided to the supervisor and employee for implementation.

h. Additional measures will be taken, as needed, to minimize heat stress. These measures may include measures such as pop-up tents over the work area and personal cooling products such as water-retentive bandanas and neck wraps.

i. Sunscreen with a minimum sun protection factor of 30.

Heat Stress Monitoring

The UXOSO will monitor heat stress and will adjust heat stress controls to control the hazard to personnel. This monitoring will include utilization of a wet-bulb globe temperature (WBGT) instrument, visual monitoring of work and worksite conditions and feedback from work crews. Use of a WBGT instrument is preferred, however, if a WBGT instrument is not available, and the WBGT cannot be obtained from local weather stations, then the Approximate WBGT Temperature Chart (EM 385-1-1, Fig. 6-1) should be used to approximate the WBGT. The UXOSO may also use local reports of heat index, applications such as OSHA's Heat Safety Tool and the heat stress TLV.

The risk of heat-related illness among healthy workers who are acclimatized to hot work is low if the heat index does not exceed the ACGIH "screening criteria" shown below in Table 9.2. The OSHA Heat Safety Tool can be used alone or in coordination with the table below as a screening tool to help identify when additional preventative measures (i.e., more water and rest breaks) may be necessary (CDC, 2018).

Table 9.2
ACGIH Screening Criteria and Action Limit for Heat Stress Exposure
(WBGT Values in Degrees Celsius/Fahrenheit [°F])

Work/Recovery Cycle	TLV®				Action Limit			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75 - 100% work	31/87.8	28/82.4	-	-	28/82.4	25/77	-	-
50 - 75% work	31/87.8	29/82.2	27.5/81.5	-	28.5/83.3	26/78.8	24/75.2	-
25 - 50% work	32/89.6	30/86	29/84.2	28/82.4	29.5/85.1	27/80.6	25.5/77.9	24.5/76.1
0 - 25% work	32.5/90.5	31.5/88.7	30.5/86.9	30/86	30/86	29/79	28/82.4	27/80.6

Note: Values from the current edition of the ACGIH publication Threshold Limit Values (TLV®) and Biological Exposure Indices.

If impermeable clothing is worn in hot environments, additional controls such as cooling vests will be implemented. Physiological monitoring will also be conducted if impermeable clothing is being worn.

The following heart rate guidance should be used:

- Count the radial (wrist) pulse during a 30-second period as early as possible in the rest period.
- If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.
- If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by an additional one-third and keep the rest period the same.

Additional physiological monitoring, such as continual pulse or core temperature, may be implemented, as needed.

9.20 COLD STRESS MONITORING PLAN

Cold Stress

The potential for cold stress is determined primarily by two variables: the temperature of the air and the speed of the wind. The cooling effects of moving air on exposed flesh can be expressed as an equivalent chill temperature (ECT), which combines temperature and air speed. At a given temperature, calm air is less dangerous.

Table 9.3 shows values of ECT for various temperature and speed combinations. The conditions represented by Zones B and C are extremely dangerous to exposed skin. Continuous exposure of exposed skin should not be permitted if the ECT is 25°F or less. Work under conditions represented by Zone A is much less dangerous to exposed skin. However, workers can suffer frostbite injury in the less severe environment if they develop a false sense of security and fail to take precautions.

At low ECT values, precautions against hypothermia are necessary, even if workers are dressed in well-insulated clothing. The danger of hypothermia is especially severe if immersion in water is possible during the work.

Table 9.3
Equivalent Chill Temperature (°F)
at Various Air Temperatures and Wind Speeds

Estimated Wind Speed (mph) ↓	Actual Temperature Reading (°F)											
	50	**40**	**30**	**20**	**10**	**Zero**	**-10**	**-20**	**-30**	**-40**	**-50**	**-60**
Calm	*50*	*40*	*30*	*20*	*10*	*0*	*-10*	*-20*	*-30*	*-40*	*-50*	*-60*
5	*48*	*37*	*27*	*16*	*6*	*-5*	*-15*	*-26*	*-36*	*-47*	*-57*	*-68*
10	*40*	*28*	*16*	*-9*	*-24*	*-24*	*-33*	*-46*	*-58*	*-70*	*-83*	*-95*
15	*36*	*22*	*9*	*-5*	*-18*	*-32*	*-45*	*-58*	*-72*	*-85*	*-99*	*-112*
20	*32*	*18*	*4*	*-10*	*-25*	*-39*	*-53*	*-67*	*-82*	*-96*	*-110*	*-121*
25		***Zone A***		*-15*	*-29*	*-44*	*-59*	*-74*	*-88*	*-104*	*-118*	*-133*
30		***Little Danger***		*-18*	*-33*	**Zone**	*-63*	*-79*		**Zone C**		
35		*(in <1 hour, if skin is dry)*		*-20*	*-35*	**B**	*-67*			**Great Danger** (Flesh may freeze within 30 seconds.)		
40	*26*	*10*	*-6*	*-21*	*-37*	*-53*	*-69*	*-85*				

The UXOSO will assess the potential for cold stress before fieldwork begins, primarily through local weather reports but also by using thermometers or wind speed measuring equipment on site as needed.

Work rules related to the prevention of cold-related injury will be required if conditions of the type represented in Zones A, B, or C in the ECT table are anticipated. Under such conditions, the UXOSO will measure temperature and wind speed when work commences each day and at routine intervals (at least every four hours) thereafter, unless he/she believes that some other means of hazard assessment is adequate. The CDHS must approve any alternative means of hazard assessment. When work is conducted under conditions represented in Zones A, B, or C, the UXOSO will implement the work rules described below to manage the potential hazard.

- Employees will receive training on the dangers and symptoms of cold-related injury and the work rules adopted to prevent it.
- Site workers will be warned that older individuals and people with circulatory problems might be at increased risk for cold-related injury, and that added precautions might be necessary to protect them.
- Each employee will be under protective observation by someone else during work (that is, use of the "buddy system" will be required).
- Employees who experience pain in the extremities or are shivering will be removed from exposure to the cold work environment.
- Work must be halted if frostbite cannot be prevented. Continuous skin exposure will not be permitted when the ECT is -25°F or less (Zones B and C on the ECT table).
- Tasks should be scheduled to avoid long periods during which workers must sit or stand still.

- Work expectations for new employees should be adjusted downward for the first few days, to permit acclimatization to the cold conditions.
- Dehydration, which decreases blood flow to the extremities, should be avoided. Employees will be encouraged to replenish water lost to perspiration and respiration. The UXOSO will provide soups and warm sweet drinks as appropriate.
- The UXOSO will develop procedures that reduce the likelihood of immersion in water or soaking of the clothing by other means during project work. Such precautions should apply to any work with liquids like gasoline, alcohols, solvents, or cleaning fluids.
- The UXOSO will plan for any likely scenarios that would lead to wet clothing (through immersion in water, soaking by mist, etc.), and provide for quick changing into dry clothing and treatment for hypothermia.
- Emergency plans will give special attention to the prevention of cold-related injury (hypothermia and freezing of damaged tissues).

If continuous work must be performed at an ECT below 19.4°F, then the UXOSO or PM will provide a heated shelter (truck, car, tent, cabin, or similar space) for warming after exposure to the cold environment. Employees should be encouraged to use the shelter at frequent intervals and upon (1) onset of pain or heavy shivering, (2) occurrence of minor frostbite, or (3) onset of feelings of excessive fatigue, drowsiness, irritability, or euphoria. For these conditions, the UXOSO will monitor weather and environmental conditions and implement a mandatory work/warming regimen according to Table 9.4.

Table 9.4
Work/Warming Schedule for a 4-Hour Shift

Air Temp. (°F)	Air Speed (miles per hour)				
	Calm	**5**	**10**	**15**	**20**
-15 to -19	Normal Breaks (1)	Normal Breaks (1)	75 min. max. work period with 2 breaks	55 min. max. work period with 3 breaks	40 min. max. work period with 4 breaks
-20 to -24	Normal Breaks (1)	75 min. max. work period with 2 breaks	55 min. max. work period with 3 breaks	40 min. max. work period with 4 breaks	30 min. max. work period with 5 breaks
-25 to -29	75 min. max. work period with 2 breaks	55 min. max. work period with 3 breaks	40 min. max. work period with 4 breaks	30 min. max. work period with 5 breaks	
-30 to -34	55 min. max. work period with 3 breaks	40 min. max. work period with 4 breaks	30 min. max. work period with 5 breaks		
-35 to -39	40 min. max. work period with 4 breaks	30 min. max. work period with 5 breaks	**Nonemergency work should cease.** NOTE: The above work/warming regimens are applicable to workers in dry **not** wet clothing.		
-40 to -44	30 min. max. work period with 5 breaks				
-45 and below					

Notes:

Break period is a 10-minute warmup time in a warm location.
Source: ACGIH TLVs and Biological Exposure Indices, Cincinnati, OH,
Adapted from the Occupational Health and Safety Division, Saskatchewan Department of Labor

The rules implemented by the UXOSO will require that employees wear adequately insulating dry clothing if conditions of the type represented in Zones A, B, or C in the ECT table are anticipated. Workers should wear cold-protective clothing appropriate for the environmental conditions and the level of physical activity. The following considerations should guide the selection and use of protective clothing:

- Layered clothing will be used to preserve body heat. An easily removable outer windbreak garment should be worn in windy conditions.
- Inner garments and underwear will be made of fabrics that dry quickly and wick moisture away from the body.
- Outer garments will be made with provisions for easy ventilation to prevent inner layers to be wetted by sweat.
- An employee will not enter or remain in a cold work environment if his or her clothing is wet as a consequence of sweating. If clothing is wet, then the employee must change into dry clothing before returning to the cold environment.
- Gloves and/or mittens will be used as necessary to protect the hands, and employees will be warned not to touch very cold objects and surfaces with bare skin.
- Workers will routinely change socks and removable felt insoles to reduce moisture around the feet.
- Eye protection suitable to the type of hazard will be used. Special precautions against ultraviolet light and glare might be necessary in snow-covered terrain.
- Hardhat liners will be used. If work must be done on slippery surfaces, then shoe attachments that enhance traction shall be used.

Repetitive Action or Vibration Disorder Prevention

Exposure to cold and vibration can lead to a condition known as Raynaud's disease or "white finger disease.' The disease is caused by poor circulation in the fingers and toes. Symptoms may include: cold fingers or toes, tingling and slight loss of feeling or numbness in the fingers and toes and whitening of the fingers.

Both hand-held and stationary tools that transmit vibration through a work piece can cause vibration "white fingers" or hand-arm vibration syndrome. The use of these types of tools is not anticipated on this project; however, if they should be required, proper control measures will be utilized to minimize hand-arm vibration. The control measures may include:

- Using anti-vibration tools and/or gloves;
- Keeping hands and body warm;
- Minimizing the vibration coupling between the hand and the tool;
- Participating in the medical surveillance program; and
- Adhering to the ACGIH TLV for hand/arm vibration.

9.21 INDOOR AIR QUALITY MANAGEMENT

Not applicable. This type of work will not be performed under the current work scope.

9.22 MOLD REMEDIATION PLAN

Not applicable. This type of work will not be performed under the current work scope.

9.23 CHROMIUM (VI) EXPOSURE EVALUATION

Not applicable. This type of work will not be performed under the current work scope.

9.24 CRYSTALLINE SILICA ASSESSMENT

Not applicable. This type of work will not be performed under the current work scope.

9.25 NIGHT OPERATIONS LIGHTING PLAN

Not applicable. Night operations are not within the scope of this project. Intrusive activities will be performed during daylight hours only.

9.26 TRAFFIC CONTROL PLAN

A Traffic Control Plan will not be required for this project, as there will be no work performed adjacent to roads.

9.27 FIRE PREVENTION AND PROTECTION PLAN

The APP/SSHP will serve as the written fire prevention plan and will be posted at the project site. The APP/SSHP includes emergency contact information, a list of major workplace fire hazards, potential ignition sources, types of fire suppression equipment available to control a fire, and responsibilities and good housekeeping procedures and considerations. Fire prevention training and awareness will be provided during the site-specific briefing and during daily TSMs.

Workplace Fire Hazards

The main fire hazards at the project site consist of brush and range fires, electrical fires, and those associated with flammable and combustible liquids, waste materials, combustible wastes, fueling operations, storage of fuels and other flammable liquids at the project site, and welding and cutting activities.

Potential Ignition Sources

The significant ignition sources at the project site include smoking materials (matches and lighters), welding/cutting equipment, vehicle/equipment exhaust, and catalytic converters.

Fire-Control Systems, Equipment, and Procedures

Depending on the nature and extent of a fire, the following fire-control systems and equipment will be evaluated or provided for at the project site:

- Contact information for the fire department (listed at the beginning of this APP) will be available.
- Fire extinguishers will be maintained in all vehicles and in specific areas of concern (for example, near electrical work or areas of hot work). Where flammable or combustible materials in quantities greater than 5 gallons are present and where hot work will be performed, 10-pound extinguishers rated 4A:60B:C will be present in the immediate area. At least one dry chemical fire extinguisher having a minimum UL rating of 1A5BC will be available in all vehicles and trailers.
- Flammable wastes will be stored or disposed of in metal containers, clearly marked as containing flammable materials.
- Storage of combustible materials will be kept to a minimum.
- Flammable and oxidizing materials will be stored in marked (no smoking, matches, or open flame) areas with fire extinguishers available.
- Smoking will be permitted only in designated areas. Personnel will never discard cigarette butts into the environment while working at the site.
- Open flames will be prohibited.
- Vehicles and equipment will not be left idling or parked in areas where catalytic converters may ignite vegetation.
- Project personnel will be permitted to extinguish small fires in their incipient stages only if the personnel have been trained and feel comfortable doing so.

Fire-Control Equipment Maintenance Responsibilities

The UXOSO will be responsible for performing the monthly inspections of portable fire extinguishers and obtaining annual service for all HGL Team provided fire extinguishers used at the project site. Subcontractors will be responsible for performing the monthly inspections and obtaining annual service for all fire extinguishers that they provide for use at the project site. Vehicle and equipment operators will be responsible for the daily inspection of fire extinguishers on vehicles/equipment.

In the event of a fire, staff should only attempt to extinguish a fire if it is containable. All additional occupants will immediately evacuate the area following the posted emergency evacuation routes and go to the designated rally point. The senior person present will take a head count to account for all personnel.

9.28 WILD LAND FIRE MANAGEMENT PLAN

Any wild land fires will be responded to by on site personnel. More than one vehicle escape route has been plotted from the site in case fire or smoke blocks the primary route. An overland route also has been plotted in case all roadways are blocked. Additional fire prevention measures may be needed (for example, removing brush or wetting areas down) during some activities.

9.29 ARC FLASH HAZARD ANALYSIS

Not applicable. This type of work will not be performed under the current work scope.

9.30 ASSURED EQUIPMENT GROUNDING CONTROL PROGRAM

All portable electrical equipment and extension cords will be protected with a ground fault circuit interrupter. Only hard or extra hard outdoor usage extension cords with a rating (in watts or amps) at least equal to the sum of the connected loads will be used. Extension cords, power tools, and lighting equipment will be inspected before each use, protected from damage, and kept out of standing water.

All electrical installations will be made as required by National Fire Protection Association (NFPA) 70: National Electrical Code (NFPA, 2012) or the local code, whichever is more protective. Only qualified electricians may work on electrical circuits. Qualified personnel will receive training on the use of the special precautionary techniques, PPE, arc flash, insulating and shielding materials, and insulated tools and test equipment.

9.31 HAZARDOUS ENERGY CONTROL PLAN (LOCKOUT/TAGOUT/TRYOUT)

Not applicable. Hazardous energy locations are not anticipated for this project.

9.32 STANDARD PRE-LIFT PLAN

Not applicable since this type of work will not be performed under the current work scope.

9.33 CRITICAL LIFT PROCEDURES

Not applicable. Critical lifts are not anticipated for this project.

9.34 NAVAL ARCHITECTURAL ANALYSIS

Not applicable. This type of work will not be performed under the current work scope.

9.35 FLOATING PLANT INSPECTION AND CERTIFICATION

Not applicable since there will be no Floating Plant and Marine Activities under the current scope of work as defined in Section 19 A of the *Safety and Health Requirements Manual* (USACE, 2014).

9.36 SEVERE WEATHER FOR MARINE ACTIVITIES

Not applicable since there will be no Marine Activities under the current scope of work.

9.37 EMERGENCY PLAN FOR MARINE ACTIVITIES

Not applicable since there will be no Floating Plant and Marine Activities under the current scope of work as defined in Section 19 A of the *Safety and Health Requirements Manual* (USACE, 2014).

9.38 MAN OVERBOARD/ABANDON SHIP

Not applicable since there will be no boats, vessels, or skiffs used at the project under the current scope of work.

9.39 FLOAT PLAN FOR LAUNCHES, MOTORBOATS, AND SKIFFS

Not applicable since there will be no boats, vessels, or skiffs used at the project under the current scope of work

9.40 FALL PROTECTION AND PREVENTION PLAN

Not applicable. No activities requiring fall protection are anticipated for this project.

9.41 DEMOLITION/RENOVATION PLAN

Not applicable. Demolitions are not within the scope of this project.

9.42 ROPE ACCESS WORK PLAN

Not applicable since work involving ladders, stairs, and railings will not be performed under the current scope of work.

9.43 EXCAVATION/TRENCHING PLAN (INTRUSIVE ACTIVTIES)

Excavations and trenching greater than 5 feet and requiring an Excavation/Trenching Plan are not anticipated for this field effort. An Excavation/Trenching Plan is required for excavations and trenches that will exceed depths greater than 5 feet below ground surface. Any changes to the plan that become necessary will be submitted to the Project CIH for acceptance. Once accepted by the CIH, the plan will be added to the APP as an amendment. If excavations exceed 5 feet an Excavation/Trenching Plan and an AHA will be prepared by the Competent Person for Excavation or a Registered Professional Engineer, submitted and accepted by the GDA prior to beginning operations.

9.43.1 Conditions

If required, excavation operations on the site will be conducted to 1) characterize the extent of contamination inside the excavations and then 2) excavate and remediate those areas that exceed

threshold requirements established by the Government. Because depths vary, all excavations will be covered under both an Excavation/Trenching Plan and the AHA for Excavation/Trenching.

9.43.2 Competent Person

A competent person shall perform daily inspections of the excavation. Additional inspections may also be necessary because of weather changes, e.g., rain, which may change the excavation. The daily inspections will be documented as an excavation inspection. The designated excavation competent person may vary throughout the project; however, the excavation competent person shall possess the following credentials, at a minimum:

- Successfully completed the OSHA 30-Hour Construction Safety Course
- Successfully completed Excavation Competent Person Training
- Designated by their employer as being given Competent Person responsibilities on the project
- Fulfills Requirements of Section 25, EM 385-1-1 and 29 CFR 1926 Subpart P

The name of the competent person must be identified for each daily excavation. Documentation of these credentials for the excavation competent person must be attached to the AHA for the day that excavation is performed.

9.43.3 Diagram

Excavations may be located inside the investigation area as shown in the site map (Figure 2.1).

9.43.4 Projected Excavation Depths

Excavation depths are not expected to exceed 5 feet. The total depth of excavations is unknown but will be determined based on the depth needed to resolve anomalies.

9.43.5 Projected Soil Types and Methods of Testing

The site is located in central South Carolina. The area is typical of the belt of country lying along the fall line of the between the Coastal Plain and the Piedmont Plateau. The area includes various geological formations and soils. The soils in the area are very low in organic matter, predominately of light gray to bluish gray in color. Underlying rocks carry numerous veins of quartz, fragments of which occur on the surface in places.

9.43.5.1 <u>Visual Soil Testing Method</u>

Visual testing will be performed to estimate the range of particle sizes (fine- or coarse-grained), observe the excavated soil to evaluate whether it is cohesive or breaks apart easily, observe the sides and adjacent surface area of the opened excavation to identify if fissures are present, evaluate if the soil has been previously disturbed, determine if water conditions (groundwater) are present, and determine if any vibrations from construction activities, nearby roads, etc. are impacting the excavation.

9.43.5.2 Manual Soil Testing Method

The following manual testing methods may be used:

1. Plasticity or Wet Thread Test. This test is conducted by molding a moist sample of the soil into a ball and attempting to roll it into a thin thread approximately 1/8 inch (3 millimeter) in diameter (thick) by 2 inches (50 millimeter) in length. The soil sample is held by one end. If the sample does not break or tear, the soil is considered cohesive.
2. Pocket Penetrometer. This test is conducted by using a penetrometer tool to determine the compressive strength of the soil. The inspector initially sets the penetrometer for the lowest possible reading on the scale and then pushes the penetrometer piston into the soil up to a designated point as identified by the manufacturer's instructions.

9.43.5.3 Soil Classification

- Type A
  - Clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam.
  - No soil is Type A if it is fissured, is subject to vibration of any type, has previously been disturbed, is part of a sloped, layered system where the layers dip into a slope of 4 horizontal to 1 vertical (4H:1V) or greater, or has seeping water excavation on a slope of 4 horizontal to 1 vertical (4H:1V) or greater, or has seeping water.
- Type B
  - Cohesive soil that includes angular gravel; silt; silt loam; previously disturbed soils unless otherwise classified as Type C; soils that meet the unconfined compressive strength or cementation requirements of Type A soils but are fissured or subject to vibration; dry unstable rock; and layered systems sloping into the trench at a slope less than 4H:1V (only if the material would be classified as a Type B soil).
- Type C
  - Cohesive soils that include granular soils such as gravel, sand and loamy sand, submerged soil, soil from which water is freely seeping, and submerged rock that is not stable. Also, in this classification is material in a sloped, layered system where the layers dip into the excavation or have a slope of 4 horizontal to 1 vertical (4H:1V) or greater.

9.43.5.4 Inspections

A competent person shall conduct inspections and should be documented. The following guide specifies the frequency and conditions requiring inspections:

- Daily and before the start of each shift
- As dictated by the work being done in the trench
- After every rainstorm

- When fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom, or other similar conditions occur
- When there is a change in the size, location, or placement of the spoil pile
- When there is any indication of change or movement in adjacent structures

9.43.6 Planned Methods for Shoring, Sloping, and/or Bracing

Excavations less than 5 feet in depth and that a competent person examines and determines there is no potential for cave-in will not require protective systems; however, a fixed means of egress will be required every 25 feet for excavations 4 feet deep or greater. Sloping and benching will be performed on excavations greater than 5 feet in depth if personnel entry is required. Sloping and benching will conform to the systems in EM 385-1-1 and OSHA 29 CFR 1926, Subpart P, Appendix B.

The primary approach for sloping excavations less than 20 feet in depth will be measuring a maximum slope of 34 degrees from the horizontal (1-1/2 horizontal to 1 vertical). If alternate sloping or benching approaches are required, they will be conducted IAW Section 25.C of EM 385-1-1.

Table 9.5 shows the allowable slopes and angles for all soil types. Unless designed by a Registered Professional Engineer, excavations less than 20 feet in depth will have a maximum slope of 34 degrees measured from the horizontal.

Table 9.5
Sloping

Soil Type	Height/Depth Ratio	Slope Angle
Stable Rock	Vertical	90°
Type A	¾:1	53°
Type B	1:1	45°
Type C	1½:1	34°
Type A (short-term)	½:1	63°

9.43.7 Perimeter Protection Controls

Protection will be provided to prevent personnel, vehicles, and equipment from falling into excavations.

If the excavation is exposed to members of the public or vehicles or equipment, then Class I perimeter protection will be required. Class I perimeter protection will guard against traffic (vehicles and/or equipment) or personnel falling into an excavation. It will be designed, by a qualified person to withstand the potential forces and bending moments due to impact by traffic. The perimeter protection must:

- Have the strength, height, and maximum deflection requirements for guardrails;
- Provide fall protection equivalent to that provided by a toprail, midrail, and toeboard;
- Have post spacing equivalent to a standard guardrail;

- Have the strength, height, and maximum deflection requirements for guardrails;
- Provide fall protection equivalent to that provided by a toprail, midrail, and toeboard; and
- Have post spacing equivalent to a standard guardrail.

Class II perimeter protection will be the minimum protection required if the excavation does not meet the requirements for Class I perimeter protection but is:

- Routinely exposed to employees, and
- Is deeper than 6 feet (1.8 meter [m]), or
- Contains hazards (e.g., impalement hazards, hazardous substances).

Class II perimeter protection will consist of warning barricades or flagging placed at a distance not closer than 6 feet (1.8 m) from the edge of the excavation. Warning barricades or flagging do not have to meet the requirements for Class I perimeter protection, but they will display an adequate warning at an elevation of 3 feet (0.9 m) to 4 feet (1.2 m) above ground level.

When workers are in the zone between the warning barricades/ flagging and the excavation, they will be provided with fall protection.

If the excavation does not meet the requirements for either Class I or Class II perimeter protection, then Class III perimeter protection is the minimum protection required. Class III perimeter protection will consist of warning barricades or flagging placed a distance not closer than 6 inches (15.2 centimeters) nor more than 6 feet (1.8 m) from the edge of the excavation. Warning barricades or flagging will display an adequate warning at an elevation of 3 feet (0.9 m) to 4 feet (1.2 m) above ground level.

9.43.8 Confined Space Entry, Safe Access and Egress, and Atmospheric Monitoring

Not applicable. Confined space entry hazards are not anticipated for this project.

9.43.9 Location of Utility Shut-offs

No active utilities are present in anticipated excavation areas. If excavations are planned in areas with active utilities, the utilities will be marked, and permits obtained as necessary through the local county authorities.

9.43.10 Protection of Utilities, Facilities, and Features

Aboveground and overhead utilities will be sufficiently avoided to prevent impact from the excavation activities. Excavation operations will not be located near energized power lines.

9.43.11 Management of Excavated Soil, Asphalt, and Concrete

All excavated materials will be placed no closer than 2 feet from the edge of the excavations IAW EM 385-1-1. Following completion of the intrusive investigation, the spoils will be replaced back into the excavations.

9.43.12 Traffic Control

No excavations across roads are expected.

9.43.13 Excavation Permits

Excavation permits are not anticipated for this operation. If required, proper permits will be coordinated with local authorities to ensure they are in place.

9.43.14 Certification of Unexploded Ordnance

Excavation will be performed in areas known or suspected to contain explosives, unexploded munitions, or military ordnance. Work will be performed IAW the QAPP and DDESB approved Explosives Site Plan.

9.43.15 Perimeter Protection

Perimeter protection shall be provided for unattended excavations as specified in EM 385-1-1, Section 25.B. The excavation-competent person shall evaluate daily the exposure of the excavation to employees, the public, vehicles, and equipment. This evaluation shall be used in determining the class of perimeter protection.

9.43.16 Accumulated Water

Surface water will be diverted from excavations using swales or berms as necessary. If water that impacts the safety of the operation is encountered while excavating buried objects, water pumps or water diversion may be used to de-water excavations. If water is controlled or prevented from accumulating by using water removal equipment, a competent person shall monitor the process to verify proper operation.

9.44 FIRE PREVENTION PLAN FOR UNDERGROUND CONSTRUCTION

Not applicable, there will be no underground construction.

9.45 COMPRESSED AIR PLAN FOR UNDERGROUND CONSTRUCTION

Not applicable, there will be no underground work.

9.46 ERECTION AND REMOVAL PLAN FOR FORMWORK AND SHORING

Not applicable. Form and shoring activities are not within the scope of this project.

9.47 PRECAST CONCRETE PLAN

Not applicable. Precast concrete will not be used under the current work scope.

9.48 LIFT SLAB PLANS

Not applicable. Lift slab work will not be performed under the current work scope.

9.49 MASONRY BRACING PLAN

Not applicable. This type of work will not be performed under the current work scope.

9.50 STEEL ERECTION PLAN

Not applicable. Steel erection activities are not within the scope of this project.

9.51 EXPLOSIVES SAFETY SITE PLAN

The HGL Team will conduct explosive operations IAW the Explosives Management Plan provided in Appendix D of the QAPP.

9.52 BLASTING PLAN

The transportation, handling, storage, and use of demolition explosives, blasting agents, and blasting equipment are addressed in the Explosives Management Plan (Appendix D of the QAPP), and HGL Team SOPs (Appendix G of the QAPP). Applicable state and federal regulations and explosive blasting procedures required in Section 29 of EM 385-1-1 apply.

9.53 DIVING OPERATIONS PLAN

Not applicable, no diving will be conducted.

9.54 SAFE PRACTICES MANUAL FOR DIVING ACTIVITIES

Not applicable, no diving will be conducted.

9.55 EMERGENCY MANAGEMENT PLAN FOR DIVING

Not applicable, no diving will be conducted.

9.56 TREE FELLING/MAINTENANCE PROGRAM

Not applicable. This type of work will not be performed under the current work scope.

9.57 AIRCRAFT/AIRFIELD CONSTRUCTION SAFETY AND PHASING PLAN

Not applicable. This type of work will not be performed under the current work scope.

9.58 AIRCRAFT/AIRFIELD SAFETY PLAN COMPLIANCE DOCUMENT

Not applicable. This type of work will not be performed under the current work scope.

9.59 SITE SAFETY AND HEALTH PLAN

See Appendix A, Attachment A1.

9.60 CONFINED SPACE ENTRY

Not applicable. Confined space entry hazards are not anticipated for this project.

9.61 CONFINED SPACE PROGRAM

Not applicable. Confined space entry hazards are not anticipated for this project.

10.0 RISK MANAGEMENT PROCESS

Detailed project-specific hazards and controls for each major DFW /activity will be addressed in task-specific AHAs. The AHAs define the job steps to be performed for each activity; the specific anticipated hazards associated with each job step; and the equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk. The AHAs will include site-specific training requirements, inspection schedules, and the names of competent and qualified personnel. AHAs required for the project will be submitted for approval to the GDA 15 days prior to the commencement of the work covered by the AHA. Work shall not begin until the AHA for that activity has been accepted by the GDA and discussed with all HGL Team and subcontractor personnel engaged in the activity. The AHAs are to be considered living documents and are intended to be created in the field and updated by the workers as needed. A RAC associated with each activity will be determined. RACs are defined by probability and severity of occurrence.

AHAs will be revised, as necessary, when unforeseen circumstances arise, or work-site conditions change. Any revisions will be immediately communicated to the affected site workers. If the need to complete an unplanned task becomes necessary at any point throughout the day the AHA will be revised.

Project-specific hazards and controls are discussed in Section 2.0, Hazard/Risk Analysis of the SSHP.

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ATTACHMENT A1
SITE SAFETY AND HEALTH PLAN

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EMERGENCY CONTACT INFORMATION

In case of emergency or unplanned situation, contact the appropriate responder from the list below. This summary precedes this Accident Prevention Plan for quick reference.

- In emergency situations, contact the site Point of Contact (POC) who will then contact the appropriate response teams.
- If a serious, life threatening emergency arises, contact emergency personnel before contacting the site POC.

EMERGENCY TELEPHONE NUMBERS AND PROJECT CONTACTS

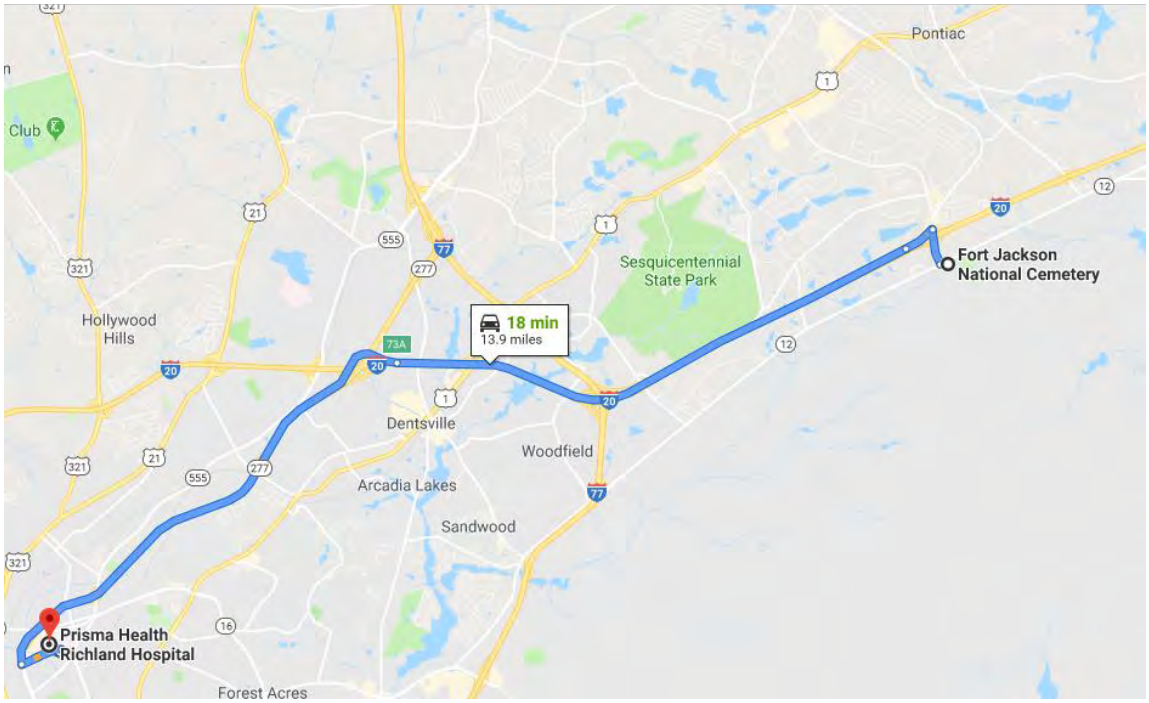
Emergency Medical Care		
Hospital: Prisma Health Richland Hospital 5 Medical Park Rd Columbia, SC 29203	Emergency 911 or (803) 751-4444 Non-emergency (803) 434-7000	
National Poison Control Center	(800) 222-1222	
National Response Center Environmental Emergencies	(800) 424-8802	
Federal Occupational Safety and Health Administration (OSHA) Emergency Hotline	(800) 321-6742	
Emergency Numbers		
Fire Fire Department – Columbia Fire Department	Emergency Non-emergency	911 (803) 545-3700
Police Richland County Sheriff's Department	Emergency Non-emergency	911 (803) 576-3000
USACE		
USACE Contracting Officer	Jeffrey Henderson	(256) 895-3953
USACE Contracting Officer's Representative (COR)	Amy Doss	(256) 895-1979
HGL Contacts		
Health and Safety 24/7 Emergency Number		(800) 341-3647
HGL Program Manager	Janardan Patel	(703) 736-4509
HGL Project Manager	Derek Anderson	(706) 372-5138
Corporate Quality Management Representative	Neil Feist	(256) 714-5808
Senior UXO Supervisor (SUXOS)/UXO Safety Officer (UXOSO)	To Be Determined (TBD)	TBD
Corporate Health and Safety Director	Stephen Davis Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP)	(865) 659-0499
Project CIH/Safety and Health Manager (SHM)	Edie Scala-Hampson CIH, Certified Hazardous Materials Manager (CHMM)	(847) 409-6384
HGL Corporate Occupational Physician *WorkCare 24-hour hotline nurse	Dr. Peter Greaney, MD	(714) 978-7488, ext. 114 *(888) 449-7787
WorkCare 24/7 Incident Intervention service (First aid and injury management guidance)	To be contacted for all work-related injuries and illnesses.	(888) 449-7787

Directions to Prisma Health Richland Hospital

The Prisma Health Richland Hospital is located at 5 Medical Park Rd, Columbia, SC 29203

From the Fort Jackson National Cemetery on Percival Road: Approximately 18 minutes

- Head southwest on SC-12 W toward S-40-52/Clemson Rd/State Rd S-40-2033 – 404 feet
- Turn right onto S-40-52/Clemson Rd/State Rd S-40-2033 – 0.4 miles
- Sharp left to merge onto I-20 W toward Columbia – 0.4 miles
- Merge onto I-20 W – 6.3 miles
- Take exit 73A to merge onto SC-277 S toward Columbia – 5.9 miles
- Turn left onto Harden Street Extension (signs for Bull St/SC-277 S) – 0.5 miles
- Turn left onto Broad St – 210 feet



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LIST OF ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AHA	activity hazard analysis
APP	Accident Prevention Plan
CDHS	Corporate Director of Health and Safety
CFR	Code of Federal Regulations
CHMM	Certified Hazardous Materials Manager
CIH	certified industrial hygienist
COR	Contracting Officer's Representative
CPR	cardiopulmonary resuscitation
CSP	certified safety professional
CWM	chemical warfare materiel
dBA	A-weighted decibels
DOE	U.S. Department of Energy
EHS	environmental health and safety
EM	Engineer Manual
EPA	U.S. Environmental Protection Agency
EZ	exclusion zone
FJNC	Fort Jackson National Cemetery
HGL	HydroGeoLogic, Inc.
IT	International Technology Corporation
MEC	munitions and explosives of concern
mm	millimeter
MPPEH	material potentially presenting an explosive hazard
OESS	Ordnance and Explosives Safety Specialist
OSHA	Occupational Safety and Health Administration
POC	point of contact
PPE	personal protective equipment
PWP	plasticized white phosphorus
QA	quality assurance
QAPP	Quality Assurance Project Plan
RAC	Risk Assessment Code
RP	red phosphorus

SAIC	Science Applications International Corporation
SDS	safety data sheet
SHM	Safety and Health Manager
SSHP	site safety and health plan
SUXOS	Senior Unexploded Ordnance Supervisor
TBD	to be determined
TLV	threshold limit value
TRIR	Total Recordable Incident Rate
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance
UXOSO	Unexploded Ordnance Safety Officer
WP	white phosphorus

1.0 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

Fort Jackson National Cemetery (FJNC) was established in 2008 following the transfer of land by the U.S. Department of Defense to the National Cemetery Administration. The transferred land is on the north border of Fort Jackson and was previously used for field training exercises. Portions of FJNC overlap with former safety fans of 1950's era mortar ranges, and small arms range fans.

Munitions and Explosives of Concern (MEC) has been encountered during previous investigations. These items include landmines, landmine fuzes, flares, grenades, illuminations rounds and one 75 millimeter (mm) projectile.

The objective of this project is to remove MEC and Material Potentially Presenting an Explosive Hazard (MPPEH), to include munitions debris at FJNC to enable these areas to be rendered usable for cemetery construction development and follow-on construction support.

The FJNC project will include the following:

- Mobilization/demobilization
- General site work
- MEC clearing and grubbing
- MEC avoidance – survey escort
- DGM collection
- MEC subsurface clearance
- MEC scrap inspection and handling
- MEC movement within the project area
- MEC disposal
- MPPEH processing
- Vehicle operations

The site location maps are provided in the Accident Prevention Plan (APP) Figure 2.1.

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2.0 HAZARD ANALYSIS AND RISK ASSESSMENT

2.1 INTRODUCTION

The HydroGeoLogic, Inc. (HGL) Team has analyzed the Performance Work Statement and historical information to determine work risk hazards associated with fieldwork tasks to be performed within the FJNC project site. The hazards likely to be encountered during fieldwork include classic safety, explosive ordnance, physical safety, and biological hazards. The tasks and hazard/risk analyses detailed in this section shall be modified and approved throughout the project as needed to address changing work conditions.

2.2 ACTIVITY HAZARD ANALYSES

Detailed project-specific hazards and controls for each major definable feature of work/activity will be addressed in task-specific activity hazard analyses (AHAs). The AHAs define the job steps to be performed for each activity; the specific anticipated hazards associated with each job step; and the equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk. The AHAs will include site-specific training requirements, inspection schedules, and the names of competent and qualified personnel. The AHAs are living documents and intended to be created in the field and updated by the workers as needed. A risk assessment code (RAC) associated with each activity will be determined. RACs are defined by probability and severity of occurrence.

AHAs have been developed and are provided in Attachment A2 of the APP. Each AHA sheet provides job specific steps, associated hazards, and actions necessary to eliminate or minimize the potential hazards. The following activities were considered in preparing the AHAs:

- Mobilization/demobilization
- General site work
- MEC clearing and grubbing
- MEC avoidance – survey escort
- DGM collection
- MEC subsurface clearance
- MEC scrap inspection and handling
- MEC movement within the project area
- MEC disposal
- MPPEH processing
- Vehicle operations

Section 4.5 of the APP provides the Risk Management Process. Attachment A2 to the APP contains initial AHAs for each of the major tasks identified for the site, including activity steps, potential hazards, control measures, and training and personal protective equipment (PPE) requirements. These AHAs will be reviewed and updated by the field team prior to starting work. Updates will include listing specific equipment and the names and, if required, certification of qualified or competent persons.

If new operations or tasks are introduced, a hazard analysis will be performed by the Senior Unexploded Ordnance (UXO) Supervisor (SUXOS)/Site Safety and Health Officer (SSHO). If operations change significantly during the course of this project, the related AHA will be updated to accommodate these changes. Any changes in PPE or operating procedures will be approved by the SUXOS/SSHO before they are implemented and will be communicated to the field team(s) during daily tailgate safety meetings. It will be the responsibility of the SUXOS/SSHO to ensure that the required controls are being properly implemented for each operation or task.

2.3 CLASSIC SAFETY

The most common safety hazards potentially associated with this project are expected to include:

- Slips, trips, and falls;
- Motor vehicle and heavy equipment operation;
- Underground utilities;
- Cumulative Trauma Disorder; and
- Material handling and lifting.

Personnel working on site may encounter these hazards at one time or another. These hazards at the job site and methods to prevent injury resulting from them are described in the following subsections. Additional physical hazards are addressed in Section 2.6 of this Site Safety and Health Plan (SSHP).

2.3.1 Slip, Trip, and Fall Hazards

2.3.1.1 <u>Hazard Identification</u>

Work areas may contain slip, trip, and fall hazards for site workers, such as:

- Holes, pits, or ditches;
- Slippery surfaces;
- Uneven and rough terrain;
- Vegetation and debris such as fallen branches, vines, and roots; or
- Weather conditions that make surfaces slippery and obscure visibility, and thunderstorms and tornados.

2.3.1.2 <u>Hazard Mitigation/Prevention</u>

Site personnel will be instructed to look for these potential safety hazards and immediately inform the SUXOS/SSHO about any encountered or new slip, trip, or fall hazards. If the hazard cannot be immediately removed or mitigated, action will be taken to notify site personnel about the hazard. Slips, trips, and fall hazards will be a daily tailgate safety briefing item. Operations will cease if weather conditions should cause activities to become hazardous.

2.3.2 Motor Vehicles and Heavy Equipment

2.3.2.1 Hazard Identification

Site tasks such as site preparation, brush clearing, excavation, and vehicle and/or heavy equipment operation may present a hazard. Injuries can result from being hit or run over by a moving vehicle, from vehicles overturning, or from being struck, burned, or otherwise injured by moving parts.

2.3.2.2 Hazard Mitigation/Prevention

Before any machinery or mechanized equipment is placed into use, it will be inspected and tested to verify that it is in safe operating condition. Records of tests and inspections will be maintained at the site. The following safety procedures will be adhered to on sites using heavy machinery and equipment:

- The HGL Team will designate a competent person to be responsible for the daily inspection of all machinery and equipment and during use to ensure that it is in safe operating condition. Tests will be made at the beginning of each day the equipment is to be used to determine that the brakes and operating systems are in proper working condition.
- Preventive maintenance procedures recommended by the manufacturer will be followed. Any machinery or equipment found to be unsafe will immediately be removed from service and its use prohibited until unsafe conditions have been corrected. A tag indicating that the equipment may not be operated will be placed in a conspicuous location on the equipment. The tag will remain until it is demonstrated to the individual tagging the equipment that it is safe to operate. Where possible, lockout procedures are the preferred method of control to use.
- Only licensed or trained personnel will operate machinery and mechanized equipment. Equipment deficiencies observed at any time that affect safe operation will be corrected before continuing operation. Seats and seat belts will be installed and used by operators and passengers of heavy equipment. The only exception to this requirement will be for heavy equipment designed for stand-up operation. Entering or exiting any equipment while it is in motion is prohibited. Machinery or equipment requiring an operator will not be permitted to run unattended. Machinery or equipment will not be operated in a manner that will endanger individuals or property, and safe operating speeds or loads will not be exceeded.
- Equipment operated on the public roads will be equipped with turn signals visible from the front and rear. Mechanized equipment will be shut down prior to and during fueling operations. Closed systems, with automatic shut-off, which will prevent spillage if connections are broken, may be used to fuel diesel-powered equipment left running.
- All towing devices used on any combination of equipment will be structurally adequate for the weight drawn and securely mounted. Persons will not be permitted to go between a towed and towing piece of equipment except to connect the equipment. All equipment with windshields will be equipped with powered wipers. Vehicles that operate under

conditions that cause fogging or frosting of windshields will be equipped with operable defogging or defrosting devices.

- Whenever the equipment is parked, the parking brake will be set. Equipment parked on inclines will have the wheels chocked or track mechanism blocked and the parking brake set.
- Personnel will not work or pass underneath the loads handled by lifting or digging equipment.
- Each piece of heavy equipment on site will be equipped with at least one dry chemical or carbon dioxide fire extinguisher.
- A warning device or signal person will be provided where there is danger to nearby workers from moving equipment such as swinging loads, buckets, or booms. Where manual (hand) signals are used, only one person will be designated to give signals to the operator. The signal person will be located to see the load and will be clearly visible to the operator. Employees will be required to stay clear of any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.
- Loose, ill-fitting clothing and jewelry can become caught in heavy equipment; therefore, jewelry will be removed and proper fitting clothing will be worn during field activities that involve heavy equipment. Long hair that extends below the hard hat will be tied in a manner to prevent contact with moving equipment parts. PPE, in accordance with the APP/SSHP, will be required of all persons working with or near heavy equipment operations. Employees exposed to public vehicular traffic will be provided with, and will wear, warning vests or other suitable garments marked with or made of reflective or high-visible material.

2.3.3 Underground Utilities

2.3.3.1 Hazard Identification

Underground utility lines are not anticipated but may be present at the project site that may pose hazards during the intrusive operations. The specific hazards include, but are not limited to, utilities such as sewers, telephone, cable, fiber optic, water, fuel, gas, and electrical lines.

2.3.3.2 Hazard Mitigation/Prevention

Before digging, local service providers will be contacted to identify the locations of buried utilities before subsurface activities are allowed to commence. Prior to beginning any intrusive activities, the HGL Team SUXOS will obtain a digging clearance or permit if appropriate, and document phone calls, correspondence, and confirmation numbers. Site personnel will not enter underground utilities. If the local utility service cannot access all areas of the site where utilities may be located, geophysical instruments and utility locators will be used to scan for buried utilities.

2.3.4 Cumulative Trauma Disorder

2.3.4.1 Hazard Identification

Injuries may occur from hand digging with shovels, clearing and grubbing tools, and hand augers. Workers will be instructed to avoid over-reaching, lifting, and twisting while moving equipment, and to ensure that footing is solid before lifting commences.

2.3.4.2 Hazard Mitigation/Prevention

The following actions will be taken to minimize ergonomic risks:

- Use a hand truck or other mechanical aids to move heavy objects.
- Push, do not pull, whenever possible.
- If you find that you must twist or stretch to reach a load to be handled, readjust the load before moving it or reposition yourself before lifting it.
- Consider the size, shape, and weight of the object to be lifted. No individual employee is permitted to lift any object that weighs over 50 pounds. Multiple employees or the use of mechanical lifting devices is required for objects over the 50-pound limit.
- Consider that the safe lifting zone is between the knees and shoulders. If the object is below knee level, bend the knees and lift with the legs. If the load is above the shoulders, use a sturdy step ladder.
- Inspect the anticipated path to the destination for the presence of slip, trip, and fall hazards, and clear obstacles before commencing to move the load/object. Place feet far enough apart for good balance and stability (typically shoulder width).
- Get as close to the load as possible. Bend legs at the knees.
- Keep the back as straight as possible and abdominal muscles tightened.
- Avoid twisting motions when performing manual lifts.
- Straighten legs from their bent position to lift the object.
- Take small turning steps without twisting the knees or the back if it is necessary to turn with the load.
- Never carry a load that cannot be seen over or around.

2.3.5 Vibration

2.3.5.1 Hazard Identification

Both hand-held and stationary tools that transmit vibration through a work piece can cause vibration “white fingers” or hand-arm vibration syndrome. The use of these types of tools is not anticipated on this project; however, if they should be required, proper control measures will be used to minimize hand-arm vibration.

2.3.5.2 Hazard Mitigation/Prevention

The control measures may include the following:

- Using anti-vibration tools and/or gloves;
- Keeping hands and body warm;
- Minimizing the vibration coupling between the hand and the tool;
- Participating in the medical surveillance program; and
- Adhering to the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV) for hand-arm vibration.

2.3.6 Material Handling and Lifting

2.3.6.1 Hazard Identification

Improper handling and lifting of materials and equipment on site can result in specific injuries to the body, most notably the back.

2.3.6.2 Hazard Mitigation/Prevention

Site personnel will exercise care in lifting and handling heavy or bulky items. No site worker will attempt to lift any item in excess of 50 pounds without assistance or use of a mechanical device. Materials being lifted either mechanically or manually will not be moved or suspended over personnel unless precautions have been made to protect the personnel from falling objects. Whenever heavy or bulky material is to be moved manually, the size, shape, and weight of the object and the distance and path of movement must be considered to prevent joint and back injuries. Site personnel will adhere to the following hierarchy in selecting a means for material handling:

1. Movement of the material by mechanical device (lift truck, crane, and similar)
2. Movement by manual means using mechanical aid (dolly or cart)
3. Movement manually in a planned manner with an adequate number of personnel

The SUXOS/SSHO will train employees in proper lifting techniques and require that they lift objects properly. The following procedures shall be followed:

1. Ensure the hands and object are free of oil, grease, or water that might prevent a firm grip. A firm grip on the object is essential.
2. Keep hands, and especially the fingers, away from any points where pinching or crushing could occur, particularly when setting the object down.
3. Inspect the item for metal slivers, jagged edges, burrs, rough or slippery surfaces and pinch points, and, if necessary, use gloves to protect the hands.
4. Place the feet far enough apart for good balance and stability.
5. Ensure that solid footing is available before lifting the object.

6. When lifting, remain as close to the load as possible, bending legs at the knees, keeping the back as straight as possible, and lifting the object with the legs while straightening from a bended position.
7. Never carry a load that cannot be seen over or around while carrying it.
8. When setting an object down, keep the stance and position identical to that for lifting, with the back straight and the legs bent at the knees while the object is lowered.
9. When two or more people are required to carry an object, distribute the load uniformly. Each person should face the direction in which the object is being carried as much as possible.

– NOTE –

If site conditions or activities occur that are not discussed in this document or in the APP, then the SUXOS/SSHO will notify the Corporate Director of Health and Safety (CDHS) immediately and new procedures will be developed.

2.4 EXPLOSIVE ORDNANCE

2.4.1 MPPEH Hazards

During the project, MPPEH will be encountered by the field UXO teams. Every precaution will be taken to ensure all MEC surface and surface clearance operations are conducted in the safest possible manner.

2.4.2 MEC Hazard Safety

When MEC is encountered during any phase of work, the SUXOS and the Unexploded Ordnance Safety Officer (UXOSO) will be immediately notified. In general, the following MEC safety precautions and protocols will be followed:

- Positively identify all MEC.
- Remain alert at all times for MEC, UXO, and related scrap or MPPEH hazards.
- Observe the cardinal principle involving ordnance, explosives, ammunition, severe fire hazards, or toxic materials: limit the exposure to a minimum number of personnel, for the minimum amount of time, to a minimum amount of hazardous material consistent with a safe and efficient operation.
- Assume that MEC hazards contain a live charge until determined otherwise.
- Remain constantly aware that death or injury can occur from MEC/UXO and explosive-related accidents.
- Know that the age or condition of a MEC hazard does not decrease the effectiveness. MEC that has been exposed to the elements for an extended period of time can become more sensitive to shock, movement, and friction because the stabilizing agent in the explosives may be degraded.

- Consider MEC that has been exposed to fire as extremely hazardous. Chemical and physical changes to the contents may have occurred that render it more sensitive than it was in its original state.
- DO NOT approach leaking white phosphorus (WP) munitions unless absolutely necessary as burning WP may detonate.
- DO NOT dismantle, strip, or handle any MEC unnecessarily.
- Submerge smoking (leaking) munitions containing phosphorus, plasticized white phosphorus (PWP), red phosphorus (RP), or WP in water or cover with mud, wet sand, or earth as quickly and gently as possible if necessary to handle or transport.
- Handle crusted-over PWP/RP/WP with special care. PWP/RP/WP will ignite and burn on contact with air. Breaking the crust can cause the round to begin burning again.
- DO NOT touch crusted WP. WP munitions are prone to leaks, causing smoke in hot weather.
- Wear additional protective clothing while removing residue or attempting to move a smoking PWP/RP/WP round into a water bath.
- DO NOT touch, move or jar any ordnance items regardless of the markings or apparent condition. Under no circumstances handle any MEC during avoidance activities or move MEC in an attempt to positively identify.
- DO NOT touch, pick up, kick or move anything that is unfamiliar or unknown.
- DO NOT roll the item over or scrape the item to identify markings.
- DO NOT approach or enter a munitions site if an electrical storm is occurring or approaching. If a storm approaches during site operations, leave the site immediately and seek shelter.
- DO NOT transmit radios or cellular phones in the vicinity of suspect MEC hazards.
- DO NOT walk across an area where the ground surface cannot be seen and that has not been cleared of MEC hazards by the UXO technician.
- DO NOT rely on color codes for positive identification of ordnance items or their contents.
- DO NOT drive vehicles into a suspected MEC area—use clearly marked lanes.
- DO NOT carry matches, cigarettes, lighters or other flame-producing devices into a MEC site.
- DO NOT be misled by markings on the MEC item stating, “practice bomb,” “dummy,” or “inert.” Practice ordnance can have explosive charges that are used to mark and/or spot the point of impact, or the item could be marked incorrectly.
- Clearly mark the location of any ordnance item found for future location and avoidance.
- Follow the procedures of the Quality Assurance Project Plan (QAPP) and SSHP. Upon locating any MEC hazards, immediately notify the SUXOS and UXOSO.

- Post the following warning on site:

— WARNING —

Removing or taking any munitions, explosive, UXO, or munitions-related debris from the site by any employee is strictly prohibited.

Additional MEC safety precautions will be provided during daily safety meetings and are addressed in Engineer Pamphlet 385-1-97, *Explosives Safety and Health Requirements Manual.*

2.4.3 Explosive Demolition Operations

Explosive demolition operations will only be conducted by UXO-qualified personnel who meet the requirements of the U.S. Department of Defense Explosives Safety Board Technical Paper 18 and HGL Team standard operating procedures. DoD Explosive Safety Board approved engineering controls will be used to mitigate explosive hazards associated with demolition operations, as required.

Explosives demolition and procedures are addressed in the Explosives Safety Submission and HGL SOP 502.01 *Explosive Demolition Operations,* which will be included in the Final QAPP. Each task has been analyzed to assess the potential safety hazards that may be encountered by site personnel and prescribes the proper engineering and/or administrative controls and/or PPE. These controls will ensure that the risks to health and safety are reduced or eliminated during project performance.

2.5 CHEMICAL

Chemical hazards are not likely to be encountered while performing the fieldwork, except for hazardous substances brought on site for the execution of site. APP Section 9.13 Hazard Communication Program discusses these chemical hazards and provides the associated safety data sheet (SDS) for recording the chemical substances used at the project site. All site personnel will follow the procedures and precautions outlined in the appropriate Safety Data SDS for the appropriate use and storage of these materials. The SDS binder will be kept in the SUXOS/SSHO site vehicle or office and will be available to all employees on request.

Chemical warfare materiel (CWM) is not expected to be found on this site. If an unknown liquid filled munition is identified or suspected, personnel will immediately withdraw upwind from the work area and contact the U.S. Army Corps of Engineers (USACE) Contracting Officer, USACE COR, and the USACE Ordnance and Explosives Safety Specialist (OESS). HGL will secure the area and provide two personnel located upwind of the suspect unknown liquid filled munition to secure the site until relieved by the Department of the Army emergency response personnel.

2.6 PHYSICAL

The following physical hazards may be encountered during this project:

- Cuts and scrapes from visible or buried debris
- Stress endured from excessive heat or cold

Physical hazards are addressed in more detail in the AHAs and the hazard control plan.

2.7 IONIZING RADIATION

Ionizing radiation hazards are not anticipated under the current scope of the fieldwork.

2.8 BIOLOGICAL HAZARDS

Biological hazards are discussed in detail in Section 9.12 of the APP.

2.9 ACTION LEVELS

Action levels and methods to mitigate the hazards noted above vary depending on the hazard. Controls, preventative measures, and treatments are discussed with listed hazardous conditions. Additional action levels and required actions are presented below:

- Implementation of engineering controls and safe work practices shall be discussed before starting work or a new task.
- Upgrades/downgrades in levels of PPE shall be considered if hazards exist or if hazards are mitigated.
- Work stoppage or emergency evacuation of on-site personnel will be carried out if a hazardous condition warrants such action.
- Public exposures to hazards created by site activities will be prevented or minimized.

3.0 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

This information is found in Section 4.0 of the APP. As field personnel are identified ahead of the field mobilization date, Attachment A5 will be updated to include the personnel qualifications certification letter. The resume of Mr. Stephen Davis, as personnel assigned specific safety and health responsibilities, follows.

NAME: **STEPHEN L. DAVIS CIH, CSP** **HYDROGEOLOGIC, INC.**

TITLE: **Director, Environmental Health and Safety** **Reston, VA**

EDUCATION AND TRAINING:

M.S., Public Health, Industrial Hygiene specialization - University of South Carolina, 1983
Bachelor of Science in Zoology - Valdosta State University, 1975

PROFESSIONAL CERTIFICATIONS:

Certified Industrial Hygienist (CIH) (#4213), by the American Board of Industrial Hygiene, 1989
Certified Safety Professional (CSP) (#10044), by the Board of CSPs, 1991

EXPERIENCE SUMMARY:

Mr. Davis is a seasoned Environmental Health and Safety (EHS) professional with a broad range of successful experience in both program and project management. He is focused on developing cost-effective and "common sense" solutions to EHS challenges within resource-constrained systems. Mr. Davis is highly effective at creating successful safety cultures that achieve regulatory compliance and excellent injury statistics. He has achieved effective Workers' Compensation case management and excellent safety statistics while maintaining compliance with client safety requirements and third-party review systems. Mr. Davis also has experience in medical surveillance program management.

EMPLOYMENT HISTORY:

HydroGeoLogic, Inc., Director, EHS, Reston, VA, February 2014–Present.
Program Manager for EHS, Workers' Compensation, and Medical Surveillance programs. Responsible for execution and continuous improvement of systems to ensure the safety of HGL personnel, pursue our zero-incident goal, meet or exceed Occupational Safety and Health Administration (OSHA) regulatory requirements, exceed client EHS requirements, effectively manage workers' compensation claims, and achieve best-in-class safety statistics.

Science Applications International Corporation (SAIC), Environmental, Health and Safety and Quality Assurance (QA) Manager, Oak Ridge, TN, 2010–2012.
Program Manager for EHS and QA for the Federal Infrastructure organization within SAIC. Responsible for execution of systems to meet or exceed OSHA regulatory requirements, exceed

client EHS and QA requirements, assess and minimize risks, effectively manage Workers' Compensation claims, and achieve best-in-class safety statistics.

- Created business-unit level system for project and program risk review to identify and control risks such as serious health and safety risks, third party lawsuits, regulatory citations and fines, and environmental damage. System documented potential risks and agreed-upon risk controls and facilitated subsequent verification of execution and effectiveness.
- Managed QA program for 5,000-employee organization conducting disparate types of activities subject to requirements of multiple government and commercial clients using either NQA-1 or ISO 9001. The 5,000-employee Business Unit achieved Total Recordable Incident Rate (TRIR) of 0.27 in 2011, which is less than 1/3 the average rate reported by the Bureau of Labor Statistics for engineering firms. Average TRIR for last 4 years was 0.37. The 5,000-employee Business Unit received the National Safety Council Industry Leader award and was one of only 81 of the 54,000 National Safety Council members to receive this award.

SAIC, Vice President, EHS, Oak Ridge, TN, 1993–2009.
Program Manager for EHS for the Energy, Environment and Infrastructure Business Unit within SAIC. Responsible for execution of systems to meet or exceed OSHA regulatory requirements, exceed client EHS requirements, assess and minimize risks, effectively manage Workers' Compensation claims, and achieve best-in-class safety statistics.

- Created and implemented EHS program compliant with American National Standards Institute Z-10 "American National Standard for Occupational Health and Safety Management Systems" for the 5,000-employee Business Unit. This program exceeded all regulatory requirements and established a system for establishing and tracking world-class safety practices and performance. Led and directed activities of seven EHS Managers of sub-tier organizations and dozens of site-health and safety officers. The Business Unit received the National Safety Council "Perfect Record" award for working 2,780,000 hours without a lost time injury or illness in 2009. The Business Unit received the National Safety Council "Occupational Excellence" award each year for ten consecutive years by maintaining a lost time incident rate of less than half the average rate for other businesses in its North American Industry Classification System code.
- Established EHS systems and documentation to achieve approval from multiple third-party review programs such as ISNetworld and PICS, and clients such as the U.S. Department of Energy (DOE), the USACE, and multiple major oil and gas clients.
- Managed EHS portions of successful acquisition of $20M in commercial oil and gas business. EHS systems and performance represented 20% to 40% of evaluation criteria for these bids.
- Provided EHS leadership for over $200M in work at hundreds of sites. This work included Architect and Engineer, Military Munitions Response Program, Long Term Response Action and Hazardous Toxic and Radioactive Waste contracts for the USACE Louisville District, Savannah District, St. Louis District, Omaha District, Northwestern Division, Buffalo District, Mobile District, and Nashville District. It also included similar work for the Air Force Center for Energy and the Environment (3P, 4P, 4PAE), the U.S. Navy, the National Aeronautics and Space Administration, the National Guard Bureau, the Tennessee

Department of Transportation, U.S. Forest Service, Washington Department of Ecology, DOE prime contractors, and multiple commercial clients including oil and gas companies.

  - Coordinated with clients regarding safety expectations, provided guidance to multiple regional and on-site health and safety officers, wrote or reviewed hundreds of health and safety plans and activity hazard analyses, conducted formal readiness reviews to verify preparations, conducted audits, conducted incident investigations, conducted EHS performance reviews and compiled performance statistics.
  - Met challenges associated with these programs including MEC, residual explosives contamination, hazardous wastes, petroleum residues, ionizing radiation and radioactive contamination, operation and maintenance of on-site treatment systems, remedial construction, excavation, SCUBA diving, vessel operation, heavy equipment operation, elevated work and high voltage electrical systems.

- Established processes for Workers' Compensation reporting and case management that facilitated significant reduction in OSHA recordable injury and illness rates.
- Established successful Behavior Based Safety Program in compliance with multiple client requirements. This program allowed the organization to successfully satisfy rigorous requirements of several major oil and gas clients and federal agencies.
- Created and implemented process to review and qualify subcontractors based on prior health and safety performance in order to ensure exceptional safety performance. This program served two important functions: 1) Exclude unsafe subcontractors, and 2) Notify all subcontractors that only first-class EHS programs and execution were acceptable.

International Technology Corporation (IT), Regional Manager Health and Safety Consulting and Training, Knoxville, TN, 1983–1993.
Managed a consulting program delivering health and safety program audits, health and safety training, field project health and safety oversight, job hazard analyses, and occupational exposure monitoring for multiple clients including the DOE, USACE, U.S. Navy, and the California Department of Health Services.

- Successfully managed project to deliver health and safety support to the USACE at the Bruin Lagoon Superfund Site. The acid sludge disposal site was being remediated by excavating the sludge, mixing it with lime and soil, and burying the mix on site.
  - Services consisted of health and safety oversight of the remedial contractor, general health and safety technical advice, on-site monitoring with four real-time instruments mounted on all-terrain vehicle, and installation and maintenance of a real-time perimeter data logging system to collect and store results from multiple hydrogen sulfide and hydrogen chloride sensors. The perimeter monitoring system measured real-time concentrations, recorded instantaneous and average concentrations and provided immediate notification (alarmed) of unacceptable excursions.
  - Following project completion, the general results of the air-monitoring program were published and presented, with USACE and U.S. Environmental Protection Agency (EPA) input and approval, at the EPA Design and Construction Conference.

- Successfully managed second phase of job hazard analyses project for Ft. Bliss Army Post, Texas. Managed and participated in a project to perform hundreds of job hazard analyses at the Ft. Bliss Army Post for AIRHAS.
    - Interviewed dozens of army personnel, observed maintenance and storage operations, inventoried chemical supplies, assessed the nature and severity of potential exposures, and identified issues and hazards that needed immediate attention. Reduced the data to Army codes and entered the accumulated data into the Army's Health Hazard Information Module database. Provided industrial hygiene support for remedial investigation at the DOE Feed Materials Production Center, Fernald, Ohio.
    - The primary objective of this activity was to attain compliance with the requirements of 29 Code of Federal Regulations (CFR) 1910.120, the Hazardous Waste Operations and Emergency Response standard. Conducted detailed on-site hazard assessments, prepared over 20 task-specific health and safety plans including a line-by-line analysis of compliance with the OSHA lead standard, coordinated activities and hazard controls with DOE representatives, and conducted real-time air monitoring to assess employee exposures and verify compliance with exposure limits.
- Managed and participated in the development and delivery of over 20 sessions of the 3-day "Hazard Appraisal and Recognition Planning" course for the California Department of Health Services. This course was developed to meet the specific needs of the sponsor and was the basic health and safety training for the state hazardous waste compliance officers. The course included training in preparing program-specific hazard assessment forms, using program-specific monitoring instruments, and complying with program-specific policies. It was presented on site at multiple locations around the state.
- Managed and participated in 25 presentations of "The Navy Hazardous Substance Incident Response Management Course." This five-day course was presented in Kaneohe Bay HI, Pearl Harbor HI, Norfolk VA, Virginia Beach VA, Charleston SC, Washington, D.C., Guam, Oakland CA, Philadelphia PA, Pensacola FL, San Diego CA, Port Hueneme CA, and Seattle WA. Successful presentation required maintenance, shipment, and set-up of over two thousand pounds of gear including self-contained breathing apparatus, totally encapsulating chemical protective suits, air purifying respirators, and real-time air monitoring instruments. Each course culminated in students leading responses to simulated hazardous materials incidents.

U.S. CITIZEN: Yes

PUBLICATIONS AND TECHNICAL PRESENTATIONS:

Publications:

Davis, S.L., and B. Khona, 1991, "Airborne Exposure Control at an Acid Sludge Remedial Site," published in the proceedings of EPA conference, Design and Construction Issues at Hazardous Waste Sites.

Davis, Stephen L., 1985, "Permeation Testing of Protective Gloves Exposed to Selected High Hazard Pesticides," report prepared under EPA contract number 68 03 3069, IT Corporation, Edison, New Jersey.

Davis, S.L., C.E. Feigley, and G.A. Dwiggins, 1984, "A Comparison of Two Methods Used to Measure Permeation of Glove Materials by a Complex Organic Mixture," American Society for Testing and Materials Special Technical Publication, First International American Society for Testing and Materials Symposium on the Performance of Protective Clothing.

Technical Presentations:

Davis, Stephen, L., 1991, "Airborne Exposure Control at an Acid Sludge Remedial Site," EPA Conference, Design and Construction Issues at Hazardous Waste Sites.

Davis, Stephen, L., 1985, "Industrial Hygiene Assessment for Initial Entry into Hazardous Waste Sites," Joint Conference of Occupational Health, Orlando, Florida.

Davis, Stephen, L., 1983, "Permeation of Glove Materials by Liquefied Coal," Carolina's Section, American Industrial Hygiene Association, Asheville, North Carolina.

Davis, Stephen, L., 1983, "A Comparison of Two Methods Used to Measure Permeation of Glove Materials by a Complex Organic Mixture," Carolina's Section, American Industrial Hygiene Association, Asheville, North Carolina.

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4.0 TRAINING

Personnel who participate in field activities associated with this project are subject to the site-specific training requirements presented in Section 6.0 of the APP. This information is presented only in the APP to eliminate redundancy.

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5.0 PERSONAL PROTECTIVE EQUIPMENT

PPE is addressed in Section 9.12.4 of the APP.

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6.0 MEDICAL SURVEILLANCE

Workers exposed to site hazards, including all HGL Team employees, will participate in a program of medical surveillance as specified in 29 CFR 1926.65, the OSHA standard on "Workplace Health and Safety in Hazardous Waste Operations and Emergency Response." Such workers must present a physician's statement that they are medically qualified for: (1) work in hazardous waste operations, and (2) the use of respirators. The UXOSO will evaluate all physicians' letters and refer any questions to the CDHS. Annual or biennial medical certification is required. A physician's statement must be no older than 2 years.

The UXOSO will note any restrictions stated on a physician's statement and arrange to avoid any prohibited activity or condition. In addition, the UXOSO will monitor all employees to detect early signs of exhaustion, heat stress, or other conditions that might suggest a lack of fitness for a particular task.

Medical treatment received related to a workplace injury or illness will be managed in accordance with the OSHA standard referenced above. The UXOSO will notify the CDHS immediately if such an event occurs.

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7.0 EXPOSURE MONITORING AND AIR SAMPLING

No routine exposure monitoring or air sampling is anticipated. The UXOSO and the CDHS will confer often to assess the need for such testing and will implement a monitoring or sampling program if this is warranted by site activities or conditions.

The UXOSO will monitor employees' noise exposure whenever noisy operations are in progress and require the use of hearing protection whenever the sound level measured in a work area is 85 A-weighted decibels (dBA) or greater. A good rule of thumb is to wear hearing protection when normal conversation cannot be heard at arm's length. Hearing protection will have a minimum noise reduction rating of 30 dBA.

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8.0 HEAT STRESS AND COLD STRESS

The potential for heat stress is high because the work is physical and will be performed during the summer months. Care must be taken to control work schedules and hydration and to observe and respond to symptoms. Heat and cold stress management is addressed in Sections 9.19 and 9.20 of the APP.

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9.0 SAFETY PROCEDURES, CONTROLS, AND PRACTICES

This section outlines the general hazards and safe work practices that all site personnel will follow to eliminate or reduce the risk of exposure to anticipated site hazards. These controls are presented as a guide for site personnel and do not cover all compliance issues. The SUXOS and UXOSO will ensure full compliance with applicable regulatory requirements.

9.1 SITE RULES

General safe work practices for every job site include the following:

- **Using the Buddy System.** Employees shall not work alone—every employee is required to work near someone else who could offer assistance or summon help in the event of an accident or illness. At all times, an employee on a field site must be observable by at least one other person or sufficiently close to at least one other person to communicate by voice.
- **Reporting unsafe conditions.** Site personnel will immediately report to the UXOSO any unsafe acts or conditions, including violations of this document or the APP.
- **Reporting injuries and illnesse**s. All injuries or illnesses, including apparently minor ones such as insect bites, will be reported to the UXOSO promptly.
- **Reporting pre-existing medical conditions.** Site personnel will inform the UXOSO of any known medical conditions that may cause illness in the workplace, aggravate a possible work-related illness, or increase the likelihood of accidents. This includes hypersensitive allergic reactions to stinging and biting insects or poisonous plants; diabetes; high blood pressure; skin or eye sensitivity to sunlight and ultraviolet radiation; chronic illness; and acute illnesses such as a cold, the flu, or stomach/intestinal disorders. Persons with known hypersensitive allergic reactions to stinging/biting insects or to toxic plants will carry appropriate emergency medical antidotes on their person at all times when on site.
- **Prohibiting horseplay.** Site personnel shall not engage in horseplay, running, or other irresponsible behavior or harm people, property, or the environment.
- **Avoiding skin contact with poisonous plants.** Personnel in vegetated or wooded areas shall wear long-sleeve shirts with the sleeves rolled down to reduce contact with poisonous plants.
- **Eating, drinking, and smoking restrictions**. Eating, drinking, and smoking shall be permitted only in areas designated by the UXOSO and at designated break times after employees have washed their hands. Eating, drinking, and smoking shall be forbidden in any exclusion zone (EZ) or nearby decontamination area.
- **Prohibiting ignition sources.** Ignition of flammable materials in any work area is prohibited, unless approved in writing by the UXOSO. Matches, lighters, or other sources of sparks shall not be allowed in any EZ or nearby decontamination area.

- **Limiting personnel exposed to potential risks.** The number of personnel in any work area will be the minimum number necessary to perform work tasks in a safe and efficient manner.
- **Reporting the location of site personnel.** Site personnel will check in with the UXOSO before leaving the site and upon returning to the site.
- **Escorting site visitors**. Site visitors are to be escorted by the UXOSO, or an appropriate designee, at all times.
- **Qualifying personnel for specific tasks.** Site personnel shall perform only those tasks for which they are qualified by training and, when applicable, appropriate certifications. Such certifications shall include those required by this document and the APP.
- **Limitation on admission to work areas.** No one may enter a site work area without the approval of the UXOSO. The UXOSO shall consider the qualifications of each entrant and the risks present in the areas they want to enter.
- **Housekeeping**. All work areas will be maintained in a clean, neat, and orderly fashion, free of loose debris and scrap. Any materials and equipment not being used will be stored or discarded properly. All work areas will be supplied with a trash receptacle that has a lid. The contents of all trash receptacles either will be removed from the site daily or emptied daily into a larger trash storage container that will be tightly closed each night before personnel leave the sites.

9.2 HAZARD COMMUNICATION

HGL's Hazard Communication Program is discussed in Section 9.13 of the APP.

9.3 WORK PERMIT REQUIREMENTS

There are no work permit requirements associated with this project.

9.4 MATERIAL HANDLING PROCEDURES AND SPILL CONTINGENCY

These procedures are covered under section 9.2.2 Spill Plans of this APP.

9.5 DRUM CONTAINER/TANK HANDLING

There are no planned drums or tank handling activities associated with this project.

9.6 COMPREHENSIVE ACTIVITY HAZARD ANALYSIS OF TREATMENT TECHNOLOGIES

There are no planned treatment technologies associated with this project.

9.7 MACHINE GUARDING

To protect site personnel from unguarded moving machinery and equipment surfaces, personnel will follow the requirements found in Subpart O of 29 CFR 1910, Section 16B of Engineer Manual (EM) 385-1-1 and the general provisions listed below:

- All reciprocating, rotating, or moving parts of machinery or equipment will be guarded in accordance with manufacturers' specifications if they create a hazard through contact with personnel.
- No guard, safety appliance, or device will be removed from machinery or equipment or made ineffective except when making immediate repairs, lubrication, or adjustments, and then only after the power has been shut off.
- All guards or safety appliances removed for repair, lubrication, or adjustments will be replaced immediately upon completion of said activity and before the power is restored.

9.8 HAZARDOUS ENERGY CONTROL

All site personnel involved in the use of lockout/tagout for the control of hazardous energy will receive on-site training. All training will comply with Section 12 of EM 385-1-1. If tagout procedures are used on site, authorized personnel will be trained in the following limitations of tags:

- Tags are warning devices affixed to energy-isolating devices. Tags do not provide physical restraint on those devices, such as restraint provided by a lock.
- When a tag is attached to an energy-isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.
- Tags must be legible and understandable by all authorized and affected personnel whose work operations are, or may be, in the area.
- Tags must be securely attached to energy-isolating devices so that they cannot be inadvertently or accidentally detached during use.

9.9 ILLUMINATION

Potentially hazardous operations will be performed only during the time period from 30 minutes after sunrise to 30 minutes before sunset.

9.10 LIGHTNING AND SEVERE STORMS

The UXOSO will remain aware of weather forecasts and plan for inclement weather during project work. If inclement weather appears imminent, the safety officer will direct site workers to halt work and to take refuge in vehicles or nearby buildings. A lightning detector will be present on the site and will be monitored by the UXOSO when threatening weather is noted or when storms are forecast. If the UXOSO deems that lightning is a potential threat, he/she will order employees to take shelter in an enclosed building or a vehicle.

9.11 SANITATION AND DRINKING WATER

An adequate supply of potable (drinkable) water will be provided on site at all times and in accordance with the following provisions:

- Containers will be clearly marked, capable of being tightly closed, equipped with a tap, maintained in a sanitary manner, and cleaned at least weekly.
- Where single-service cups are provided, separate sanitary containers will be available to store the unused cups and to dispose of the used cups.
- Water or other supplied beverages will not be dipped from the container by any means, and using a common cup will not be allowed. Use of non-potable water is not anticipated; however, if containers of such water are used, they will be conspicuously labeled "Caution: water unfit for drinking, washing, or cooking."

Toilet and washing facilities will be available at the project site. The UXOSO will require proper hygienic practices to remove contaminants that might be present on the hands, clothing, or PPE.

9.12 POWER AND HAND TOOL OPERATION

To control the hazards associated with use of hand and power tools, the requirements outlined in EM 385-1-1, Chapter 13, and the safe work practices listed below will be observed when using power tools:

- Power tools will be operated by personnel trained in the use of the tool, its operation, and safety precautions.
- Power tools will be inspected prior to use, and defective equipment will be removed from service until repaired.
- Power tools with guards for moving parts will have such guards in place before and during use, and loose-fitting clothing or long hair will be secured away from moving parts.
- Hands, feet, etc., will be kept away from all moving parts.
- Maintenance and/or adjustments to equipment will not be conducted while the equipment is in operation or connected to a power source, and maintenance on gasoline-powered tools will be conducted only after the spark plug has been removed and secured.

Use of improper or defective hand tools can contribute significantly to the occurrence of accidents on site. Therefore, the requirements outlined in EM 385-1-1, Chapter 13, and the safe work practices listed below will be observed when using hand tools:

- Inspect hand tools for defects before each use.
- Remove defective hand tools from service and repair or properly discard.
- Select and use tools in the manner for which they were designed.
- Be certain of footing and grip before using any tool.

- Wear leather work gloves to increase gripping ability and to protect the hand if a cut, laceration, or puncture hazard exists during the use of the tool.
- Use safety glasses or a face shield if using a tool presents an eye/face hazard.
- When working on elevated surfaces, secure tools to ensure they cannot fall on someone below.
- Do not use tools that have split handles, mushroom heads, worn jaws, or other defects.
- Do not use makeshift tools or other improper tools.

9.13 CHEMICAL HAZARD COMMUNICATION

The UXOSO will control the entry of chemical products into the work environment and limit the number of such products to the minimum necessary for project execution. He/she will obtain a copy of the available SDSs for all such chemical products (unless an exception applies) and maintain them on the site. In addition, the UXOSO will review the hazards inherent in the storage and anticipated use of the chemicals and train workers exposed to these hazards. Such training will occur initial assignment to the site and before use of the product. Supplemental training will be scheduled and presented whenever a new hazardous substance is introduced into the work area or whenever an employee changes job locations where different products are encountered.

The UXOSO will maintain the following documents and records on the site and will inform site workers of their place of storage: (1) The OSHA standard on chemical hazard communication (29 CFR 1910.1200), and (2) a list of chemical products on the site with associated SDSs.

Subcontractors will comply with the requirements presented above and will supply the UXOSO with copies of the SDS for any chemical product they bring to the site.

9.14 SPILL CONTROL

A portable spill-response kit containing oil/solvent absorbent pillows/pads, PPE, and disposal supplies will be maintained in a readily accessible location where fuels, oils, solvents and other environmentally harmful materials are stored on site. The UXOSO will train workers in the proper use of such equipment.

9.15 CONTACT WITH CONTAMINATED SOIL OR WATER

Significant exposure to chemical contaminants in soil and water is unlikely. Limited potential for exposure to munitions constituents will exist when employees come into contact with soil or water. The UXOSO will inform site workers of the risks discussed below and implement the precautions described.

Inhalation of chemical vapors and contaminated dust could occur during excavation operations. Chemical vapors could be present above freshly exposed earth long after excavation tasks are complete. Personnel will attempt to remain upwind of excavation operations, fresh excavations, and piles of freshly exposed earth.

Ingestion of contaminants could occur through hand-to-mouth contact and could easily be avoided. The UXOSO will require proper hygienic practices to prevent ingestion of contaminants that might be present on the hands, clothing, or PPE.

The UXOSO will halt work immediately and confer with the HGL Team CDHS if evidence of grossly contaminated soil or water is noted. Such evidence could include unusual odors, unusually discolored soil or water, or the unexpected presence of chemical containers.

9.16 WORK AROUND HEAVY EQUIPMENT

When working near or alongside heavy equipment, personnel will wear Type 2 reflective vests and/or outer clothing. Hardhats will be worn if struck-by or overhead hazards are present. Ground personnel shall not position themselves between equipment and stationary objects. Personnel shall not be permitted in the swing radius of the equipment. Personnel are only permitted to approach equipment after a signal from the operator and will maintain eye contact with the operator if crossing the path of the equipment. Subcontractors using heavy earth-moving equipment must comply with the daily safety and inspection provisions in Section 18 and 18.G of EM 385-1-1. Inspection forms will be completed by the designated equipment competent person.

9.17 WORK AROUND DEEP WATER

There is no work planned adjacent to deep water environments.

10.0 SITE CONTROL

10.1 WORK ZONE ACCESS CONTROL AND SECURITY

The UXOSO and SUXOS will control access to the site during operations and will enforce the restrictions listed in this document on site visitors. If difficulties related to access control and site security arise, the UXOSO will confer with the USACE OESS to identify corrective action.

10.2 WORK ZONES

The UXOSO will determine EZ around a potentially hazardous operation. Where ordnance could be disturbed, the distances established in the Explosives Safety Submission will define the EZ. In other cases, the EZ will be dictated by the distance necessary to avoid work hazards, such as the steep edge of an excavation or heavy downwind dust concentrations. If heavy equipment is used, then the "reach" of the bucket plus a few extra feet will determine the radius of the EZ.

The UXOSO will designate the support zone, which will include the equipment storage area, access roads, and adjacent areas. The UXOSO will implement procedures to prevent the transport of gross contamination from the EZ into the support zone on boots, clothing, tools, and heavy equipment. The need for rigorous decontamination procedures is not anticipated.

10.3 SITE COMMUNICATIONS

Effective on-site and off-site communication will be established before beginning site activities. On-site communication will be used to coordinate site operations, to maintain site control, to convey safety information, and to alert site personnel to emergency situations. Off-site communication will be available to ensure effective coordination with off-site management personnel, the USACE, and emergency response services.

All site personnel will be familiar with the different methods of both on-site and off-site communication. The methods that will be used for on-site and off-site communication will include the following:

- Handheld radios issued to the field team leader, supervisors and managers
- Cellular telephones
- Air horns, bullhorns, sirens, or hand signals, as needed

Site personnel will use cellular telephones or other supplied communication systems for off-site communication. The UXOSO will verify that the 911 service is available and will make appropriate alternative arrangements if it is not available.

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11.0 PERSONNEL HYGIENE AND DECONTAMINATION

Sanitary and washing facilities, personnel and Level D decontamination, and waste control plans are discussed below.

11.1 SANITARY FACILITIES

The HGL Team will ensure toilet facilities are available, with at least one unit for each 15 workers, in accordance with EM 385-1-1, Section 2.

11.2 WASHING FACILITIES

The HGL Team will provide hand-washing supplies convenient to the work area, including potable washing water and soap. All hand-washing facilities will be supplied with soap, paper towels, and trash receptacles. All washing facilities or areas will be kept clean and free of trash.

All field personnel will wash their hands and faces before eating and drinking and before leaving the site for the day.

11.3 PERSONNEL DECONTAMINATION

Effective decontamination is not simply removing contaminants, it begins with preventing contamination. PPE prevents the wearer from becoming contaminated and good work practices reduce contamination of protective clothing and equipment.

11.4 LEVEL D DECONTAMINATION

Personnel decontamination for this project is anticipated to encompass typical field hazards such as poison oak, ticks, and other biological hazards specific to the project area.

11.5 WASTE CONTROL AND DISPOSAL

Solid trash, paper towels, and other items used in the work areas will be classified as solid waste, containerized and disposed of appropriately.

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12.0 EQUIPMENT DECONTAMINATION

Procedures for the decontamination of field equipment are presented in Appendix G of the QAPP (SOP 2.01).

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13.0 EMERGENCY EQUIPMENT AND FIRST AID

The emergency equipment listed in Table 13.1 will be on site, stored in the location indicated and available for use during the operation specified. Emergency equipment assigned to an area or team will be maintained in proper working order by the team, as directed by the team leader. The UXOSO will conduct an inspection of all emergency equipment at least weekly to ensure completeness and proper working order.

Table 13.1
Emergency Equipment Requirements

Emergency Equipment	No. Per Location	Area Where Item(s) Will Be Stored	Operation Requiring Specified Equipment
Portable Eye Wash Kit*	2 each	Each vehicle	All operations
15-Minute Eye Wash*	1 each	Support Zone	All operations
First Aid Kit	1 each	Each vehicle	All operations
Fire Extinguisher	1 each	Support vehicles, and Support Zone	All operations
Cellular Telephone/ Site Communication	1 each	SUXOS/UXOSO and Support Zone	All operations

*For use if employees are exposed to corrosives, strong irritants, or toxic chemicals.

The size and number of first aid kits will be sufficient to accommodate the maximum number of people (including government personnel and visitors) on site at any given time.

When required, portable eyewash bottles will be available for immediate use while the injured person is transported to the area where the 15-minute eye flushing station will be available. After flushing, the eyes will be bandaged lightly, and the person will be transported to the appropriate medical facility for further evaluation and treatment, if needed.

Personnel administering first aid and/or cardiopulmonary resuscitation (CPR) will comply with the following:

- Wear disposable latex gloves if body fluid is visible.
- Use the CPR Pocket Mask when performing CPR and dispose of the Mask after use.
- Immediately change clothing that becomes contaminated with body fluids as a result of performing first aid, or as soon as feasible.
- Wash hands immediately after performing first aid procedures.

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14.0 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

The Emergency Response Plan addresses the following emergency response and contingency procedures: pre-emergency contingency planning, contacting off-site agencies, documentation, personnel, medical facility routes, and SDSs. Each procedure is summarized below in this section.

14.1 PRE-EMERGENCY CONTINGENCY PLAN

A pre-emergency contingency plan is a written document that establishes policies and procedures and outlines authority for responding to site emergencies. The contingency plan will be part of the SSHP, will anticipate the potential emergencies at the site, and will integrate actions by the local agencies, fire department, and medical facilities.

The contingency plan assigns the role of authority to the UXOSO and SUXOS. These two individuals are responsible for directing emergency response operations, notifying on-site and off-site personnel, requesting aid from outside sources, and documenting the event.

14.2 CONTACTING OFF-SITE AGENCIES

The pre-emergency contingency plan will include arrangements with the local medical provider, police, and fire department for support in the event of an emergency. A list of telephone numbers and directions to these agencies will be in each vehicle. All personnel will be informed of this list and the communication system at the morning tailgate safety meeting.

A map is included in the front of the APP and the front of this SSHP showing the location of the closest medical provider in relationship to the site.

14.3 DOCUMENTATION

The UXOSO and CDHS will initiate an investigation and create documentation of any incidents. This step is important in all cases but is especially so when the incident has resulted in personal injury, on-site property damage, or damage to the surrounding environment. Documentation may be used to help avert recurrences, as evidence in future legal action, for assessment of liability by insurance companies, and for review by government agencies.

Documentation may include a written transcript taken from tape recordings made during the emergency or a bound field book with notes. The document must be accurate and authentic. Documentation steps will include:

- An objective recording of all information,
- A chain of custody procedure, and
- Signed and dated document entries.

Documentation should be maintained with a minimum number of documents (forms or logbooks) to avoid confusion and conflicting accounts. Individuals may be required to give testimony at hearings or in court—a minimal number of documents will facilitate testimony.

If details change or revisions are needed, the person making the notation should mark a horizontal line through the old material and initial the change. Nothing should be erased.

At a minimum, the following will be included:

- Chronological history of the incident
- Facts about the incident and when they became available
- Title and names of personnel involved, composition of team
- Actions—decisions made and by whom; orders given to whom, by whom, and when; and actions taken—who did what, when, where, and how
- Types of samples and test results
- Possible exposure of site personnel
- History of all injuries or illnesses during or as a result of the emergency

14.4 PERSONNEL ROLES, AUTHORITY, AND COMMUNICATION PLAN

The UXOSO has full responsibility and commensurate authority for responding to any emergency that may occur at the MEC work site until the HGL Team is relieved by the proper authorities. With multiple teams working on site, emergency alerts will be broadcast on mobile and/or hand portable field radios. The UXOSO will inform the SUXOS and project manager of emergencies and response actions by telephone or fax as soon as practicable, followed by a written report providing full details. The HGL Team will provide the UXOSO with a cellular telephone and radio communication for use in the field, along with telephone numbers and frequencies that may be used to communicate with emergency services providers and other authorities.

Emergency situations might arise as a result of fire, injury/accident, accidental initiation of explosives or ordnance, serious illness, or weather (such as lightning). All personnel are responsible for observing the work environment, personally practicing safe work habits, and insisting that other personnel work safely. The UXOSO is responsible for ensuring that the potential for emergencies is minimized at the work site by closely observing personnel work habits and ensuring that the physical layout of the work site is established and maintained in such a way that there is minimal potential for incidents.

14.5 ROUTE MAPS TO THE CLOSEST MEDICAL FACILITY

Maps containing routes and written directions to the supporting medical facility are provided in the front of the APP and at the front of this SSHP. This information will be given to all personnel at morning safety meetings, and a copy will be kept on site.

14.6 SAFETY DATA SHEETS

When available, an SDS can provide valuable information when handling a chemical substance. Since the establishment of the Hazard Communication Standard (29 CFR 1910.1200), chemical manufacturers and distributors are required to provide SDSs and warning labels on their products.

Obtaining a SDS on a chemical substance may provide valuable information on the chemical and physical hazards the material presents.

The sections on a SDS and the information they can provide are as follows:

- Chemical identity and manufacture information
- Hazardous ingredients and exposure limits
- Physical and chemical characteristics
- Fire and explosion hazard data
- Reactivity and stability data
- Health hazard and medical treatment information
- Precautions and protection for safe handling and use
- Control measures to avoid overexposure

SDSs are intended to provide comprehensive hazard information; however, many published SDSs are incomplete and lack enough accurate information to assess a chemical hazard. Therefore, use SDSs as a guide and get more in-depth information from other sources. Names of applicable SDSs brought on site by the HGL Team and its subcontractors will be filed in a binder, maintained on site at the HGL Team field office trailer, and made available for project personnel at all times.

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15.0 EMERGENCY RESPONSE PLAN

The UXOSO will evaluate the nature of the emergency and take proper precautions to secure the site to protect project personnel and public safety. Depending on the emergency, personnel will follow the specific safety requirements presented below.

15.1 OPERATIONS

The frequency and severity of emergency situations can be dramatically reduced through proper implementation of the APP. However, if an emergency does occur, quick, decisive action is required. Delays of just minutes can create or escalate life-threatening situations. In an emergency situation, site personnel involved in emergency response and rescue must be prepared to respond immediately. All required equipment must be on hand, in proper working order, and ready to use. To ensure rapid, effective response to a site emergency, the procedures and contingency plans outlined in this section must be implemented before and during any site activities involving exposure to safety and health hazards.

15.2 PRE-EMERGENCY PLANNING WITH LOCAL EMERGENCY RESPONDERS

Before conducting site operations, HGL Team site representatives will meet with the appropriate local authorities to inform them of the nature of the site activities to be performed under this SSHP, and the potential hazards that the performance of these activities pose to site personnel, the environment, and the general public.

15.2.1 Identification of Local Emergency Services

The HGL Team has obtained emergency and non-emergency telephone numbers for emergency services on Fort Jackson. In the event that evacuation of the general public is required because of either normal site operations or an emergency event, the safety POC, USACE OESS, and the HGL Team UXOSO are responsible for contacting the appropriate local officials who execute and coordinate an evacuation.

15.3 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATION

Key personnel roles, lines of authority, and communications plan are detailed in Section 4 of the APP. Emergency response roles are discussed below.

15.3.1 Personnel On-Scene Incident Commander

If an emergency arises, the UXOSO assumes responsibility for the site with the SUXOS as alternate if the UXOSO is unavailable or incapacitated. The UXOSO has responsibility for directing all on-site and off-site response personnel and, as soon as possible, advises the USACE OESS of the emergency situation.

15.3.2 On-Site Emergency Response Services

HGL Team personnel are trained to provide first aid treatment for minor injuries. At least two people on site will be trained in first aid and CPR. The UXOSO will determine whether any injury

requires treatment in addition to first aid. If there is any doubt as to whether additional treatment is necessary, the UXOSO will call 911 for follow-on advanced care and transport to Prisma Health Richland Hospital.

15.3.3 Off-Site Emergency Response Services

Off-site emergency response services may be needed; in the event of a site emergency medical and law enforcement personnel may be required. All requests for emergency services are accessible via the 911 telephone system.

15.4 EMERGENCY RECOGNITION AND PREVENTION

During the development of this SSHP, great attention was given to identifying potential safety and health hazards associated with conducting site activities. Once identified, these hazards were assessed to determine if they could result in an emergency situation. The potential emergencies that may result during site activities are as follow:

- Injury or illness
- Fire/explosion
- Inclement weather

If additional site or task hazard information becomes available during the project, the CDHS will assess this information to determine whether the contingency plans in this section need to be updated.

15.5 SAFE DISTANCES AND PLACES OF REFUGE

Safe distances and places of refuge will be addressed at the daily safety meetings depending on field activities. Work and EZs will vary from day to day. EZs will be established to protect the public during MEC intrusive activities and safe working distances will be established to protect site workers.

During an emergency situation, all work will stop, and field crews will return to a predesignated rally point for further direction on the best place of refuge.

15.6 SITE SECURITY AND CONTROL

In an emergency, it is imperative that site control and security be maintained. The UXOSO will use the Personnel Site Entry/Exit Log to ensure all are present or accounted for at the prearranged emergency assembly points. Depending on site size and configuration, weather and wind conditions, and the nature of the emergency, the following will, as applicable, be used to maintain site security:

- Close, but do not lock, gates as evacuation occurs.
- Erect flagging or barrier tape to prevent accidental entry.
- Use vehicles to block access routes to the site, but ensure they can be moved rapidly if emergency vehicles must use the access route.

15.7 EVACUATION ROUTES AND PROCEDURES

Evacuation routes and procedures are discussed below.

15.7.1 Evacuation Route

The established evacuation route will be checked by the UXOSO and then traveled by all site personnel before the start of site activities to become familiar with the route. Emergency meeting points will vary from day to day depending on work location. The planned evacuation route will be discussed with the field crew at the daily tailgate safety briefing.

Emergency evacuation routes will be posted in the HGL Team field office at each room's exit point. All exit routes will be unobstructed and kept free of debris.

15.7.2 Medical Facilities

A map showing the location of Prisma Health Richland Hospital will be kept readily available in each project vehicle. The emergency number is 911.

15.7.3 Directions to Hospital

A map to Prisma Health Richland Hospital will be in each vehicle and posted in the field. Directions and maps also can be found in the front of this SSHP and the APP.

15.7.4 Medical Evacuation

Medical evacuation requirements will be determined by the emergency first responder. Personnel requiring additional treatment will be evacuated to the hospital. If responders require training on site hazards, the UXOSO will provide this training prior to initiation of fieldwork. Training will be documented using the site training log and will include the subjects listed below:

- Emergency chain-of-command
- Communication methods and signals
- Emergency equipment and PPE
- Removal of injured personnel from the site
- Emergency contacts, telephone numbers, and hospital route

15.8 DECONTAMINATION

Leaking hazardous substances are not expected to be encountered. Field crews are to avoid drums or leaking substances and are to report them when discovered.

15.9 EMERGENCY MEDICAL TREATMENT AND FIRST AID

If an emergency arises, field crews will have first aid kits and at least two staff qualified to administer first aid. The objective will be to stabilize the victim and call for medical assistance. All work will stop during emergency situations and the UXOSO and SUXOS will be notified.

15.9.1 Assessing the Emergency

As much as possible of the following information related to the emergency should be obtained and the on-site response capabilities evaluated:

- What happened:
  - Type of incident
- Casualties involved:
  - Victims (number, location, and condition)
  - Treatment required
  - Missing personnel
- Cause of incident
- Extent of damage to structures, equipment, and terrain
- What can be done to mitigate the situation? Consider:
  - Equipment and personnel needed for rescue and hazard mitigation
  - Number of uninjured personnel available for response
  - Resources available on site
  - Resources available from off-site response groups and agencies
  - Time needed for off-site response resources to reach the site
  - Hazards involved in rescue and response

15.9.2 Rescue and Response Actions

Based on the information collected during the emergency assessment, take the general actions listed below, conducting some concurrently as appropriate. No one is to attempt emergency response or rescue until the situation has been assessed and the appropriate response outlined by the UXOSO.

- Enforce the buddy system:
  - Allow no one to enter a hazardous area without a partner.
  - Personnel in the EZ should be in line-of-sight of or in communication with the UXOSO or their designee.
- Survey casualties:
  - Locate all victims and assess their condition.
  - Determine resources needed for stabilization and transport.

- Assess existing and potential hazards and determine:
  - Whether and how to respond,
  - The need for evacuation of site personnel and off-site population, and
  - The resources needed for evacuation and response.
- Request aid: Contact the required off-site/on-site personnel or facilities, such as ambulance, fire department, and police.
- Allocate resources: Allocate on-site personnel and equipment to rescue and initiate incident response operations.
- Control: Assist in bringing the hazardous situation under complete or temporary control and use measures to prevent the spread of the emergency (control fire, secure site, and similar steps).
- Extricate: Remove or assist victims from the area.
- Stabilize:
  - Administer any medical procedures that are necessary before the victims can be moved.
  - Stabilize or permanently fix the hazardous condition.
  - Attend to what caused the emergency and anything damaged or endangered by the emergency (for example, drums and tanks).
- Transport: Using either on-site or off-site assets.
- Record Casualty: Record the name of the victim, time of injury, destination, and condition upon transport.
- Evacuate:
  - Move site personnel to the rally point, a safe distance upwind of the incident.
  - Monitor the incident for significant changes. The hazards may diminish, permitting personnel to re-enter the site, or hazards may increase and require public evacuation.
- Track Casualty: Record disposition, condition, and location of casualty.

15.10 EMERGENCY ALERTING AND RESPONSE PROCEDURES

Emergency response procedures include all steps to be taken for notifying, evaluating, reacting to, documenting, and following up on a given emergency situation. To ensure all necessary elements are covered, implement the procedural steps outlined in this section for each emergency, regardless of its nature.

15.10.1 Notification

Once the UXOSO has been informed of the emergency, the UXOSO will use radio communication to:

- Notify personnel and get their attention;
- Stop work activity as required;
- Lower noise levels to speed and simplify communication; and
- Begin emergency or evacuation procedures.

If on-site HGL Team personnel or off-site emergency personnel are to enter the site in response to the emergency, the UXOSO, to the extent possible, will notify response personnel about:

- What happened and when it happened;
- Where on the site the emergency situation occurred;
- Who is involved and, if possible, the cause of the emergency;
- The extent of damage and what hazards may be involved; and
- What response actions are required.

15.11 CRITIQUE OF RESPONSE AND FOLLOW-UP

Before normal site activities can resume, the site and personnel must be prepared and re-equipped to handle another emergency. It is also imperative that all federal, state, and local regulatory agencies be notified of the emergency. Therefore, the following activities must be conducted before restarting site activities:

- Notify all appropriate governmental agencies as required. OSHA must be notified if any fatalities occurred or if three or more personnel were hospitalized.
- Restock and clean all equipment and supplies used or damaged in the emergency.
- Investigate the accident to determine the cause of the emergency and what preventive measures could be taken.
- Complete the HGL Team incident form.
- Review and revise the site operational procedures as needed, and update the SSHP to reflect the new procedures if necessary.

15.12 DOCUMENTATION

Record information related to an emergency completely, accurately, and as soon as possible after the emergency while memory of the events is fresh. Record the following information:

- A chronological record of events
- The personnel involved, including personnel on site, site personnel who responded, personnel in charge, and off-site groups or agencies that responded
- Actions taken to minimize the effects of, or to mitigate, the emergency

- An assessment of the potential exposures received by site personnel and the surrounding public
- A recording of the injuries or illnesses that occurred as a result of the emergency

15.13 PPE AND EMERGENCY EQUIPMENT

Planned project PPE is Level D. Upgrades of Level D may be required based on site conditions. Additional PPE such as hard hats and hearing protection may be available from the UXOSO. HGL Team subcontractors will provide PPE for their field crews.

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16.0 EMERGENCY RESPONSE TEAM

Not applicable. This type of work will not be performed under the current work scope.

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17.0 LOGS, REPORTS, AND RECORD KEEPING

17.1 SAFETY, TRAINING, AND VISITORS

The UXOSO will maintain a safety log to record all significant information related to workplace health and safety each day. The safety log should include the following:

- A record of safety briefings
- Details of any accidents, injuries, illnesses, or near misses
- Details related to the conduct and outcome of internal and external audits
- The reason for and duration of safety-related "stop work" orders
- Any other issues pertaining to site or personnel safety or health

The UXOSO will document all safety-related training sessions in a training log or on appropriate forms collected in a file or logbook and maintained on the site. This log will include the initial site-specific training conducted prior to the start of site activities, the safety briefings, hazard-specific training, and similar information.

The UXOSO will maintain a visitor log to record the entry and exit of all visitors. No visitors will be allowed to enter the project site without providing the information required.

17.2 INJURY/ILLNESS/ACCIDENT REPORTS

Accident reporting is discussed in Section 8.0 of the APP.

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ATTACHMENT A2
ACTIVITY HAZARD ANALYSIS FORMS

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ACTIVITY HAZARD ANALYSIS (AHA)

Activity/Work Task: General Site Work

Project Location: Fort Jackson National Cemetery, Columbia, SC

Contract Number: W912DY-17-D-0004

Date Prepared: 5/17/2019

Prepared By: Dusty Easton

Corporate H&S Reviewer: Edie Scala-Hampson

Notes: (Field Notes, review comments, etc.)

Overall Risk Assessment Code (RAC) (Use highest code) **L**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	*M*	*L*
Marginal	H	M	M	*L*	*L*
Negligible	M	L	L	*L*	*L*

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

Probability the likelihood the activity will cause a Mishap (near miss, incident or accident). Identify as: Frequent, Likely, Occasional, Seldom, or Unlikely.

Severity the outcome/degree if a mishap occurred. Identify as: Catastrophic, Critical, Marginal, or Negligible

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

RAC Chart

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

Job Steps	Hazards	Controls	RAC
Review–Health and Safety (H&S) Needs	Inadequate preparation which can lead to personal injuries, property damage and project delays	SSHO to identify applicable portions of SSHP and include those and AHAs in site training. SSHO to perform onsite verification that SSHP and AHAs capture all important site hazards. SSHO to verify that access to the necessary equipment, to evaluate and control site hazards, is available and complete. For example: PID with correct lamp for evaluating chemical hazards in breathing zones and PPE.	L
	Unfamiliarity with site-Addition of new personnel to work team	Conduct training and coordination with team	L
	Emergency response unfamiliarity	SSHO to verify that emergency safety supplies and first aid supplies available and complete. SSHO to review emergency procedures, contact numbers and evacuation plans and rally points. SSHO to confirm that all personnel know what to do in the event of an accident (personal or property damage).	L

Job Steps	Hazards	Controls	RAC
Transportation–Vehicle Maneuvering	Vehicle accidents/Traffic	Prohibit cell phone use by driver while vehicle is in motion. Practice defensive driving and wear safety restraints when vehicle is in motion. Adjust vehicle per your personal specifications and confirm that it is in good working order and all cargo is secured and distractions are minimized. Familiarize yourself with the route and directions. Keep vehicle speed appropriate to road conditions. Be aware of the onset of driving fatigue and take breaks as needed. Perform a walk-around vehicle inspection at least daily.	**L**
	Poor road conditions: ruts, snow, ice mud puddles, poor traction	Monitor weather conditions and consider postponing travel or decreasing speed in poor travel conditions. Match driving speed to the conditions.	**L**
	Maneuvering in tight areas/potential vehicle or personnel damage	Use a spotter to help maneuver in tight areas. Avoid backing if possible. Check all blind spots before you attempt to move vehicle. Sound horn before backing and move slowly.	**L**
Secure site	Security/Site access control–unwanted entry	Establish positive site access control prior to on-site operations using barricades, signs, or fencing.	**L**
Material handling and set up	Strains, sprains, awkward bending/lifting/ positions and ergonomic hazards	Know your own limitations and ask for help if you need it. Size up the load before the lift. Use mechanical assistance or 2-person lift for loads greater than 50 pounds and large awkward loads. Lift with the legs and keep back straight. DO NOT lift and twist torso at the same time. Confirm walking pathway is clear. Limit repetitive awkward motions and unbalanced lifting as much as possible.	**L**

Job Steps	Hazards	Controls	RAC
Working around earth moving Equipment	Traffic/Heavy Equipment–struck-by hazards, crushing hazards	Select work location away from traffic. Place barricades or stationary vehicles for work site protection, if necessary. Wear high visibility vest. Stay clear of traffic and equipment. Discuss active work areas in daily briefings. Make eye contact with operators of equipment to make sure they know your intentions. STAY CLEAR of earth moving equipment. Prohibit machinery or equipment, requiring an operator, to run unattended. Confirm all heavy equipment has functional backup alarms. Minimize the number of ground personnel working around heavy equipment. Never position yourself between moving and fixed objects	**L**
Working around other trades or contractors	Failure to communicate hazards (various hazards: chemical, physical, biological)	Coordinate with subcontractors and other personnel on a daily basis. Notify others of potential hazards to them posed by HGL work and ask them to do the same for us. Stop work or implement controls if the work of others poses a hazard for HGL or subcontractor personnel. Inform subcontractors of hazards and precautions that they should be taking. Provide specific training tailored to the particular workplace. Inspect the work of subcontractors to verify safe operation and compliance with applicable requirements, and require correction of deficiencies. Ask the “creating” employers (subcontractors) to correct hazards. NEVER tell the “creating” employer how to do their job but tell subcontractors to get the hazard corrected and to hold them accountable. If HGL detects a safety violation we have an obligation to see that it gets corrected by the subcontractor that created the hazard.	**L**
	Failure to communicate hazards (various hazards: chemical, physical, biological) (continued)	Ensure that all site workers have the required OSHA training. Require each subcontractor be responsible for conducting inspections of their specific operations and equipment, conducting exposure monitoring for their workers and providing SDSs, PPE, medical surveillance programs and specialized worker training (e.g., fork lift, excavation and trenching, fall protection, etc.). Keep documentation.	**L**

Job Steps	Hazards	Controls	RAC
Working around other trades or contractors (continued)	Fire	Maintain at least one dry chemical fire extinguisher having a minimum UL rating of 1A5BC on site. 10B:C should be in cab of bulldozer, crane, front-end-loader, etc. Limit smoking to designated areas	L
	Injuries and accidents from driving/walking over soft ground and uneven and rough terrain	Choose location with level and firm soils, when possible. Have gravel added to site roads to improve traction. Maintain vehicle speed corresponding to road conditions. Watch footing when walking in mud or wet soils	L
Working in remote areas.	Criminal activity, wild animals, falls leading to inability to self-evacuate	The buddy system is always preferable, however if it cannot be used, follow the Lone Worker Procedure, if working alone: contact PM or alternate point of contact at work start, mid-day, and when leaving work site at end of day. Let others on site (non-HGL staff) know where you are working and establish a check in procedure. Bring a topographic and/or site map and compass or GPS.	L
	Unhygienic conditions	Confirm that restroom facilities, if installed on site, are adequately provided and maintained. Maintain hand disinfectant, wipes, and wash stations.	L
	Slip, trip, and fall hazards	Wear slip-resistant footwear. Inspect the work area for slip, trip and fall hazards Use sand or salt or slip-on traction aids to control ice slip hazards, as needed. Keep work area picked up and as clean as feasible and free of tripping and fall hazards. Keep egress routes are as clear and unobstructed as possible.	L
Inspection and use of powered tools and hand tools	Struck by flying debris–eye, head, etc.	Wear safety glasses when there is a potential for flying debris. Ensure eyewash bottle is available Wear required PPE including: safety glasses with side shields and, hardhat as necessary.	L

Job Steps	Hazards	Controls	RAC
Inspection and use of powered tools and hand tools (continued)	Hand tools/power tools-laceration hazards, jamming, pinch points, struck-by, caught between, electric shock	Confirm that hand tools are in good repair and used correctly. Use the right tool for the right job. Inspect tools daily prior to use and remove defective tools from service immediately. Wear heavy duty work gloves when using equipment that can cut or pinch. Use electric power tools and extension cords protected by a ground fault circuit interrupter.	**L**
General Site Work- Walking on site. Working outdoors.	Biologicals–contact with poisonous plants, allergens, insects and animal kingdom hazards (for example: spiders, hornets, reptiles, snakes, ticks, mosquitoes, bird and rodent droppings, biting and stinging insects, thorny plants, etc.)	Note: All personnel have the option to complete the Voluntary Allergy/Sensitivity/Medical Questionnaire. Conduct visual inspection before work begins and note (mark) areas of poisonous vegetation, insect (hornet wasp) nests and snake habitats. Use mosquito repellant with DEET and tick repellant with permethrin, as required. Treat clothing with permethrin-based products if ticks are prevalent. Know the local fauna and review emergency preparedness measures. Review potential animal dangers specific to the site and precautions (actions to take if run-in with wild animal occurs) and treatments. Inspect your body and clothing for ticks during outdoor activity and at the end of the day. Wear light colored clothing so ticks can be more easily seen. Remove ticks right away to prevent infections. Wear long-sleeved shirts that should be tucked in. When in areas with tick potential tuck pants into socks. Review information for poison ivy recognition and treatment. Use existing footpaths when possible. Avoid walking in un-cleared areas with poison ivy or biological hazard potential.	**L**
	Biologicals–contact with poisonous plants, allergens, insects and animal kingdom hazards (for example: spiders, hornets, reptiles, snakes, ticks, mosquitoes, bird and rodent droppings, biting and stinging insects, thorny plants, etc.) (continued)	Use barrier cream and cleaning products such as Zanfel, Ivy Block, Tecnu, IvyX if poison ivy or poison oak is prevalent. • Wash hands using Ivy cleanser, prior to eating, using restroom, operating motor vehicle or after leaving field • Do not touch face with body parts or clothing while in the field • Remove contaminated work clothing with gloves. Store, bag and wash separately.	**L**

Job Steps	Hazards	Controls	RAC
General Site Work- Walking on site. Working outdoors. (continued)		Use poison ivy cleansers (not lotion soap) to clean affected skin. Lotion soaps will spread the oil on the skin Shower immediately upon leaving work. Wear snake chaps if poisonous snakes are present.	L
Working outdoors-General Site Work	UV exposure–sunburn	Wear UVA/UVB SPF sunscreen (minimum 30 SPF) and reapply frequently. Wear hats and clothing that shield skin from direct sun.	L
	Noise–hearing loss	Wear hearing protection if noise levels from neighboring equipment exceeds 85 dBA (if you cannot be heard speaking in a normal voice at arm's distance). Look for ways to limit exposure to high level noise sources.	L
	Temperature stress: heat	Heat stress controls to institute when the heat index is greater than 75 degrees Fahrenheit (°F), when the temperature is 75 °F or more with relative humidity of 55% or more: Acclimatize by gradually working in heat, systematically building up tolerance. Conduct field activities in the early morning if possible to avoid heat. Have enough water onsite so that each worker can consume at a minimum, one quart per hour per shift. Have frequent reminders to personnel, to take water breaks so that each person can consume enough water. Provide access to shade that is reasonably close to the work area. Take breaks as necessary in shady or cool areas and drink plenty of liquids.	L
		Conduct training on risk factors, signs and symptoms of heat illness, importance of hydration and acclimatization, and importance of reporting symptoms and what to do in case of heat illness emergency, and contacting emergency medical services (see APP, Heat Stress Monitoring Plan). Follow the requirements for physiological monitoring as stated in the APP. (e.g., During work in temperatures above 90 adjusted temperature, perform physiological monitoring—see safety plan if wearing Tyvek for when to start monitoring. Be conscious of your individual tolerance to work in hot weather Monitor yourself and co-workers for signs and symptoms of heat stress.	L

Job Steps	Hazards	Controls	RAC
Working outdoors-General Site Work (continued)	Temperature stress: cold (continued)	Cold stress controls to institute when air temperature or wind chill is, or may drop below 40° Fahrenheit (F), when parts of the body are or may become immersed in cold water, and when working in snow or ice: Train employees on the dangers and symptoms of cold-related illnesses and the applicable hazard controls. Train workers on the personal factors that may increase risk such as advanced age and circulatory problems. Establish a buddy system and ensure that personnel watch each other for signs of cold related illnesses. Provide a warm break area and establish a schedule for warm-up breaks and increase the frequency of warm-up breaks with decreasing temperatures. Take warm-up breaks if personnel exhibit shivering or report pain in the extremities that might be due to incipient frostbite. Prevent or minimize exposure of bare skin if temperature or wind chill is less than minus (-) 25°F. Schedule tasks to avoid long periods during which workers must sit or stand still. Adjust work schedules or tasks for new employees to permit acclimatization to the cold conditions. Encourage personnel to drink adequate quantities of water, soup, or other fluids to ensure adequate hydration. Establish emergency plans to include at least immediately available dry clothing if there is a potential for personnel to be splashed or immersed in liquid.	**L**

Job Steps	Hazards	Controls	RAC
Repetition of work tasks for periods longer than 8 hours	Fatigue associated with extended work shifts including general drowsiness and also associated driving fatigue.	Operators of heavy equipment must not exceed 12 hours of duty time in any 24-hour period. Motor vehicle operators must not exceed 10 hours of driving in any 24-hour period. Do not operate motor vehicles after working for more than 12 hours during any 24-hour period. Know your physical and psychological limitations. Stop work/driving when necessary to take breaks and hydrate. Stop work all together if fatigue endangers your safety or the safety of others. If appropriate, find a replacement for your job tasks. Schedule more demanding tasks for when endurance and alertness is best. Postpone more demanding and hazardous jobs if you are fatigued. Follow guidelines of APP for work-rest regimens under adverse conditions of heat or cold stress.	**L**
Completion of work shift and clean-up	Clothing contact with potentially irritant materials/insects. Take home toxics.	Decontaminate yourself and gear, as appropriate for contaminants and dust. If appropriate wear Tyvek as necessary and washable or disposable over-boots to keep personal clothing clean and free of any contaminated soils. Use liners to prevent contamination of truck. Shower immediately at end of workday. Check body for ticks, bites and signs of irritation or cuts.	**L**

Job Steps	Hazards	Controls	RAC
Add Steps, Hazards, and Actions to Eliminate or Minimize Hazards based on conditions encountered in the field.			

Equipment	Training	Inspection
PPE Level D: Hard hat (if there are overhead hazards) Safety glasses Safety-toed boots Work gloves/chemical resistant gloves ANSI Class 2 reflective warning vests Hearing protection, as necessary Other Equipment: Generator Fire extinguishers Emergency eyewash bottle First aid kit Insect repellant–DEET and permethrin Hand tools Spill containment supplies, if needed Containers as needed Tarps GFCI Heavy duty extension cords Drinking water Weather radio/or Smart phone apps (temperature stress, noise, weather)	Competent Person (CP) / Qualified Person (QP): CP/SSHO_____ _____ QP/First Aid and CPR _____ Training Requirements (as determined by the SSHO): HAZWOPER 40 hour Site safety orientation Tailgate meetings Emergency procedures Hazard communication Hearing conservation MEC awareness, as necessary Applicable AHAs Fire extinguisher use Biological hazard identification and control Severe weather helter location Lightning safety procedures Temperature stress prevention, controls, treatment	Daily inspection (SSHO) _____ Housekeeping (daily) Fire extinguisher (monthly) Vehicle inspection (daily) Eye wash bottle Equipment and tools inspection (daily and before use) Survey areas for poisonous plants, insects, and animals (each work area) Check body for ticks (each evening during tick season) Identify closest usable severe weather shelter (ex. tornado shelter) that is available in each work area)

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ACTIVITY HAZARD ANALYSIS

Activity/Work Task: MEC Anomaly Avoidance During Geophysical Survey Activities

Project Location: Fort Jackson National Cemetery, Columbia, SC

Contract Number: W912DY-17-D-0004

Date Prepared: 5/17/2019

Prepared By: Dusty Easton

Corporate H&S Reviewer: Edie Scala-Hampson

Notes: (Field Notes, review comments, etc.)

Overall Risk Assessment Code (RAC) (Use highest code) **M**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

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

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

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

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

RAC Chart

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

Job Steps	Hazards	Controls	RAC
Site access and control	Unauthorized entry	Implement positive site access control prior to site operations. Maintain a constant watch or surveillance for intrusion of unauthorized personnel. Positive site access control will be established prior to on-site operations using barricades, signs or other methods to control unauthorized access during tasks that could cause exposure to MEC or other safety and health hazards. The MSD/EZ of will be established before initiation of MPPEH inspection and handling activities. Prohibit non-essential personnel within the EZ during MEC activities. Employ UXO teams to observe the team separation distance (TSD) in accordance with the DDESB-approved ESS/ESP.	L

Job Steps	Hazards	Controls	RAC
MEC avoidance during geophysical survey activities. Conduct visual and handheld magnetometer check of investigation transects or survey area to avoid MEC hazards during geophysical survey activities.	MEC hazard/explosion, fire and overpressure	Use only trained and qualified UXO Technicians to perform MEC anomaly avoidance responsibilities. Deliver daily task specific briefings regarding the hazards associated with the task and procedures used to control/mitigate the hazards. Provide field team instruction on: – MEC/UXO hazards awareness, recognition, avoidance and reporting procedures. – The requirement that non-UXO personnel be escorted by a UXO Technician II or above in areas where MEC/UXO is suspected. – The requirement that non-UXO personnel will not touch or disturb any potential MEC items. – The requirement that non-UXO personnel adhere to the instruction of the UXO Technician. – The markings for vehicle and foot path ingress/egress routes on the work site. Use red or orange pin flags as visible warning to field personnel of identified hazards. Use required PPE as indicated by the SSHP, by all personnel inside the EZ.	**M**
	Adverse weather and lightning	Monitor warnings or indications of severe weather conditions and take appropriate precautions to protect personnel and property. If lightning is observed, all Load Handling Equipment (LHE), drill rigs, work on elevated platforms or scaffolding, roofing activities, tree trimming activities, pole climbing activities, or work in open areas shall stop. A determination shall be made as to the proximity to the operation being performed. Once lightning is seen, count the number of seconds until you hear the thunder. Divide the number of seconds by 5 to get the distance the lightning is away from you. If lightning is 10-miles away or less, work should stop until 30-minutes after the last audible thunder or visible flash of lightning.	**L**

Job Steps	Hazards	Controls	RAC
General site operations	General site hazards: Insect bites and stings .Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac). Vehicle traffic Severe weather Heat stress Cold stress Noise. Lifting Slips, trips, falls UV hazards, etc. Site access control-unwanted entry Strains, sprains, awkward bending/lifting/ positions and ergonomic hazards Overhead hazards Electrical Traffic/Heavy Equipment Unhygienic conditions Fire	Refer to General Site Work AHA.	**M**
	Cuts, lacerations, abrasions from flying debris from soil movement (dust, dirt, rocks), brush/ vegetation (skin/eye hazards) and trip hazards	Wear thick clothing fabrics and appropriate PPE such as leather gloves when there is a potential for cuts and lacerations. Wear safety glasses and other required PPE as indicated in the SSHP if there is a potential for dust and flying debris. Maintain a readily available eye wash. Maintain adequate First Aid supplies. Watch for people, plants, rocks, animals and animal burrows.	**L**

Job Steps	Hazards	Controls	RAC
Add Steps, Hazards, and Actions to Eliminate or Minimize Hazards based on conditions encountered in the field.			

Equipment	Training	Inspection
Personal Protective Equipment: Safety Glasses Other PPE as specified in SSHP Other Equipment: Handheld detector (GA-52Cx or White XLT) Batteries Drinking water Smart phone apps for: weather, temperature, noise	Competent Person (CP) / Qualified Person (QP): CP/SSHO_____ CP/SSHO _____ QP/First Aid and CPR _____ QP/First Aid and CPR _____ Training Requirements (as determined by the SSHO): UXO personnel will be trained IAW DDESB TP 18, DOD 4140.62, USACE EM 385-1-97 and EM 1110-1-4009 Documentation of training will be kept on file at the project site Initial Site Safety/Task hazard training PPE training 40 hr HAZWOPER 8 hr. Annual HAZWOPER Training in survey instruments-magnetometers	Daily site safety inspection (SSHO) _____ Inspect equipment setup Perform equipment detection validation test. Batteries are secure from movement and damage. Inspect batteries daily for damage, cracks and leaks and remove from service when these conditions are present.

HGL HydroGeoLogic, Inc

ACTIVITY HAZARD ANALYSIS

Activity/Work Task: Clearing and Grubbing

Project Name/Location: Fort Jackson National Cemetery, Columbia, SC

Contract number: W912DY-17-D-0004

Date Prepared: 5/17/2019

Prepared By: Dusty Easton

Corporate Health and Safety Reviewer: Edie Scala-Hampson

Notes: (Field Notes, review comments, etc.)

Overall Risk Assessment Code (RAC) (Use highest code) **L**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

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

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

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

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

RAC Chart

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

Job Steps	Hazards	Controls	RAC
Discuss the task, hazards, and hazard controls with HGL staff and subcontractors	No hazards directly related to this step. This step is intended to provide task-specific training.	Conduct this discussion in a safe area away from traffic or other hazards. Remind HGL personnel and subcontractors that they are to comply with this AHA and that it can be changed if needed. Subcontractors must also have their own safety programs and procedures specific to their tasks and equipment and are responsible to ensure the safety of their personnel.	L
Site access control	Unauthorized entry	Implement positive site access control prior to site operations. Maintain a constant watch or surveillance for intrusion of unauthorized personnel. Positive site access control will be established prior to on-site operations using barricades, signs or other methods to ensure unauthorized access during tasks that could cause exposure to safety and health hazards.	L
Inspection of grid prior to clearing	Traffic-Struck by hazards	Note all moving equipment in work areas. Wear Hi visibility vest. Make eye contact with equipment operators to let them know you are there. Use a spotter when visibility is poor (backing).	L

Job Steps	Hazards	Controls	RAC
Inspection of grid prior to clearing (continued)	Slip, trip and fall hazards - Walking over soft ground, uneven terrain	Determine best access route before transporting equipment or walking in order to avoid tripping hazards. Wear slip resistant footwear with ankle support. Be aware of rocks, brush, animal boroughs and other hazards. Choose firm ground for walking, if possible.	
	Cuts, lacerations, flying debris from brush/vegetation (eye hazards)	Wear thick clothing fabrics and appropriate PPE such as leather gloves when there is a potential for cuts and lacerations. Wear safety glasses if there is a potential for dust and flying debris. Ensure eye wash is available. Maintain adequate First Aid supplies.	
	Remote location	Institute buddy system. Establish a system of regular contact for lone workers.	
Vegetation removal. Hand brush cutting and clearing with hand tools, i.e., machete.	Flying debris, dust, dirt, rocks, sparks, abrasions, cuts and slips	Inspect all tools daily, prior to use. Tag and removed defective tools from service immediately. Wear safety glasses, heavy duty work gloves, hard hat and safety toed boots. Wear abrasion resistant clothing (thick fabrics). Maintain 25-foot separation between personnel using machetes, sling blades, and similar tools. Attach tools to workers with lanyards if possible	**L**
Use of mechanical brush clearing/vegetation removal equipment	Flying debris, dust, dirt, rocks, abrasions	Inspect all areas of the grid ahead of the vegetation removal crews with the aid of handheld magnetometers (Step 3). Mark any hazards by encircling the hazard with red flagging tape. Vegetation will be cut above the ground level if a bush hog or other mechanical equipment is used to avoid striking surface hazards. If no hazards are found the vegetation can be cut to within 6-12 inches above ground level.	**L**
	Spills and leaks-Environmental damage	Maintain a portable spill response kit containing absorbent materials, non-sparking shovel, PPE and disposable supplies in a readily accessible location. Screw caps on tightly and store fuel in designated area.	
	Noise-hearing loss	Wear hearing protection when noise levels are above 85 dBA (when you cannot be heard speaking in a normal voice at arm's length).	
	Fire	Inspect and clean (as necessary) engine compartment regularly to prevent accumulation of flammable debris. Have a fire extinguisher readily available. Turn off all motorized equipment during fueling. Bond and ground components during fueling.	

Job Steps	Hazards	Controls	RAC
Use of mechanical brush clearing/vegetation removal equipment (continued)	Moving parts, struck-by	Keep hands and feet away from rotating power-driven parts. Turn engine off for servicing. Wear high visibility vest. Stand clear of operating equipment. Operators must be authorized in writing.	
General site work	General site hazards: Insect bites and stings. Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac). Vehicle traffic Severe weather Heat stress Cold stress Noise. Lifting Slips, trips, falls UV hazards, etc.	See General Site Work AHA.	**L**

Job Steps	Hazards	Controls	RAC
Add Steps, Hazards, and Actions to Eliminate or Minimize Hazards based on conditions encountered in the field.			

Equipment	Training	Inspection
PPE: Hard Hat Safety Glasses with side shields Safety-Toed Boots Work Gloves Class 2 high visibility vests Hearing protection, as necessary Face-shield, as necessary <u>Other Equipment</u>: Hand tools Survey instruments Fire Extinguishers First Aid Kit GFCI Heavy duty extension cords Drinking water Weather radio and/or Smart phone temperature app and noise measurement app Insect repellant with DEET (Deep Woods Off™ or equivalent) Repel Permanone™	Training in survey instruments 40-hr. HAZWOPER 8-hr. HAZWOPER Refresher Supervisor course for SSHO OSHA 30 hour for SSHO Initial Site Safety /Task Hazard Training PPE training Training in proper inspection, maintenance and use of hand tools Survey personnel will be licensed IAW with local and State requirements QP/First Aid and CPR QP/First Aid and CPR Training Requirements (as determined by the SSHO): Site safety orientation Emergency procedures Hazard communication Hearing conservation MEC awareness Applicable AHAs Qualified equipment operators Licensed forklift operator Lifting/back safety Fire extinguisher use Biological hazard identification and control	Daily inspection of hand tools and power tools. Survey areas for poisonous plants, insects, and animals(each work area) Check body for ticks (each evening during tick season) Identify closest usable tornado shelter that is available (each work area)

ACTIVITY HAZARD ANALYSIS

Activity/Work Task: MEC Operations – Demolition of MEC

Project Location: Fort Jackson National Cemetery, Columbia, SC

Contract Number: W912DY-17-D-0004

Date Prepared: 5/17/2019

Prepared By: Dusty Easton

Corporate H&S Reviewer: Edie Scala-Hampson

Notes: (Field Notes, review comments, etc.)

Overall Risk Assessment Code (RAC) (Use highest code): M

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

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

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

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

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

RAC Chart

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

Job Steps	Hazards	Controls	RAC
Site access control	Unauthorized entry	Implement positive site access controls prior to site operations. Maintain a constant watch for intrusion of unauthorized personnel. Positive site access controls will include as required: barricades, signs or other methods to control unauthorized access during tasks that could cause exposure to MEC or other environmental/safety hazards. Establish the MSD/EZ. IAW the DDESB-approved ESP, Table 7-1 before initiation of explosive demolition operations. Employ UXO teams that conduct simultaneous MEC activities to observe the MSD for intentional detonations during explosive demolition operations.	L
Using demolition explosives counter charge on MEC hazards to blow in place (BIP) or to conduct consolidated demolition shots.	MEC hazard/explosion, fire and overpressure	Read and sign off on the HGL work plan and SSHP. Prior to commencing all explosive operations site personnel will be given task-specific briefings regarding the hazards associated with the task and the procedures used to control/mitigate the hazards. Deliver daily task specific briefings, prior to commencing all explosive operations, regarding the hazards associated with the task and the procedures used to control/mitigate the hazards. Use authorized, trained and qualified UXO Technicians to perform MEC explosive demolition and surface clearance activities.	M

Job Steps	Hazards	Controls	RAC
Using demolition explosives counter charge on MEC hazards to blow in place (BIP) or to conduct consolidated demolition shots.	MEC hazard/explosion, fire and overpressure (continued)	Use required PPE as indicated in the SSHP, by all personnel inside the EZ. Minimum Level D. Require attendance, of all HGL subcontractors, at the site specific hazards and health and safety training given by the HGL UXOSO. Escort all non-UXO personnel by a UXO Technician II. Instruct non-UXO personnel to not touch or disturb any potential MEC items. Non-UXO personnel will adhere to the instructions of the UXO Technician II. Have a fire extinguisher readily available for protection of all non-essential personnel, only those personnel essential to the performance of the demolition operations will be permitted to work inside the MSD/EZ while MEC items are being primed for demolition. Restrict entry: Any occupied building or public roadways in the MSD will be evacuated and/or blocked to prevent non-essential personnel from entering during demolition operations. Comply with evacuation procedures. Before initiation of demolition explosive charges all HGL and subcontractor personnel will evacuate to a designated safe area outside of the EZ. Use engineering controls if necessary to reduce the effect of blast and fragmentation. Sandbag or water mitigation will be used IAW with USAESH HNC-ED-CS-S-98-7, HNC-ED-CS-S-00-3, HNC safety advisory dated 7 Nov 11, and DDESB memo dated 29 Nov 10 (Classification regarding use of sandbags for mitigation of fragmentation and blast effects due to intentional detonations).	**M**
	Cuts and lacerations	Wear thick clothing fabrics and appropriate PPE such as leather gloves when there is a potential for cuts and lacerations. Wear safety glasses if there is a potential for dust and flying debris. Maintain adequate First Aid supplies Use Level D PPE per the APP for all tasks with the potential for cuts or lacerations. Personnel will be trained in the proper use and selection of the equipment and the tools they must use to complete their task and the hazards of exposed metal and other cut hazards.	**L**
	Eye hazards- Flying debris, dust, dirt, rocks, sparks, abrasions	Use eye protection which meets ANZI/ASSE Z81 to protect eyes from hazards associated with MEC operations and flying debris. Select hand tools and power tools that are right for the job. Inspect all tools daily, prior to use. Defective tools must be tagged and removed from service immediately. Ensure that eyewash and first aid supplies are readily available. Wear abrasion resistant clothing (thick fabrics).	**L**

Job Steps	Hazards	Controls	RAC
Using demolition explosives counter charge on MEC hazards to blow in place (BIP) or to conduct consolidated demolition shots. (continued)	Lifting	Restrict lifts to 50 pounds or less. When lifting in excess of 50 pounds, but no more than 100 pounds two or more workers are required. Any item weighing more than 100 pounds will only be lifted using mechanical equipment or devices. Personnel will use safe lifting procedures and lift with their legs and not their backs and will be trained in proper lifting techniques. Know your limitations Maintain good fitness	**L**
	Mechanized equipment	Inspect all mechanized equipment, prior to it being placed in use on site (per a competent person, IAW, the manufacturer's recommendations and requirements of this SSHP). All mechanized equipment will be inspected daily (while in use) to ensure safe operating conditions. Inspections will be conducted by the operator or a designated competent person at the beginning of the day of use. Prior to daily use braking and operating systems will be function checked and all safety devices will be in place. Whenever an unsafe condition or discrepancy is found the equipment will be immediately removed from service and prohibited from use until the unsafe condition is corrected. ONLY qualified operators holding an appropriate certification are permitted to operate mechanized equipment. Equipment operations will be conducted in a manner as to not endanger personnel. Equipment will not be mounted nor dismounted while moving.	**L**
	Physical injury from mechanized equipment	Establish a clear safety zone at the maximum radius of the bucket. The safety zone will be clearly marked with orange safety cones or other demarcation. Personnel will remain clear and not enter the safety zone when excavator is in operation. All personnel working near the safety zone will wear PPE consisting of a high-visibility vest and head, foot and eye protection.	**L**
	Sprains and strains	Wear sturdy footwear. Avoid twisting or turning while opening doors and walking with hand-pulled equipment. Use caution to not over exert or overstrain muscles and joints. Know your limitations	**L**

Job Steps	Hazards	Controls	RAC
Using demolition explosives counter charge on MEC hazards to blow in place (BIP) or to conduct consolidated demolition shots. (continued)	Slips, trips and falls	Wear slip resistant footwear with ankle support. Determine best access route before transporting equipment or walking in order to avoid tripping hazards. Be aware of uneven walking surfaces, rocks, brush, animal boroughs and other hazards. Avoid walking near cliffs or on inclined/slopes greater than 30 degrees. Choose firm ground for walking, if possible. Continually inspect work area for hazards and practice good housekeeping procedures and maintain clear work areas to remove trip hazards.	**L**
	Contact with moving vehicles	Be aware of vehicle traffic. Stay off of roads.	**L**
	Overhead hazards	Wear hard hats in those areas with the potential for head injury. All protective head gear shall meet the current requirements of ANSI Z89.1.	**L**
General site hazards (if not covered specifically in this AHA, refer to the General site hazards AHA)	General site hazards: Insect bites and stings .Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac). Vehicle traffic Severe weather Heat stress Cold stress Noise. Lifting Slips, trips, falls UV hazards, etc.	Refer to General Site Work AHA	**M**

Job Steps	Hazards	Controls	RAC
Add Steps, Hazards, and Actions to Eliminate or Minimize Hazards based on conditions encountered in the field.			

Equipment	Training	Inspection
Remote firing device or initiators. PPE as indicated in SSHP	CP/UXOSO _____ QP/First Aid and CPR _____ QP/First Aid and CPR _____ UXO Technicians will meet the training/certification requirements of DDESB Technical Paper 18. Documentation of training will be kept on file at the project site. Initial Site Safety/Task Hazard Training. PPE Training. 40 hr HAZWOPER. 8 hr Annual HAZWOPER Refresher. All personnel operating initiating firing devices will in training in the proper inspection, maintenance and use.	Conduct preoperational inspection Perform equipment function test. Fire extinguisher (monthly) Vehicle inspection (daily) Equipment and tools inspection (daily and before use) Survey areas for poisonous plants, insects, and animals(each work area) Check body for ticks (each evening during tick season) Identify closest usable tornado shelter that is available (each work area)

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ACTIVITY HAZARD ANALYSIS (AHA)

Activity/Work Task: MEC DGM and DGPS

Project Location: Fort Jackson National Cemetery, Columbia, SC

Contract Number: W912DY-17-D-0004

Date Prepared: 5/17/2019

Prepared By: Dusty Easton

Corporate H&S Reviewer:

Notes: (Field Notes, review comments, etc.)

Overall Risk Assessment Code (RAC) (Use highest code): M

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

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

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

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

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

RAC Chart

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

Job Steps	Hazards	Controls	RAC
Load/Unload Geophysical equipment	Walking over soft ground, uneven terrain/ Slip, trip and fall hazards	Determine the best access route before transporting equipment. Wear slip resistant footwear with ankle support. Pay attention to footing and best path of travel to avoid tripping hazards. Prohibit jumping from truck beds or raised platforms. Be aware of rocks, brush, animal boroughs and other hazards. Choose firm ground for walking, if possible.	L
Setting up and operating: a. Precision Differential Global Positioning Systems (DGPS). b. Hand operated/towed metal detectors, locators and magnetometers. Perform DGM and DGPS survey data collection and recording using the EM61-Mk2 metal detector.	Dehydration, heat stress, sunburn	Drink a minimum of two liters of water per day. Remain in shade whenever possible. Wear sunscreen with sun protection factor of at least 30. Design an acceptable work-rest regimen based on WGBT readings, smart phone apps and/or staff acclimatization. See General Site Hazards AHA for additional information	L

Job Steps	Hazards	Controls	RAC
Setting up and operating: c. Precision Differential Global Positioning Systems (DGPS). d. Hand operated/towed metal detectors, locators and magnetometers. Perform DGM and DGPS survey data collection and recording using the EM61-Mk2 metal detector.	Heavy lifting: Injury from physical exertion, sprains, strains, awkward bending/lifts, fatigue, and ergonomic hazards	Operate machinery strictly per the manufacturer's recommendations. While operating, moving, or turning be sure to use postures to prevent back injury. Lift with legs and straight back technique to load geophysical equipment into back of truck. Equipment can weigh up to 30 lbs. (WMS detector can weigh 100 lbs.-requires 2 person lift) Assure solid footing. Maintain good personal level of fitness. Be alert to signs and symptoms of overexertion. Know your limitations. Do not lift greater than 50 lbs. Use mechanical assistance or two man lift whenever possible for awkward or heavy objects. Limit repetitive awkward motions.	**M**
	Contact with MEC/UXO	Deliver daily task specific briefings regarding the hazards associated with the task and procedures used to control/mitigate the hazards. Use required PPE as indicated by the SSHP, by all personnel inside the EZ. Require attendance of all HGL and subcontractors at the site specific hazards and health and safety training given by the HGL UXOSO. Escort all non-essential UXO personnel by a UXO Technician II or above. Instruct non-UXO personnel to not touch or disturb any potential MEC items. Non-UXO personnel will adhere to the instruction of the UXO Technician.	**M**
	Adverse weather and lightning	Monitor warnings or indications of severe weather conditions and take appropriate precautions to protect personnel and property. If lightning is observed, all Load Handling Equipment (LHE), drill rigs, work on elevated platforms or scaffolding, roofing activities, tree trimming activities, pole climbing activities, or work in open areas shall stop. A determination shall be made as to the proximity to the operation being performed. Once lightning is seen, count the number of seconds until you hear the thunder. Divide the number of seconds by 5 to get the distance the lightning is away from you. If lightning is 10-miles away or less, work should stop until 30-minutes after the last audible thunder or visible flash of lightning.	**L**
	Slips, trips and falls	Wear slip resistant footwear with ankle support. Pay attention to footing and best path of travel to avoid tripping hazards. Note terrain and footing and walk the area to be scanned (if possible) and mark uneven surfaces. Do not use geophysical equipment if slope is too steep to operate safely.	**M**

Job Steps	Hazards	Controls	RAC
Setting up and operating: (continued)	Traffic-struck hazards	Note all moving equipment in work areas. Wear High Visibility vest. Stay off roads if possible, using traffic cones if on a road.	**L**
Walking and working on site	General site hazards: Insect bites and stings .Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac). Vehicle traffic Severe weather Heat stress Cold stress Noise. Lifting Slips, trips, falls UV hazards, etc.	Refer to General Site Work AHA	**L**
	Getting lost	Sign in before beginning a hike, do not travel alone (use buddy system), and bring a topographic map, compass and communication device.	**L**

Job Steps	Hazards	Controls	RAC
Add Steps, Hazards, and Actions to Eliminate or Minimize Hazards based on conditions encountered in the field.			

Equipment	Training	Inspection
Personal Protective Equipment: As required by the SSHP Minimum Level D Other Equipment: DGPS System EM61-M2 metal detector Batteries Water Smart phone apps for temperature and weather to be used for work-rest regimen	Competent Person (CP) / Qualified Person (QP): CP/SSHO_____ _____ QP/First Aid and CPR _____ QP/First Aid and CPR _____ Training Requirements (as determined by the SSHO): Site-specific/task-specific safety training and Hazards Communications 40 hr HAZWOPER 8 hr HAZWOPER annual refresher PPE All personnel tasked with use of metal detectors, locators and magnetometers will be trained in their use.	Daily site safety inspection (SSHO) _____ Inspect all electronic connections and system test for proper setup. Perform data input validation. Inspect equipment setup Perform equipment detection validation test. Secure batteries from movement and damage. Inspect batteries daily for damage, cracks and leaks and remove from service when these conditions are present.

ACTIVITY HAZARD ANALYSIS

Activity/Work Task: MEC movement within a munitions response site, operational range, or installation

Project Location: Fort Jackson National Cemetery, Columbia, SC

Contract Number: W912DY-17-D-0004

Date Prepared: 5/17/2019

Prepared By: Dusty Easton

Corporate H&S Reviewer: Edie Scala-Hampson

Notes: (Field Notes, review comments, etc.)

Overall Risk Assessment Code (RAC) (Use highest code): M

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

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

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

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

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

RAC Chart

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

Job Steps	Hazards	Controls	RAC
Site access control	Unauthorized Entry	Implement positive site access controls prior to site operations. Maintain a constant watch for intrusion of unauthorized personnel. Positive site access controls will include as required: visual, barricades, signs or other methods to control unauthorized access during tasks that could cause exposure to MEC or other environmental/safety hazards. Establish the MSD as detailed in the project work plan.	L
Determining MEC as acceptable to move	MEC hazard/explosion, fire and overpressure	Determine acceptability to move: In accordance with EM 385-1-97, munitions encountered during munitions response or other activities can be determined acceptable to move when technically qualified personnel performing the functions of SUXOS and UXOSO determine the risk associated with movement is acceptable, and movement is necessary for the protection of people, property or critical assets, or the efficiency of the activities being conducted.	L

Job Steps	Hazards	Controls	RAC
Relocating acceptable to move MEC	MEC hazard/explosion, fire and overpressure	Read and sign off on the HGL work plan and SSHP. Prior to commencing all explosive operations site personnel will be given task-specific briefings regarding the hazards associated with the task and the procedures used to control/mitigate the hazards. Deliver daily task specific briefings prior to commencing all explosive operations, regarding the hazards associated with the task and the procedures used to control/mitigate the hazards. Use authorized, trained and qualified UXO Technicians to perform MEC clearance activities. Use required PPE as indicated in the SSHP, by all personnel inside the EZ. Minimum Level D. Identify munitions items. Abide by the following do's and don'ts: • Under no circumstances will any MEC be moved in an attempt to make positive identification. Only MEC that has been positively identified can be determined acceptable to move. • Do not transport white phosphorous munitions unless they are immersed in water, mud, or wet sand. • If loose pyrotechnic, tracer, flare, or similar mixtures are to be transported, they will be placed in Number 10 mineral oil or equivalent to minimize the fire and explosion hazards. • Incendiary-loaded munitions will be placed on a bed of sand and covered with sand to help control the burn if a fire should start during transport. • If an unfired rocket motor will be transported, it will be positioned in the vehicle parallel to the rear axle and secured in place with sandbags. This will afford maximum protection for the personnel operating the vehicle. • Do not depress plungers, turn vanes, or rotate spindles, levers, setting rings, or other external fittings on MEC. Such actions may arm or activate items. • Do not attempt to remove any fuze(s) from MEC. Do not dismantle or strip components from any MEC.	M

Job Steps	Hazards	Controls	RAC
Relocating acceptable to move MEC (continued)	Slip, trip and fall hazards -Walking over soft ground, uneven terrain	• MEC with exposed fillers, such as high explosives, will be placed in appropriate containers with packing material to prevent migration of the hazardous fillers. Padding will be added to protect the exposed filler from heat, shock, and friction. • Arming wires and pop out pins on unarmed fuzes will be secured prior to moving MEC. • Do not rely on the color-coding of munitions for positive identification. Determine best access route before transporting munitions, equipment, or walking in order to avoid tripping hazards. Wear slip resistant footwear with ankle support. Be aware of uneven walking surfaces, rocks, brush, animal boroughs and other hazards. Avoid walking near cliffs or on inclined/slopes greater than 30 degrees. Choose firm ground for walking, if possible. Inspect work area for hazards and practice good housekeeping procedures and maintain clear work areas to remove trip hazards.	M
	Lifting	Restrict lifts to 50 pounds or less. When lifting in excess of 50 pounds, but no more than 100 pounds two or more workers are required. Any item weighing more than 100 pounds will only be lifted using mechanical equipment or devices. Personnel will use safe lifting procedures and lift with their legs and not their backs and will be trained in proper lifting techniques. Know your limitations. Maintain good fitness.	L
	Cuts and lacerations	Wear thick clothing fabrics and appropriate PPE such as leather gloves when there is a potential for cuts and lacerations. Wear safety glasses if there is a potential for dust and flying debris. Maintain adequate First Aid supplies Use Level D PPE per the APP for all tasks with the potential for cuts or lacerations. Personnel will be trained in the proper use and selection of the equipment and the tools they must use to complete their task and the hazards of exposed metal and other cut hazards.	L

Job Steps	Hazards	Controls	RAC
Relocating acceptable to move MEC (continued)	Injury from mechanized equipment	Inspect all mechanized equipment, prior to it being placed in use on site (per a competent person, IAW, the manufacturer's recommendations and requirements of this SSHP). All mechanized equipment will be inspected daily (while in use) to ensure safe operating conditions. Inspections will be conducted by the operator or a designated competent person at the beginning of the day of use. Prior to daily use braking and operating systems will be function checked and all safety devices will be in place. Whenever an unsafe condition or discrepancy is found the equipment will be immediately removed from service and prohibited from use until the unsafe condition is corrected. ONLY qualified operators holding an appropriate certification are permitted to operate mechanized equipment. Equipment operations will be conducted in a manner as to not endanger personnel. Equipment will not be mounted nor dismounted while moving. Establish a clear safety zone at the maximum radius of the equipment. The safety zone will be clearly marked with orange safety cones or other demarcation. Personnel will remain clear and not enter the safety zone when excavator is in operation. All personnel working near the safety zone will wear PPE consisting of a high-visibility vest and head, foot and eye protection.	L
	Overhead hazards-stuck by	Require hard hats in those areas with the potential for head injury. All protective head gear shall meet the current requirements of ANSI Z89.1.	L
	Contact with moving vehicles	Be aware of vehicle traffic. Stay off roads.	
	Spills and leaks-Environmental damage	Maintain a portable spill response kit containing absorbent materials, non-sparking shovel, PPE and disposable supplies in a readily accessible location.	
	Hand and power tools	Select hand tools to ensure the right tool is being used for the right job and being used in the manner which it was intended to be use. All hand tools will be inspected daily prior to use and any defective tools will be tagged and removed from service immediately. Employees will follow the procedures and safety precautions specified by the manufacturer to insure safe and proper use of all hand and power tools.	

Job Steps	Hazards	Controls	RAC
Relocating acceptable to move MEC (continued)	General site hazards: Insect bites and stings. Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac). Vehicle traffic Severe weather Heat stress Cold stress Noise. Lifting Slips, trips, falls UV hazards, etc.	See General Site Work AHA	M

Equipment	Training	Inspection
PPE Level D: • Hard hat (if there are overhead hazards) • Safety glasses • Safety-toed boots • Work gloves Other Equipment: • Hand tools for excavating • Sandbags • Heavy equipment as required	UXO Technicians shall meet the training/certification requirements of DDESB Technical Paper 18. 40 hr HAZWOPER 8 hr HAZWOPER annual refresher Documentation of training will be kept on file at the project site Initial Site Safety/Task Hazard Training Current equipment operator certificate PPE training	Daily inspection of hand tools. Daily inspection and tests of manufactures recommendations. SUXOS and UXOSO evaluate the munition and authorize its movement.

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ACTIVITY HAZARD ANALYSIS

Activity/Work Task: MPPEH Processing

Project Location: Fort Jackson National Cemetery, Columbia, SC

Contract Number: W912DY-17-D-0004

Date Prepared: 5/17/2019

Prepared By: Dusty Easton

Corporate H&S Reviewer: Edie Scala-Hampson

Notes: (Field Notes, review comments, etc.)

Overall Risk Assessment Code (RAC) (Use highest code): M

RAC Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

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

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

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

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

RAC Chart

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

Job Steps	Hazards	Controls	RAC
Site access control	Unauthorized entry	Implement positive site access control prior to site operations. Maintain a constant watch or surveillance for intrusion of unauthorized personnel. Positive site access control will be established prior to on-site operations using barricades, signs or other methods to ensure unauthorized access during tasks that could cause exposure to MEC or other safety and health hazards. The MSD/EZ of will be established prior to initiation of MPPEH inspection and handling activities. UXO teams will observe the team separation distance (TSD) when applicable.	L
UXO Technicians will inspect MPPEH, MD, range debris (RD) and scrap to insure an explosive hazard does not exist	MEC hazard/explosion, fire and overpressure	Use only trained and qualified UXO Technicians to perform MPPEH inspection activities. Segregate all MPPEH according to its classification as either Material Documented as an Explosive Hazard (MDEH) or Material Documented as Safe (MDAS). Stow separately in locked/sealed containers in a secure area until final disposition. Escort all non-UXO personnel by a UXO Technician. Instruct non-UXO personnel to not touch or disturb any potential MEC items. Non-UXO personnel will adhere to the instructions of the UXO Technician II. Have a fire extinguisher readily available.	M

Job Steps	Hazards	Controls	RAC
UXO Technicians will inspect MPPEH, MD, RD and scrap to insure an explosive hazard does not exist (continued)	MEC hazard/explosion, fire and overpressure (continued)	Certify and verify documentation is completed using DD Form 1348-1A, *Material Transfer/Release* Form and the HGL Chain of Custody Manifest form before releasing physical control or custody of MPPEH.	**M**
	Remote location	Determine accessibility to associates, communication needs, first aid and rescue equipment and procedure. Institute buddy system.	**L**
	General site hazards: Insect bites and stings Contact dermatitis from: poisonous and irritating plants (poison ivy, poison oak, and poison sumac) Vehicle traffic Severe weather Heat stress Cold stress Noise Lifting Slips, trips, falls UV hazards, etc.	See General Site Work AHA.	**M**
UXO Technicians will inspect MPPEH, MD, RD and scrap to insure an explosive hazard does not exist (continued)	Injury from misidentification of MPPEH	Inspect (visual) all MPPEH by two independent 100 percent inspections by at least one UXO Technician II and one UXO Technician III to determine its status as either Material Documented as Explosive Hazard (MDEH) or Material Documented as Safe (MDAS). All MPPEH will undergo a quality control inspection by a UXO Quality Control Specialist as specified by the site-specific WP and/or Explosive Safety Submission.	**M**
	Contact with moving vehicles	Be aware of vehicle traffic. Stay off roads.	**L**

Equipment	Training	Inspection
PPE Level D: • Safety glasses • Safety-toe boots • Work gloves Weigh scales Smart phone apps for physical hazards	Competent Person (CP) / Qualified Person (QP): CP/UXOSO _____ Alternate CP/UXOSO _____ UXO personnel will be trained DDESB TP 18, DOD 4140.62, and USACE EM 1110-1-4009 Documentation of training will be kept on file at the project site Initial Site Safety/Task hazard training PPE training 40-hr HAZWOPER 8-hr HAZWOPER annual refresher Training in survey instruments-magnetometers. All personnel operating hand tools will be trained in the proper inspection, maintenance and use. Initial Site Safety/Task Hazard training. PPE Training Training in proper inspection, maintenance and use of hand tools Survey personnel will be licensed IAW with local and state requirements	Perform calibration before each use Check Known Allergies Questionnaire, training, and medical certifications against personnel roster. Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection (daily) Equipment and tools inspection (daily and before use) Survey areas for poisonous plants, insects, and animals. Check body for ticks. Verify weather no less than twice a day and prior to commencing operations. Verify tornado shelter location and availability.

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ACTIVITY HAZARD ANALYSIS

Activity/Work Task: MEC Operations – Scrap Inspection/Handling, Material Potentially Presenting an Explosive Hazard: Munitions and Range Related Debris

Project Location: Fort Jackson National Cemetery, Columbia, SC

Contract Number: W912DY-17-D-0004

Date Prepared: 5/17/2019

Prepared By: Dusty Easton

Corporate H&S Reviewer: Edie Scala-Hampson

Notes: (Field Notes, review comments, etc.)

Overall Risk Assessment Code (RAC) (Use highest code) M

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

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

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

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

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

RAC Chart

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

Job Steps	Hazards	Controls	RAC
Site access control	Unauthorized entry	Implement positive site access control prior to site operations. Maintain a constant watch or surveillance for intrusion of unauthorized personnel. Positive site access control will be established prior to on-site operations using barricades, signs or other methods to ensure unauthorized access during tasks that could cause exposure to MEC or other safety and health hazards. The MSD/EZ of will be established prior to initiation of MPPEH inspection and handling activities. UXO teams will observe the team separation distance (TSD) when applicable.	L
UXO Technicians will inspect MPPEH, MD, RD and scrap to ensure an explosive hazard does not exist	MEC hazard/explosion, fire and overpressure	Use only trained and qualified UXO Technicians to perform MMPEH inspection activities. All MPPEH will be subjected to a 100% visual inspection and a 100% re-inspection by at least one UXO Technician II and one UXO Technician III to determine its status as either Material Documented as Explosive Hazard (MDEH) Or Material Documented as Safe (MDAS). All MPPEH will undergo a quality control inspection by a UXO Quality Control Specialist as specified by the site-specific Work Plan and/ or Explosive Safety Submission. UXO Tech I's can tentatively identify a located item as MPPEH, followed by a required confirmation by a UXO Tech II or III.	M

Job Steps	Hazards	Controls	RAC
UXO Technicians will inspect MPPEH, MD, RD and scrap to ensure an explosive hazard does not exist (continued)	MEC hazard/explosion, fire and overpressure (continued)	A UXO Tech II will perform a 100% inspection of each item as it is recovered and determine whether the item is an UXO, a DMM, munitions debris, or range related debris; whether the item contains explosives hazards or other dangerous fillers, requires detonation, demilitarization, venting or draining of hazardous or toxic materials. Items will be segregated all MPPEHH according to its classification as either Material Documented as an Explosive Hazard (MDEH) or Material Documented as Safe (MDAS). A UXO Tech III will perform a 100% re-inspection of all recovered items to determine if free of explosives hazards or other dangerous fillers and engine fluids, illuminating dials and other visible liquid HTRW materials. The UXO Tech III will also supervise detonation of items found to contain explosive hazards or other dangerous filers and venting/demil procedures in addition to supervising the consolidation of MPPEH for containerization and sealing. Munitions Debris and Range-related Debris will be segregated. Material will be stored separately in locked/sealed containers in a secure area until final disposition. All MPPEH will undergo a quality control inspection by a UXO Quality Control Specialist as specified by the site-specific Work Plan and/ or Explosive Safety Submission. The UXOSO ensure the specific procedures and responsibilities for processing MPPEH for certification as munitions debris or range-related debris specified in the WP are being followed and all procedures for processing MPPEH are being performed safely and consistent with applicable regulations. The SUXOS will be responsible for ensuring work and QC plans specify the procedures and responsibilities for processing MPPEH for final disposition as munitions debris or range-related debris. The SUXOS will perform random checks to satisfy that the munitions debris and range-related debris is free from explosive hazards necessary to complete the Form, DD 1348-1A, certify all munitions debris and range-related debris as free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials; the SUXOS will be responsible for ensuring that inspected debris is secured in a closed, labeled and sealed container and properly documented. The SUXOS will certify and verify documentation is completed using DD Form 1348-1A, *Material Transfer/Release* Form and the HGL Chain of Custody Manifest form before releasing physical control or custody of MPPEH.	**M**

Job Steps	Hazards	Controls	RAC
UXO Technicians will inspect MPPEH, MD, RD and scrap to ensure an explosive hazard does not exist (continued)	Chemical Hazards from Expray use and MEC: DMSO (Dimethyl sulfoxide) 45% of Exspray. If the skin is in contact with any potentially hazardous chemicals (explosives, heavy metals such as lead VOCs/SVOCs) DMSO will act as a vehicle for absorption of the chemical into the body. This chemical is absorbed through the intact skin and acts as a carrier, transporting any chemicals in contact with the skin into the body. RDX Tetryl TNT	Use in well-ventilated area. Spray away from the body. Do not inhale. Wear proper personal protective equipment (PPE): Neoprene, butyl, Silver Shield brand, or 4H brand gloves. Flush with water-In case of accidental contact with eyes. Do not use near fire. Do not puncture aerosol can.	**M**
	Remote location	Determine accessibility to associates, communication needs, first aid and rescue equipment and procedure. Institute buddy system.	**L**
	General site hazards: Insect bites and stings. Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac). Vehicle traffic Severe weather Heat stress Cold stress Noise. Lifting Slips, trips, falls UV hazards, etc.	See General Site Work AHA	**M**
	Injury from misidentification of MPPEH	Escort all non-UXO personnel by a UXO Technician II. Instruct non-UXO personnel to not touch or disturb any potential MEC items. Non-UXO personnel will adhere to the instructions of the UXO Technician II. Have a fire extinguisher readily available.	**M**
	Contact with moving vehicles	Be aware of vehicle traffic. Stay off of roads	**L**

Equipment	Training	Inspection
Scales <u>Personal Protective Equipment</u>: Hard Hat - overhead hazards present Safety glasses with side shields Safety-toed boots Work gloves Hearing protection, as necessary	Competent Person (CP) / Qualified Person (QP): CP/SSHO _____ _____ QP/First Aid and CPR _____ QP/First Aid and CPR _____ UXO personnel will be trained DDESB TP 18, DOD 4140.62, and USACE EM 1110-1-4009 Documentation of training will be kept on file at the project site Initial Site Safety/Task hazard training PPE training 40 hr HAZWOPER, 8 hr. Training in survey instruments-magnetometers. All personnel operating hand tools will be trained in the proper inspection, maintenance and use. Initial Site Safety/Task Hazard training. PPE Training Training in proper inspection, maintenance and use of hand tools Survey personnel will be licensed IAW with local and State requirements	Perform calibration before each use Daily site safety inspection (SSHO) _____ Daily site safety inspection (QCO) _____

ACTIVITY HAZARD ANALYSIS

Activity/Work Task: MEC Surface and Subsurface Target Anomaly Investigation and MEC Clearance

Project Location: Fort Jackson National Cemetery, Columbia, SC

Contract Number: W912DY-17-D-0004

Date Prepared: 5/17/2019

Prepared By: Dusty Easton

Corporate H&S Reviewer: Edie Scala-Hampson

Notes: (Field Notes, review comments, etc.)

Overall Risk Assessment Code (RAC) (Use highest code): M

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

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

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

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

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

RAC Chart

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

Job Steps	Hazards	Controls	RAC
Site access control	Unauthorized entry	Implement positive site access control prior to site operations. Maintain a constant watch or surveillance for intrusion of unauthorized personnel. Positive site access control will be established prior to on-site operations using barricades, signs or other methods to ensure unauthorized access during tasks that could cause exposure to MEC or other safety and health hazards. The MSD/EZ of will be established prior to initiation of MPPEH inspection and handling activities. UXO teams will observe the team separation distance (TSD) when applicable.	L
Establish of subsurface grid or clearance area.	MEC hazard/explosion, fire and over pressure	Deliver daily task specific briefings regarding the hazards associated with the task and procedures used to control/mitigate the hazards. Use required PPE as indicated by the SSHP, by all personnel inside the EZ. Require attendance of all HGL and subcontractors at the site specific hazards and health and safety training given by the HGL UXOSO. Escort all non-essential UXO personnel by a UXO Technician II or above. Instruct non-UXO personnel to not touch or disturb any potential MEC items. Non-UXO personnel will adhere to the instruction of the UXO Technician. Use only trained and qualified UXO Technicians to perform MEC surface and subsurface clearance activities as specified the training requirement section of this AHA. Suspend MEC operations when an electrical storm approaches to within 10 miles of the project location.	M

Job Steps	Hazards	Controls	RAC
Conduct mechanical and hand tool subsurface target anomaly investigation to clear MEC.	MEC hazard/explosion, fire and over pressure	Same as above.	**M**
Conduct point detection magnetometer assisted excavations to investigate subsurface target anomaly.	MEC hazard/explosion, fire and over pressure	Same as above.	**M**
Walking and working on site	General site hazards: Insect bites and stings. Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac). Vehicle traffic Severe weather Heat stress Cold stress Noise. Lifting Slips, trips, falls UV hazards, etc.	Refer to General Site Work AHA.	**M**
	Adverse weather and lightning	Monitor warnings or indications of severe weather conditions and take appropriate precautions to protect personnel and property. If lightning is observed, all Load Handling Equipment (LHE), drill rigs, work on elevated platforms or scaffolding, roofing activities, tree trimming activities, pole climbing activities, or work in open areas shall stop. A determination shall be made as to the proximity to the operation being performed. Once lightning is seen, count the number of seconds until you hear the thunder. Divide the number of seconds by 5 to get the distance the lightning is away from you. If lightning is 10-miles away or less, work should stop until 30-minutes after the last audible thunder or visible flash of lightning.	**L**
	Cave-in of excavated soil, open excavation and permits	Require that excavated soil be placed two (2) feet away from the edge of the excavation area. A competent person will examine and determine if soil type requires protective measures using sloping or benching methods to protect employees from cave-ins. If anomaly is deeper than four (4) feet stop excavation and notify the UXOSO. When excavation exceeds a depth of 4 feet sufficient egress measures are required. Excavations shall be backfilled upon completion of anomaly clearance. Excavations not immediately backfilled or covered will be cordoned off to prevent personnel, livestock and wildlife from entering or falling into the excavation. When required, an excavation permit will be obtained by the Project Manager from the appropriate authority.	**M**
	Contact with moving vehicles	Be aware of vehicle traffic. Stay off of roads.	**L**
	Cuts and lacerations	Wear Level D PPE with leather gloves per the APP for all tasks with the potential for cuts or lacerations. Personnel will be trained in the proper use and selection of personal protective equipment and tools they must use to complete their task and the protection needed for hazards of exposed metal and other cut hazards.	**L**
	Eye hazards	Wear protective eyewear which meets ANZI/ASSE Z81 to protect eyes from hazards associated with MEC operations.	**L**

Job Steps	Hazards	Controls	RAC
Using mechanized equipment	Physical injury from mechanized equipment	Inspect mechanized equipment prior to it being placed in use on site, by a competent person IAW the manufacturer recommendations and requirements of this SSHP. All mechanized equipment will be inspected daily (while in use) to promote safe operating conditions. Inspections will be conducted by the operator or a designated competent person at the beginning of the day of use. Prior to daily use braking and operating systems will be function checked and all safety devices will be in place. Whenever an unsafe condition or discrepancy is found the equipment will be immediately removed from service and prohibited from use until the unsafe condition is corrected. ONLY qualified operators holding an appropriate certification are permitted to operate mechanized equipment. Equipment operations will be conducted in a manner as to not endanger personnel and IAW with manufacturer's instructions. Equipment will not be mounted nor dismounted while moving.	**M**
	Physical injury from mechanized equipment	Establish a clear safety zone at the maximum radius of the bucket. The safety zone will be clearly marked with orange safety cones or other demarcation. Personnel will remain clear and not enter the safety zone when the excavator is in operation. All personnel working near the safety zone will wear PPE consisting of a high-visibility vest and head, foot and eye protection.	**M**
	Overhead hazards	Wear Safety hard hats in those areas with the potential for head injury. All protective head gear shall meet the current requirements of ANSI Z89.1	**M**
	Sprains and strains	Wear sturdy footwear. Avoid twisting or turning while opening doors and walking with hand-pulled equipment. Personnel will be cautioned about physical strain associated with strenuous activities that may be conducted on site. Personnel will use caution to not over exert themselves of overstrain muscles and joints. Know your limitations.	**L**
	Slips, trips and falls	Wear sturdy footwear, and continually inspect work area for hazards and practice good housekeeping procedures and maintain clear work areas to remove trip hazards. Personnel will also be aware of uneven walking surfaces, animal boroughs, ground surfaces tree roots, small scrubs and the potential for rocks and other trip hazards associated with the work site. Avoid walking near cliffs or on inclined/slopes greater than 30 degrees.	**L**

Job Steps	Hazards	Controls	RAC
Add Steps, Hazards, and Actions to Eliminate or Minimize Hazards based on conditions encountered in the field.			

Equipment	Training	Inspection
Hand tools for excavating Mechanized equipment Handheld magnetometers Smart phone apps for noise, weather, temperature, etc. <u>Personal Protective Equipment</u>: Hard Hat - overhead hazards present Safety glasses with side shields Safety-toed boots Hearing protection when noise exceeds 85 dBA	UXO Technicians shall meet the training/certification requirements of DDESB Technical Paper 18. 2 First aid trained staff _____ _____ 40 hr HAZWOPER. 8 hr HAZWOPER annual refresher. Documentation of training will be kept on file at the project site. Initial Site Safety/Task Hazard Training. Current equipment operator certificate PPE Training.	Daily inspection of hand tools. Daily inspections and tests IAW manufacturer's instructions and recommendations. Magnetometers will be response tested daily at the test plot to ensure proper operations. All magnetometer tests will be recorded in their respective equipment test log.

HGL HydroGeoLogic, Inc

ACTIVITY HAZARD ANALYSIS

Activity/Work Task: Mobilization/Demobilization (includes set-up, take down, and staging of equipment

Project Location: Fort Jackson National Cemetery, Columbia, SC

Contract Number: W912DY-17-D-0004

Date Prepared: 5/17/2019

Prepared By: Dusty Easton

Corporate H&S Reviewer: Edie Scala-Hampson

Notes: (Field Notes, review comments, etc.)

Overall Risk Assessment Code (RAC) (Use highest code) L

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

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

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

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

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

RAC Chart

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

Job Steps	Hazards	Controls	RAC
1. Review-Health and Safety needs	Inadequate preparation which can lead to the pain and suffering of an accident or personal injury	Confirm all field personnel understand the project Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP) and are trained in the procedures corresponding to work assignments. Conduct pre-entry H&S briefing. Confirm all site hazards are recognized. Confirm all necessary equipment to evaluate and control site hazards is available and in good working condition. Confirm applicable engineering, administrative and personal protective equipment (PPE) controls are ready to be implemented as needed. Confirm emergency safety and first aid supplies are available. Review emergency procedures and evacuation plans.	L

Job Steps	Hazards	Controls	RAC
2. Mobilize Equipment, Tools and Safety Gear/Demob same.	Strains, sprains, awkward bending/lifts and ergonomic hazards	Move the load inside the truck as close to the edge of the bed as possible to be ready for unloading/ loading Test the load first by nudging the item or container to estimate its weight and to determine if it is able to be moved alone. Seek assistance in moving the object or load. Slide the load across the track bed, do not lift and move. Move obstructions inside the truck to allow the load to slide across the truck bed. Use a step stool or step ladder to gain access to bed. Use proper lifting techniques. Lift with legs and a straight back. Do not twist while carrying a load. Move feet to avoid twisting. Maintain good personal fitness Know your limitations Ensure walking pathway is clear Do not lift greater than 50 lbs. Use mechanical assistance or 2 man lift whenever possible Limit repetitive awkward motions See General Site Hazards AHA	**L**
3. Travel	Traffic (road and site traffic)	Assure vehicle is adjusted per your personal specifications and is in good working order and all cargo is secured and distractions are minimized. Familiarize yourself with the route and directions.	**L**
4. On-site Mobilization/Demob • Determine location for set up/staging equipment. Determine strategy for demob. • Develop capability at the site, to include installation of office/equipment storage trailers, etc., as needed • Set up/ take down trailers and other support services, as need	Traffic-Struck by hazards	Select location away from traffic Place barricades for work site protection, if necessary Wear high visibility vest Stay clear of traffic and equipment. Have all necessary PPE (hardhat, safety glasses, hearing protection, vest, etc)	**L**
	Driving over soft ground Uneven and rough terrain	Choose location with level and firm soils	**L**
	Site access control-unwanted entry	Maintain a constant watch for intrusion of unauthorized personnel	**L**
	Electric shock	Require that all electrical power hook up, installations and disconnections be made or certified by a qualified electrician who will provide written certification of installation and grounding.	**L**

Job Steps	Hazards	Controls	RAC
5. Removal and transport of equipment and supplies from the site	Take home toxics	Note a source of Decon water on site. Do not bring contaminated PPE or boots into truck. Use liners to prevent contamination of truck	L
	Same hazards as in step 4 above	See action to eliminate or minimize hazards in step 4	L
6. General site work	General site hazards: Insect bites and stings .Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac). Vehicle traffic Severe weather Heat stress Cold stress Noise. Lifting Slips, trips, falls UV hazards, etc.	Refer to General Site Work AHA Pack what you will need for control of hazards	L

Job Steps	Hazards	Controls	RAC
Add Steps, Hazards, and Actions to Eliminate or Minimize Hazards based on conditions encountered in the field.			

Equipment	Training	Inspection
Personal Protective Equipment: Level D: Hard Hat Safety Glasses Safety-Toed Boots Work Gloves/ Chemical resistant gloves ANSI Class 2 reflective warning vests Other Equipment: Generator Fire Extinguishers Emergency Eyewash First Aid Kit Insect repellant with DEET Repel Permanone™ Hand tools Spill containment supplies First aid supplies Containers as needed Tarps GFCI Heavy duty ext. cords Drinking water Weather radio Heat stress monitoring Wind sock Sampling equipment: including pumps, pump controllers, PID/OVM, water level probe, misc. hand tools	Competent Person (CP) / Qualified Person (QP): CP/SSHO_____ _____ QP/First Aid and CPR _____ QP/First Aid and CPR _____ Training Requirements (as determined by the SSHO): HAZWOPER 40 hour Site safety orientation Tailgate meetings Emergency procedures Hazard communication Hearing conservation MEC awareness Applicable AHAs Fire extinguisher use Biological hazard identification and control Tornado shelter location Lightning safety procedures Heat stress prevention and heat stroke treatment Cold stress prevention	Daily site safety inspection (SSHO) _____ Housekeeping (daily) Eye wash equipment (weekly) Fire extinguisher (monthly) Vehicle inspection daily Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals (each work area) Check body for ticks (each evening during tick season) Identify closest usable tornado shelter that is available (each work area).

ACTIVITY HAZARD ANALYSIS

Activity/Work Task: Vehicle Operations

Project Location: Fort Jackson National Cemetery, Columbia, SC

Contract Number: W912DY-17-D-0004

Date Prepared: 5/17/2019

Prepared By: Dusty Easton

Corporate H&S Reviewer: Edie Scala-Hampson

Notes: (Field Notes, review comments, etc.)

Overall Risk Assessment Code (RAC) (Use highest code): M

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
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Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

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

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

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

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

RAC Chart

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

Job Steps	Hazards	Controls	RAC
Project vehicle use on and off project site. Inspecting vehicles. Vehicle operations. Parking vehicles. Backing vehicles.	Accidents due to faulty equipment on vehicles	All company owned, leased, or rented vehicle operations shall comply with the requirements of HGL Procedure No. 16 "Driving Safety." Subcontractors operating motor vehicles shall comply with all federal, state, and local traffic regulations. Subcontractors shall only use vehicles that are in good condition and safe to operate. All personnel shall drive defensively and wear seat belts while vehicles are in motion. Inspect vehicles before use – document inspection. Keep alert for pedestrians. Always yield to and give pedestrians the right of way.	L
	Failure to properly plan daily activities	This AHA shall be reviewed and a pre-task safety and health analysis completed by the crew prior to commencing daily activities, as a component of the morning Tailgate Safety Meeting to accommodate conditions encountered in the field and at any time throughout the workday when new tasks are initiated, unforeseen circumstances arise, or if working conditions change.	L

Job Steps	Hazards	Controls	RAC
Project vehicle use on and off project site. Inspecting vehicles. Vehicle operations. Parking vehicles. Backing vehicles.	Accidents	In the event of an accident: stop; call for medical assistance; notify police; complete Vehicle Accident Report and submit to the SSHO. If an HGL employee is injured, contact Workcare 24-7 emergency number 888-4497-787, Workcare will provide information on the nearest health clinic or emergency room. Follow HGL Procedure No. 9 “Incident Reporting Procedures.” If a subcontractor employee is injured, the Supervisor's Employee Injury/Illness Report Form must be completed and submitted to the SSHO.	**M**
	Equipment failure	Perform daily inspections of your vehicle. Any vehicle with mechanical problems that may endanger the safety of the driver, passengers, or the public shall not be used.	**L**
	Not prepared for emergency	Ensure safety equipment is in the vehicle. Safety equipment should include a spare tire, jack, first-aid kit, fire extinguisher, and flashlight. Flares and/or reflective triangles shall be available in larger trucks. Verify that the proper documentation is in the vehicle - documentation includes an operations manual for the vehicle, insurance card, vehicle registration, and HGL accident forms.	**L**
	Unfamiliar with the vehicle	Familiarize yourself with the vehicle before moving. Properly adjust mirrors and seat. Review the dashboard controls, steering radius, overhead, and side clearances. Locate controls for windshield wipers and lights.	**M**
	Vehicle loading	Do not overload the vehicle. Secure all equipment within the body of the vehicle. Do not block side view mirrors with load. Do not transport Department of Transportation manifested hazardous materials without a commercial driver’s license. Dispatch all equipment and personnel with proper forms and identification.	**M**
	Cellular phones	Do not use handheld cellular phones while driving. Pull over to the side of the road when making or receiving a call.	**M**

Job Steps	Hazards	Controls	RAC
Project vehicle use on and off project site. Inspecting vehicles. Vehicle operations. Parking vehicles. Backing vehicles.	Influenced by drug and alcohol	Never drive under the influence of drugs or alcohol. Disciplinary action, including termination, will be taken against anyone who is convicted of or who pleads no-contest to the charges of driving under the influence in accordance with the HGL Substance Abuse Policy. Project-assigned hourly employees are not permitted to operate company owned, leased, or rented vehicles after 10:00 p.m. without written authorization from their supervisor.	**M**
	Driver attitude/fatigue	Do not operate any vehicle when abnormally tired or fatigued. Keep an even temper when driving. Do not let the actions of others affect your attitude. Take breaks to avoid “highway-hypnosis” and “falling asleep at the wheel”. Take plenty of breaks when driving long distances or rotate driving responsibility with a passenger. Personnel, while on duty, shall not operate motor vehicles after being in a duty status (regardless of their role or function) for more than 12 hours during any 24-hour period without at least eight consecutive hours of rest. No employee may drive continuously for more than 10 hours in any single on- duty period (continuous period of more than 10 hours in any 24-hour period without at least eight consecutive hours of rest).	**M**
	Backing	Back into parking spaces upon arrival, whenever possible. When preparing to move or back vehicles, walk around the vehicle 360° before entering vehicle to identify any new conditions or obstructions. Use a spotter when backing whenever possible. Determine and agree upon hand signals (between spotter and driver) before attempting to back vehicle. Check the rear-view and side mirrors prior to backing (Note: All vehicles, other than automobiles, must have small convex mirrors attached to the side mirrors). Back slowly in areas of obstructed vision.	**M**
	Blind Spots	Become familiar with any blind spots associated with your vehicle. Adjust mirrors properly. Make sure you use your directional signals. Always look over your shoulder to assure the lane is clear when changing lanes. Exercise caution when approaching other driver’s blind spots.	**M**

Job Steps	Hazards	Controls	RAC
Project vehicle use on and off project site. Inspecting vehicles. Vehicle operations. Parking vehicles. Backing vehicles.	Spacing/distance	Identify if your vehicle has Anti-Lock Brakes. Do not tailgate. Follow the 3-second rule. Increase the 3-second rule as necessary during hazardous travel conditions. Always leave yourself an “out” during travel – this applies to stoplights as well. When stopping, make sure that you leave enough distance between you and the car in front of you (you should be able to see the rear tires of the vehicle in front, when stopped). When at a red light, and it turns green, use the “delayed start” technique, by counting to three before you take your foot off the brake. Allow extra spacing and braking time for trucks and vehicles towing trailers. Trailers shall be equipped with brakes.	**M**
	Skids.	If the vehicle has begun to skid out of control, turn the steering wheel in the direction of the skid and re-adjust the wheel, as necessary. Slow down during hazardous travel conditions. Use 4-wheel drive, if available, when driving vehicles off road, on steep inclines, muddy conditions, etc. Do not take vehicles “off road” if they cannot be operated safely.	**M**
	Speed.	Obey all posted speed limits. Radar detectors are prohibited in all company owned, leased, or rented vehicles. Reduce travel speed during hazardous conditions (i.e., rain, fog, snow).	**M**
	High profile vehicle/low clearances.	Determine actual height of vehicle during initial inspection - prior to moving vehicle. Maintain awareness of vehicle height while driving. Identify low clearance structures, such as motel overhangs, gas station canopies, bridges, tunnels, parking garages, fast-food drive-throughs, banks, etc. Determine the height of the low clearance structure prior to driving under it and verify that there is enough clearance to safely pass – use a spotter as necessary.	**M**
	Crossing railroad tracks.	Stop, look, and listen before crossing railroad tracks. Be aware that multiple tracks may have more than one train using them, and the trains may be traveling in opposite directions. Never drive around crossing gates.	**M**
	Flooding/high water/drowning.	Never drive vehicles across flowing water on the road.	**M**

Job Steps	Hazards	Controls	RAC
Add Steps, Hazards, and Actions to Eliminate or Minimize Hazards based on conditions encountered in the field.			

Equipment	Training	Inspection
Equipment: Emergency phone list. Can be available on cell phone contacts. Map to medical care facilities Operator's manual Insurance card Vehicle registration Shaw accident forms Fire Extinguishers First Aid Kit Spare tire and jack Flashlight Flares and/or reflective triangles shall be available in larger trucks	Competent Person (CP) / Qualified Person (QP): CP/SSHO_____ _____ Training Requirements (as determined by the SSHO): Site safety orientation Qualified vehicle operators Defensive driving	Daily vehicle inspections Vehicle inspections (prior to trips greater than 50 miles for HGL provided vehicles) Walk around the vehicle 360° before entering vehicle (each time)

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ATTACHMENT A3
SAFETY PERSONNEL
PROOF OF TRAINING AND COMPETENCY AND CERTIFICATIONS OF EMPLOYEE MEDICAL SURVEILLANCE PROGRAM PARTICIPATION

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Personnel Proof of Training and Competency and Certifications of Employee Medical Surveillance Program Participation will be provided to the COR and USACE Project PM prior to the commencement of field operations for their review and approval. These will be included in the Final version of the QAPP.

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ATTACHMENT A4
CONTAMINANTS OF INTEREST AND POTENTIAL ACUTE HEALTH EFFECTS

(MC Sampling Not Applicable To This Task Order)

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ATTACHMENT A5
PERSONNEL QUALIFICATIONS

Field management personnel qualifications will be reviewed and approved by USACE prior to commencement of field operations for their review and approval. These will be included in the Final version of the QAPP.

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NAME: **EDIE SCALA-HAMPSON CIH, CHMM** **HYDROGEOLOGIC, INC.**
TITLE: **Project CIH** **Reston, VA**

EDUCATION AND TRAINING:

Bachelor of Science, Loyola University of Chicago, 1976

PROFESSIONAL CERTIFICATIONS AND TRAINING:
CIH #2929CP, (1984) certified by American Board of Industrial Hygiene;
CHMM, Certified Hazardous Materials Manager, #06859 (1996);
40-Hr HAZWOPER / 8-Hr Refresher/Supervisor Training / 30-Hr Construction Safety / Confined Space Entry Training / Excavation Competent Person / USACE EM 385-1-1 Course / MEC Hazard Awareness Training / DOT-IATA Shipping of Hazardous Materials / First Aid/CPR.
Past Chair of AIHA/ACGIH Hazardous Waste Committee.

COURSES:
Asbestos Project Management, Radiation Worker I and II, Industrial Hygiene Toxicology, Ventilation Design, Noise Control, Training by Design, Hazard Communication, Phase I Environmental Site Assessments, Environmental Liability, The SUPERFUND Process, EPA Principles of Risk Assessment, Air Sampling Hazardous Waste Sites, Integrated Emergency Response Planning, Air Quality, Determining Action Levels for Hazardous Waste Sites, Remediation of Contaminated Soil and Groundwater, Conducting Environmental Audits, Lead testing, Toxicology and risk assessment, Fundamentals of Safety Management, Chemical Protective Clothing, Environmental Liability, I.H. Writing and Speaking: Precise as News Concise as Law, Resolving Mold and Other IAQ Concerns Without Testing, Respiratory Protection-OSHA Training Institute, Advanced Concepts in Emergency Chemical Detection

EXPERIENCE SUMMARY:

Ms. Scala-Hampson has more than 30 years' experience assessing hazards and risks; writing and/or reviewing APPs, SSHPs, and activity hazard analyses' (AHAs); assessing compliance with controls; assessing effectiveness of controls and developing and providing applicable safety and health (S&H) training. She has 18 years' experience developing and managing S&H programs for HTRW, MEC, and UXO avoidance and removal, including respiratory protection and personal protective equipment (PPE) programs. Ms. Scala-Hampson has a broad range of successful experience in both program and project management. Environments she has familiarity with have included those with metals, pesticides, chlorinated solvents, hydrocarbons, CWM, as well as radiological and MEC contaminants. She also:

- Administers and maintains the HGL medical surveillance program, training and certifications.
- Develops multimedia procedures, utilized for review and training.
- Conducts employee exposure monitoring surveys.

- Acts as liaison between HGL and outside Safety and Health related agencies.
- Maintains and updates OSHA Regulatory and company related training materials and procedures.

RELEVANT PROJECT HISTORY

RI/FS at Former Camp Bostwick Bomb Target Munitions Response site, Putnam County, FL, USACE, U.S. Army Corps of Engineers, Jacksonville District, U.S. Army Engineering and Support Center, Huntsville (2017–Present) Reviewed the APP, SSHP and AHAs for explosives; (RDX), mineral dusts and metals inclusive of lead, zinc, copper and aluminum. The phases of work will include UXO avoidance activities in collaboration with vegetation removal, DGM, analog surveys, intrusive investigations, MC sampling/processing and analysis. Anomalies will be intrusively investigated and identified. Any MPPEH recovered during this effort will be disposed and the final phase of the field effort will involve site restoration.

Military Munitions Response Program (MMRP) services at Yellow Jacket Target Area, Tooele County, Utah (Nov. 2017–present). The SSHP that was developed had to pay particular attention to the chemical hazards that may be encountered when digging geophysical anomalies that might be caused by CWM or digging in test areas where Chemical Agent (CA) was used (mustard, thiodigycol, 1,4-dithiane, 1,4-thioxane, phosgene and hydrogen cyanide).

The purpose of the Military Munitions Response Program (MMRP) services at the YJTA is to conduct a munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH) site characterization survey, delineate areas of MEC and MPPEH concern, and conduct specified environmental and cultural surveys. Historical records indicate that conventional munitions and chemical warfare materiel (CWM) were used for military training and testing against cave type fortifications.

Remedial action Oahu Island Formerly Used Defense Site, Target Islands and Surrounding Waters MRS Honolulu County, Oahu Island, Hawaii (2017–present). In addition to the typical hazards posed by MEC the APP and SSHP had to address terrestrial and water-based vehicle operations: inflatable boats, scuba diving rescue, MEC remedial action-diver instrument aided removal action, drum handling and underwater UXO disposal operations.

HGL personnel will perform UXO avoidance and diver instrument-aided removal activities at the Oahu Island Target MRS. UXO avoidance and diver instrument-aided removal activities will be conducted to locate potential MEC anomalies on the ocean floor within the MRS. The objective of this project is to provide all Military Munitions Response Program (MMRP) services necessary to investigate and remove MEC and MPPEH, including MD, from the Target Islands and Surrounding Waters Munitions Response Site (MRS) on Oahu Island, Hawaii.

Environmental remediation services for the Formerly Utilized Sites Remedial Action Program (FUSRAP) in St. Louis, Missouri (March 2016–present). Reviewed and revised APP/SSHP and developed AHAs for remedial activities. The site played a key role with the MED/AED in the race against Nazi Germany to build a nuclear weapon by separating uranium from ore and processing it into uranium-bearing feed materials. When the process was

performed, the resulting residuals were released from the property into the environment through handling and disposal practices. The cleanup area on and around the property is designated as SLDS (St. Louis downtown site).

The drumming up storage area where the uranium process byproducts were transported became known as SLAPS (St Louis Airport site). The residues from these storage containers and open piles migrated into the soil and groundwater and were carried by wind to adjacent properties; rain washed the waste into nearby Coldwater Creek. The contaminated byproducts and scrap were eventually sold and hauled away for further processing; however, the hauling efforts caused the contamination to spread even further. By 1966, all the uranium byproducts and scrap were removed from the SLAPS, but the residues remained. Environmental remediation services address contamination at the St. Louis Downtown Site (SLDS) and the North St. Louis County Sites (NORCO), related to the historical Manhattan Engineer District/U.S. Atomic Energy Commission (MED/AEC) uranium ore-processing activities.

Characterization/Remediation/Demolition of BMEWS Structures, Clear AFS, Alaska (2017 to present). Reviewed APP/SSHP and AHAs for remediation of asbestos, PCB paint and silica monitoring data per the 2017 OSHA PEL changes (29 CFR1926.1153) which limit worker exposures to 50 micrograms of respirable crystalline silica per cubic meter of air (µg/m3), averaged over an eight-hour day.

Project CIH for Perfluorinated (PFAS, PFOA and PFOS) compound release and temporary mitigation of drinking water. Review and development of APP/SSHPs for Former Ft. Kelly, Mount Home Airforce base, Joint base McGuire, Ft. Peterson, Ellsworth AFB, Langley AFB (2017-present). PFOA and PFOS are fluorinated organic chemicals that are part of a larger group of chemicals referred to as perfluoroalkyl substances (PFASs). They have been used to make carpets, clothing, fabrics for furniture, paper packaging for food and cookware. They are also used for firefighting at airfields and in a number of industrial processes, hence the contamination. Studies of these emerging contaminants indicate that exposure to PFOA and PFOS over certain levels may result in adverse health effects, including developmental effects to fetuses during pregnancy or to breastfed infants (e.g., low birth weight, accelerated puberty, skeletal variations), cancer (e.g., testicular, kidney), liver effects (e.g., tissue damage), immune effects (e.g., antibody production and immunity), thyroid effects and other effects (e.g., cholesterol changes). Sampling challenges for perfluoroalkyl substances came with many prohibitions of types of field clothing personal protective equipment (PPE), personal cleaning products, sunscreens and insect repellants that had to be avoided, so as not to cause interference with sampling results.

RI/FS Fort Jay Formerly Used Defense Site, Governors Island, New York, (2017–present). Review of APP, SSHP and supporting documents. The unusual part of the RI is that it will also involve investigation of water portions of the Fort Jay FUDS surrounding historical piers that were operational during Army presence onsite. The RI will investigate the potential that MEC may have been dumped from the piers, ships moored, or directly off the seawall during military use of the island. The HGL Team will prepare a separate, detailed work plan for dive operations. A dive team will investigate pre-determined transects placed around historical pier locations. Each pier location will be circumnavigated and investigated in select locations along the

shoreline. Divers will use metals detectors to locate metallic items for further investigation and documentation. Full-coverage digital geophysical mapping (DGM) and advanced geophysical classification (AGC), followed by intrusive investigation will be completed in approximately 28 acres of open accessible areas of the Fort Jay FUDS.

RI/FS at Former Camp Butner, Granville County, NC, USACE, Wilmington (2011–Present). Reviewed the APP/ SSHP submission. Hazards involved classic safety in addition to hazards associated with brush clearing, intrusive investigation and MEC removal. No incidents or accidents during the MEC removal actions, over 16,720 hours onsite were worked without a recordable incident.

Remedial Actions at Fort McClellan, Anniston, Alabama (April 2015–September 2017). Reviewed the APP/SSHP and lead control plan. The primary field effort was to remediate soil containing metals contamination resulting from historic range use at four sites. The Fort McClellan effort, located in the foothills of the Appalachian Mountains in eastern Alabama, has removed and disposed of over 170,000 tons of metals-contaminated soil at 4 sites, remediated over 6,000 linear feet of sediment in an active creek, and restored over 100 acres of former range area, including multiple areas with extreme slopes.

Environmental Remediation Services at Former Blaine Naval Ammunition Depot (NAD), Hastings, NE, USACE, Kansas City (2012–Present). Conducted audits and worked with USACE to develop an inspection checklist referenced to 30, Nov 14 EM 385-1-1. Developed administrative controls (worker rotation) based on vibration study of whole body and hand and arm vibration. HGL worked at the Former Blaine Naval Ammunitions Depot in Hastings, NE for 5 years, where we completed over $30M in start-up and prove-out of the 3,500 GPM GWTP, installed 10 miles of influent force mains, constructed a 42-acre wetlands mitigation area, designed and constructed a 35 foot deep wet well, and conducted O&M of the GWTP and LTM of the monitoring well network. HGL was recently awarded a follow-on CPFF 5-year task order for O&M of the groundwater extraction and treatment system and monitoring network LTM.

Open Detonation Area Kick-Out, Test Ranges, and Furnace Area MEC Clearance and Characterization – Kansas Army Ammunition Plant, Labette County, KS, USACE, Kansas City (2012–2017). Developed Hazard Communication training and completed a Creek Clearance Activity Hazard Analysis. Reviewed asbestos air sampling results and compared results to the OSHA asbestos standard 29CFR 1910.1001.

MacDill Air Force Base (MAFB), FL Thermally Enhanced Reductive Dechlorination Pilot Test (March 2017). Use of thermally enhanced reductive dechlorination (ThERD) was used to address groundwater contamination in the eastern source area at ST025. The contaminants of concern (COCs) in groundwater at ST025 are naphthalene and chlorinated volatile organic compounds (CVOCs), including tetrachloroethlene (PCE), trichloroethlene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride (VC). This pilot test was undertaken to qualitatively evaluate whether the addition of heated ABC/water will accelerate rates of contaminant destruction at the site. HGL had previously injected this substrate at this site before, but it was not heated. An AHA was developed for heating the substrate solution using a pressure/steam washer to approximately 60°C before it would be injected into the subsurface.

Removal Action, Umiat Test Well No. 9, FUDS, Umiat Air Force Station, AK, USACE, Alaska, (2013–2015). Constructed training program using the ACGIH cold stress TLVs, developed by the U.S. Army Research Institute of Environmental Medicine. Cold Stress work/warm-up schedules were in effect based on air temperature and wind speed during PCB remediation activities.

Site Characterization and MEC Removal, Sector 10; Badlands Bombing Range, Pine Ridge, SD; USACE, Omaha District (2010–2015). Reviewed the APP, SSHP, and ESS for MEC Removal Action and post detonation sampling and field screening to determine presence or absence of residual explosives. Project included surveying, brush clearing, MEC, and geophysical mapping. The hazards were classic safety hazards associated with explosive ordnance, physical safety and biological hazards. During the field activities, over 27,000-man hours were worked on site without a recordable incident or accident.

Corrective Measures Implementation for SWMU 115, Hawthorne Army Depot, NV, USACE, Sacramento (2013–2014). Developed APP/SSHP for field testing of the substrate injection and recirculation system, soil vapor investigation of the deep vadose zone, plume-wide GW monitoring, and full-scale construction/system prove out. Concentrations of the TCE daughter products cis-1,2-dichoroethene and vinyl chloride, and RDX daughter products hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine,hexahydro-1,3-dinitroso-5-nitro-1,3,5-triazine, and hexahydro-1,3,5-trinitroso-1,3,5-triazine were monitored in the source area and across the plume.

Basewide ERS at IRP Sites, Scott AFB, IL, USACE, Sacramento (2010–2013). As Project CIH conducted a field inspection of the MEC/UXO removal site. Conducted document reviews of HGL Explosive Safety Submission (ESS), subcontractor S&H plan, made recommendations for improvements and accepted the approved plan.

Area IV Radiological Investigation Services, Santa Susana Field Laboratory (SSFL), Ventura County, CA, EPA (2010–2012). Managed the S&H program for the SSFL Site, where HGL completed an extensive RI at a former DOE nuclear test facility. This was a high-profile site requiring close interaction with Native American Tribes and contentious public. The RI consisted of radiological screening using various custom-designed field instruments, and multi-media sampling over a 470-acre area. Radiological worker monitoring programs for this complex site were executed under challenging physical conditions, including dealing with numerous poisonous plant/animal biological hazards. Field crews consisted of over 50 HGL staff and additional subcontractors and Tribal representatives conducting oversight. The site was situated in extremely rough terrain with rocky, steep slopes and dense vegetation and the high desert temperatures were extreme, posing a constant potential heat stress risk for workers. Oversaw field and lab S&H activities that complied with MARSSIM and Multi-Agency Radiological Laboratory Analytical Protocols.

ERS, Former Fort Devens (BRAC Site), MA, USACE, New England (2010–2011). Managed the S&H for LTM, bio-injection, and in-well recirculation treatment system. Amended the SSHP and reviewed the APP, SSHP, MEC avoidance and S&H indoctrination for site personnel on MEC hazards, anomaly avoidance and awareness. The potential MEC hazard types were

projectiles, HE filled, 37-mm, and 3-inch Stokes mortar. Associated with these MEC types were projectiles, metals (antimony, iron, copper, lead, and zinc) and explosives (octahydro-1,3,5,7-tetranitro 1,3,5,7-tetrazocine [HMX], hexahydro-1,3,5-trinitro-1,3,5-triazine [RDX], trinitrotoluene [TNT]). Reviewed subcontractor scopes of work and safety submissions.

Range Surface Clearance, ML 125, Kirtland AFB, NM, AFCEC (2010). Managed the S&H program for 1,252 acres of MEC and MD surface clearance. Reviewed the ESS submission prior to submission to AF for approval. Worked with Kirtland AFB in addressing DDESB comments on the Draft ESS due to Air Force Materiel Command changes in demolition procedures. Performed field S&H inspection to ensure that all MEC and MD removal operations were conducted IAW approved ESS.

EMPLOYMENT HISTORY:

HydroGeoLogic, Inc., Project CIH, Reston VA, September 2010 to present.
Responsible for managing hazardous waste, munitions, and radioactive waste investigation and site cleanup S&H programs, including industrial hygiene, safety, medical monitoring, and training. Responsible for the development and implementation of HGL's Environmental S&H Programs at both the program and project level, including the development of APPs, SSHPs and AHAs. Activities include identifying opportunities for improvement; and developing and implementing S&H policies.

Self-employed Industrial Hygiene/Environmental Consultant 1996-2010
Industrial Hygiene Auditing/ Regulatory Compliance Auditing

- Industrial Hygiene Risk Assessment Audits- Plastics plants in Sao Paulo, Brazil in 2010 and US locations.
- Occupational Hygiene Audits of 13 chemical plants in Brazil 2007-2008 as part of a USTDA grant.
- Safety audits of major U.S. hotel chain-various locations throughout the U.S. IAQ auditing (2007).
- Initiation and development of audit parameters for health and safety and environmental functions of a major computer company. Also, coordination of national and international site visits, reviewing air monitoring records, medical surveillance programs and data, safety data sheets (SDS) records, hazard communication programs, respiratory protection programs, emergency preparedness, and confined space entry procedures

STS Consultants, Ltd. (now AECOM) - December 1988-August 1996
Served as the Manager of Industrial Hygiene and Corporate Health and Safety Officer. Responsibilities included auditing field sites, conducting in-house training in compliance with the Occupational Safety and Health Administration's Hazardous Waste Operations and Emergency Response Standard and providing technical assistance on industrial health and chemical safety for all levels of staff and management in 6 regional offices.

Continental Insurance - 1981-1988
Senior Industrial Hygienist - CTEK Environmental Health Unit, Chicago, IL
Coordinated occupational and environmental health surveys with all company groups and acted as a consultant to fee customers and insureds throughout the United States. Advised, interpreted and evaluated environmental health exposures and control programs for underwriting. Marketed and prepared proposal and cost estimates. Interpreted the technical aspects of occupational disease exposures that resulted in reported occupational disease claims. Integrated industrial hygiene and safety functions by coordinating interaction on audit committees for environmental conservation, hazardous materials and occupational safety for Fortune 500 companies. Conducted environmental risk assessments. Represented corporations as an expert witness in occupational disease cases.

US CITIZEN: Yes

AWARDS AND TECHNICAL PRESENTATIONS:

ACHIH/AIHA-Drum Buster Award 1997. Awarded for the advancement of I.H. Knowledge, Research, Education and Public Image in the Hazardous Waste Field.

Scala-Hampson, Edie, Jan. 29, 2013, "The Heat is on: Dealing with an Antagonistic and Hostile group. What is an auditor to do?" Presentation at Annual Conference in San Diego, CA - Sponsored by: The Auditing Roundtable.

Scala-Hampson, Edie, May 20, 2013, "GHS training for Millennials (and everyone else)." AIHCE Annual conference presentation, Montreal, Canada.

PROFESSIONAL MEMBERSHIPS:
American Board of Industrial Hygiene
American Industrial Hygiene Association (national and local sections)
Institute of Hazardous Materials Management

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APPENDIX B

ENVIRONMENTAL PROTECTION PLAN

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APPENDIX B
ENVIRONMENTAL PROTECTION PLAN

REMOVAL ACTION
FORT JACKSON NATIONAL CEMETERY
COLUMBIA, SOUTH CAROLINA

Contract No. W912DY-17-D-0004
Task Order No. W192DY19F0217

Prepared for:

U.S. Army Corps of Engineers, Charleston District
U.S. Army Engineering and Support Center, Huntsville

Prepared by:

HydroGeoLogic, Inc.
4835 University Square, Suite 15
Huntsville, Alabama 35816

August 2019

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LIST OF ACRONYMS AND ABBREVIATIONS

BGEPA	Bald and Golden Eagle Protection Act
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CFR	Code of Federal Regulation
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
ESA	Endangered Species Act
HGL	HydroGeoLogic, Inc.
IAW	in accordance with
LE	Federally-listed Endangered
LT	Federally-listed Threatened
MBTA	Migratory Bird Treaty Act
MRS	Munitions Response Site
OSHA	Occupational Safety and Health Administration
PM	project manager
PPE	personal protective equipment
RA	Removal Action
SCDHEC	South Carolina Department of Health and Environmental Control
SUXOS	Senior UXO Supervisor
USFWS	U.S. Fish and Wildlife Service
UXO	unexploded ordnance
UXOSO	UXO Safety Officer

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1.0 ENVIRONMENTAL PROTECTION PLAN

This Environmental Protection Plan (EPP) describes the approach, methods, and operational procedures that will be employed to protect the natural environment during performance of all Removal Action (RA) field tasks. The EPP has been developed to document site-specific environmental conditions on the Fort Jackson National Cemetery Munitions Response Site (MRS) in Richland County, South Carolina. The EPP addresses the potential impacts that the proposed actions may have on the surrounding environment and suggests measures to be implemented during the proposed actions to protect identified environmentally sensitive areas.

1.1 PLAN OBJECTIVES

The plan also identifies environmental management controls that will prevent and/or decrease the environmental impact in and around the project location. The objectives of this plan are to:

- Define methods and procedures to minimize polluting air, water, and land resources;
- Protect identified, environmentally sensitive cultural and/or historical resources; and
- Execute field activities in the project work area in accordance with (IAW) all applicable federal, state, and local regulations.

1.2 POLLUTION MINIMIZATION METHODS

Based on the nature of the site work to be conducted, HydroGeoLogic, Inc. (HGL) anticipates little, if any, environmental impact to land, air, or water. No storm water impacts are anticipated. Hand-dug excavations will be on a very limited scale, not requiring runoff controls. Other than during the possible disposal of an unexploded ordnance (UXO) item by detonation, noise is not anticipated to be a concern. If the HGL team personnel recognizes an increase in pollution potential, the work will be stopped temporarily, and HGL and the U.S. Army Engineering and Support Center, Huntsville (CEHNC) Project Manager (PM) will evaluate the situation, coordinate with the South Carolina Department of Health and Environmental Control (SCDHEC) to take the appropriate steps to mitigate environmental impacts.

1.3 INITIAL ENVIRONMENTAL SURVEY

1.3.1 Prior to beginning site activities, the Senior UXO Supervisor (SUXOS) and UXO Safety Officer (UXOSO) will assess the site and develop a layout plan of the operating area to document conditions of areas in and adjacent to the site of the work, storage areas, and access routes. The following items will be identified on the layout plan: wetlands, endangered and protected species or habitats, and cultural or historical resource areas.

1.3.2 During the initial site assessment, photographs of the site and the surrounding area will be taken to document conditions prior to work activities. This includes taking generally representative photographs of the site and photographs of areas that will be used for administrative support, storage, and/or stockpiles. Where environmentally sensitive areas are known to be present, the HGL team will assess the environmental impact and discuss any procedures, equipment, or training that may be required to mitigate/eliminate any adverse impact.

1.4 IDENTIFICATION AND LOCATION OF KNOWN NATURAL RESOURCES

A discussion of the existing environmental conditions and natural resources believed to be present at the MRS is presented in the following sections.

1.4.1 Federally or State Threatened or Endangered Plant and Animal Species

1.4.1.1 Current information regarding endangered, threatened, and protected species was compiled for the MRS, using the U.S. Fish and Wildlife Service (USFWS) Endangered Species Act (ESA) lists for South Carolina and the USFWS Information for Planning and Conservation interactive tool (USFWS, 2019). The information provided includes species listed as federally threatened or endangered (0 mammals, 2 birds, 0 fish, 0 reptiles, 0 amphibian, and 3 plants) that occur in Richland County.

1.4.1.2 The federal-listed threatened or endangered animal and plant species potentially occurring within the project area are presented in Table B-1.1. Status of the species is shown in both tables as either Threatened (LT) or Endangered (LE) with protection under the ESA. The Bald eagle is federally protected under the Bald and Golden Eagle Protection Act (BGEPA). The migratory birds that may be seasonally present in the project area are protected under the Migratory Bird Treaty Act (MBTA). The 2010 RA did not indicate these species were present at the site.

1.5 PROTECTION OF NATURAL RESOURCES

Field activities outlined in this work plan will be conducted in a manner to minimize impacts to the natural resources listed in Section 1.4. In the event that threatened or endangered species are encountered, work will halt within 150 yards of the sighting or habitat and the SCDHEC will be notified for further action.

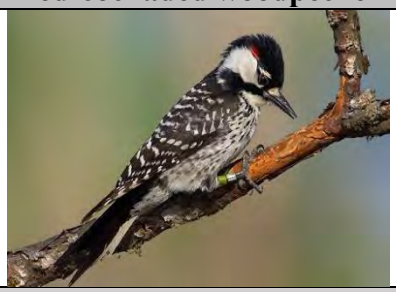
1.5.1 Project Site Monitoring

Biological monitoring of the project site will not be necessary because of the lack of critical habitats within the project site. Any identified threatened and endangered species present within the project area are not expected to be impacted by the activities performed under this Task Order.

Table B-1.1
Threatened and Endangered Plant and Animal Species, Putnam County, Florida

Species	Common Name	Category	Status
Mycteria Americana	American wood stork	Bird	LT
Picoides borealis	Red-cockaded woodpecker	Bird	LE
Acipenser brevirostrum	Shortnose sturgeon	Fish	LE
Oxypolis canbyi	Canby's dropwort	Plant	LE
Lysimachia asperulaefolia	Rough-leaved loosestrife	Plant	LE
Echinacea laevigata	Smooth coneflower	Plant	LE

Figure B-1.1
Threatened Animals and Plants Most Likely to be Found on Site

Red-cockaded woodpecker	Canby's dropwort
	
Rough-leaved loosestrife	**Smooth coneflower**
Bald Eagle	

1.5.2 Wetlands

1.5.3.1 Wetlands are saturated areas where water is present all the time or for varying periods of time during the year. Wetlands provide habitat for waterfowl, fish, other terrestrial and aquatic animals, and a wide variety of plant life. Wetlands also provide resting and feeding places on

migration routes, as well as food, shelter, breeding areas, and nurseries for many species. Wetlands protection is mandated by Executive Order 11990.

1.5.3.2 No wetlands are expected to be on site or impacted by the project. If wetlands are to be impacted, the SCDHEC will be contacted and mitigation measures will be taken to reduce the impact on the wetland ecosystem.

1.5.3 Water Resources

Water resources and floodplain protection is mandated by Executive Order 11988. Based on available aerial photography, no water resources are expected to be impacted by the project. Storm water impacts to surface water are not anticipated and are unlikely primarily because excavations will be hand-dug and very limited, creating minimal disturbance.

1.5.4 Trees and Shrubs

Digital geophysical mapping may require trimming of shrubs, undergrowth, and small trees within the project area. Following landowner approval, vegetation clearance will consist of hand or machine clearing to the extent necessary to facilitate investigation operations.

1.5.5 Cultural or Historical Resources

Because of the nature of the proposed work, any cultural or historical resources that may exist within the project area are not expected to be impacted. If any cultural or archaeological materials or resources are discovered within the project area, the SUXOS will immediately report the find to the HGL PM so a qualified archaeologist can be notified, and will provide guidance on performing further work in the area. Site work will be suspended and will resume only after obtaining approval from CEHNC. Cultural and archaeological issues will be addressed by contacting the Richland County Conservation Division at (803) 576-2080. All personnel will receive a review/training of potential archeological items that may be present to assist with identifying items if encountered.

1.5.6 Existing Waste Disposal Sites

There are no known existing waste disposal sites within the project area.

1.6 SITE-SPECIFIC MITIGATION MEASURES

1.6.1 Waste Disposal

All waste generated will be properly characterized and disposed of IAW all applicable regulations and through approved channels. It is expected that only uncontaminated trash will be generated as a result of this project.

1.6.1.1 <u>Nonhazardous Wastes</u>

All waste generated will be properly containerized and disposed of IAW all applicable regulations and through approved channels. Generation of hazardous waste is not anticipated. Uncontaminated

waste materials, such as trash and general debris, will be placed in appropriate trash receptacles for disposal.

1.6.1.2 Hazardous Wastes

The HGL team does not anticipate generating contaminated or hazardous wastes during the execution of the project; however, if hazardous wastes are generated, they will be disposed of IAW with the procedures described in the following sections.

1.6.1.3 Packaging, Labeling, Storage, and Disposal

All hazardous materials will be stored in U.S. Department of Transportation (DOT)-approved containers and labeled IAW applicable regulations. Any waste generated by the HGL team will be collected, stored, and labeled IAW applicable regulations.

1.6.1.4 Manifesting and Transporting Wastes

The HGL team does not anticipate that hazardous wastes will need to be manifested or transported. However, in the unlikely event that hazardous materials and wastes are generated, they will be manifested and transported IAW applicable DOT and U.S. Environmental Protection Agency (EPA) regulations.

1.6.1.5 Compliance with DOT Shipping Regulations

Transportation of all wastes and materials will be conducted IAW applicable DOT regulations, including use of labels and placards, and documentation of transportation.

1.6.2 Security of Hazardous Materials

HGL personnel will provide security during working hours for the work area. Explosives components comprises the major source of hazardous materials associated with the project. These components will be secured as discussed in the Explosives Management Plan (Appendix D). Other household hazardous materials, such as cleaning agents, oil, insect repellents, etc. will be securely stored during working hours.

1.6.3 Burning Activities

No burning activities are planned for this project.

1.6.4 Dust and Emission Control

EPA has established National Ambient Air Quality Standards pursuant to Sections 109 and 301(a) of the Clean Air Act. These standards, expressed in micrograms per cubic meter, establish safe concentration levels for each criteria pollutant. Standards have been set for six pollutants: particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead. The proposed project would result in a minimal amount of air pollution in the form of smoke and fugitive dust emissions. Smoke and fugitive dust emissions may result from support vehicles;

however, impact from these operations should not be significant and should not have any long-term environmental impact on air quality.

1.6.5 Noise Control and Prevention

It is expected that mechanical equipment (e.g. trucks, chainsaws) will be the primary source of noise on this project. The HGL team will control the noise emissions from this equipment by ensuring that trucks and equipment are properly functioning. The Occupational Safety and Health Administration (OSHA) permissible exposure limit for noise is 85 decibels. It is considered highly unlikely that this noise level would be reached.

1.6.6 Spill Control and Prevention

1.6.6.1 Spill Potential

Due to the nature of the operations, the potential for a spill of pollutants during operations is low. The highest probability for a spill will occur during refueling operations of vehicles or equipment.

1.6.6.2 Spill Control Measures

1.6.6.2.1 All containers of liquid containing petroleum products or other chemicals with potentially hazardous chemical constituents will be carefully managed and kept closed. The containers will be stored away from the main operations to decrease the chances of container damage and chances of spoilage.

1.6.6.2.2 Vehicles will be maintained in good operating condition and left running only when necessary. As indicated earlier all vehicles will be fueled, maintained, and serviced at an off-site location. Routine cleaning or washing of vehicles or equipment will not be permitted on site.

1.6.6.2.3 Safety cans or other approved portable service containers of flammable liquids having a flash point at or below 73 degrees Fahrenheit will be clearly marked. Drums, barrels, and flammable-liquid containers will be tightly capped.

1.6.6.2.4 When refueling vehicles or equipment, the following measures will be taken to minimize the potential for and impact from any spills:

- A spill pan will be placed beneath the vehicle/equipment fuel inlet during fueling or refueling.
- The operator will not leave the fueling operation, will be present, and will continually monitor the activity throughout the time it takes to complete the operation.
- When the vehicle/equipment is full, the fuel flow will be suspended, and the nozzle will be carefully removed from the equipment to ensure no fuel drips from the nozzle.

1.6.6.3 Spill Response

Any spills originating from small containers (e.g. gasoline cans) will be contained with absorbent materials. The HGL team will arrange for spill kits to be present on site for the immediate cleanup

of any petroleum products that may be inadvertently spilled. If fuel or oil spills onto the ground, the following measures will be taken:

- The spill area will be isolated and contained.
- The appropriate emergency response agencies will immediately be notified. A spill of over one gallon is required to be reported to the CEHNC on-site representative. If human health or the environment is threatened, the National Response Center and the state will be notified as soon as possible.
- The liquid and affected soils will be removed and placed into plastic bags. The bags will then be placed into DOT-approved containers for disposal at a permitted facility.
- Each of the DOT-approved containers will be labeled to identify the contents.

1.6.7 Storage Areas and Temporary Facilities

The HGL team anticipates establishing a temporary field office and storage area to support operations required during this project. Upon project completion, the HGL team will remove all temporary facilities and associated debris from the site.

1.6.8 Access Routes

Crews entering and exiting the work sites will use existing roads and easements. Off-road vehicle travel will be minimized. Before establishing any off-road routes necessary to gain access to sites, the possible consequences resulting from channeling run-off water in ruts will be considered.

1.6.9 Trees and Shrubs Protection and Restoration

Brush clearing may be conducted to allow for site access and munitions and explosives of concern clearance activities. Reseeding of the area will not be conducted under this task order.

1.6.10 Control of Water Run-on and Runoff

The HGL team will conduct work associated with this investigation in a manner that prevents the discharge of pollutants into adjacent waterways within and outside of the project area. No excavation or major soil disturbance activities will be conducted during the project tasks. Therefore, no sediment or erosion control measures will be required.

1.6.11 Decontamination and Disposal of Equipment

If required, non-disposable personal protective equipment (PPE) and equipment will be decontaminated prior to reuse.

1.6.12 Minimizing Areas of Disturbance

All activities associated with this project will be conducted in a manner that will minimize impacts to land resources within and outside the project boundaries. Areas affected by the project will be restored, as practical, to their original condition. Excavation holes will be backfilled with the native

materials removed. No additional fill material will be brought on site. The area of soil that will be disturbed is not anticipated to be above the threshold that requires an erosion and sediment control plan.

1.7 PROCEDURES FOR POST-ACTIVITY CLEANUP

Before leaving the location, HGL will restore the site to its approximate pre-project condition. HGL will backfill all access/excavation/detonation holes.

1.8 AIR MONITORING PLAN

Air monitoring is not being performed during this investigation.

1.9 GREEN AND SUSTAINABLE EFFORTS

The project team will implement the initiatives below to support the Army's goal of preserving natural resources, minimize energy use, minimize carbon dioxide emissions, maximize recycling and reuse of materials, and minimize the Army's environmental footprint.

- Use equipment, supplies, and materials that are locally available and are reusable and/or recyclable.
- Select local providers for field operations wherever practical.
- Complete site restoration for excavated areas as quickly as possible.
- Identify sensitive areas prior to field work (e.g., wetlands, sensitive habitats and species, historic properties, cultural resources, etc.) and plan field work to avoid or mitigate impacts.
- Plan travel to and from the site to minimize the number of trips and vehicles used.
- Inspect and maintain vehicles and equipment to ensure optimal fuel efficiency and to minimize emissions.
- Use phosphate-free detergents instead of organic solvents or acids to decontaminate sampling equipment.
- Make use of reusable PPE wherever practical.

1.10 REFERENCES

U.S. Fish and Wildlife Service (USFWS), 2019. South Carolina *Federally-Listed Threatened, Endangered, Proposed, and Candidate Species' County Distribution List*. Updated April 2019. https://www.fws.gov/charleston/pdf/Endangered/species_by_county/richland_county.pdf. Accessed June 2019.

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APPENDIX C

WASTE MANAGEMENT PLAN

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APPENDIX C
WASTE MANAGEMENT PLAN

REMOVAL ACTION
FORT JACKSON NATIONAL CEMETERY
RICHLAND COUNTY, SOUTH CAROLINA

Contract No. W912DY-17-D-0004
Task Order No. W912DY19F0217

Prepared for:

U.S. Army Corps of Engineers, Charleston District
U.S. Army Engineering and Support Center, Huntsville

Prepared by:

HydroGeoLogic, Inc.
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August 2019

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1.4.2 Manifesting and Transporting Wastes C-1

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1.0 WASTE MANAGEMENT PLAN

1.1 WASTE DISPOSAL

All waste generated will be properly characterized and disposed of in accordance with (IAW) all applicable regulations and through approved channels. It is expected that the only waste generated will be investigation-derived waste (IDW) generated as a result of this project.

1.2 MATERIAL DOCUMENTED AS SAFE

Material documented as safe will be handled in accordance with standard operating procedure 504.01.1, Materials Potentially Presenting an Explosives Hazard Inspection and Management (Appendix G).

1.3 VEHICLE FLUIDS SPILLS

If a fluid loss occurs from a vehicle used on site (gasoline, diesel fuel, hydraulic fluids), an appropriately sized spill kit will be kept on site to contain the loss. Spill kits will include absorbent materials either loose or in booms to contain or soak up loose fluids. Spills will be contained immediately using these kits in a best effort to reduce spread. Once the spill is under control, the contents of the spill kit will be placed into an appropriate waste container (e.g., 55-gallon drum, 5-gallon bucket). Field personnel will use a shovel to remove affected soil down to where no visual contamination exists. Soil will also be placed within the container with the materials from the spill kit. The contents of the container and the type of fluid will be recorded into the container tracking log and kept in the site files for later profiling and disposition.

1.4 HAZARDOUS WASTES

The HydroGeoLogic, Inc. team does not anticipate generating contaminated or hazardous wastes during the execution of the project; however, if hazardous wastes are generated, they will be disposed of IAW with the procedures described in the following sections.

1.4.1 Packaging, Labeling, Storage, and Disposal

All hazardous materials will be stored in authorized containers and labeled IAW applicable regulations. Any waste generated by the HGL team will be collected, stored, and labeled IAW applicable regulations.

1.4.2 Manifesting and Transporting Wastes

Where hazardous materials are generated, they will be manifested and transported IAW applicable U.S. Department of Transportation (DOT) regulations. Manifesting of wastes will be coordinated with the U.S. Army Corps of Engineers – Jacksonville District. Transportation of all wastes and materials will be conducted IAW applicable DOT regulations, including use of labels, use of placards, and documentation of transportation.

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APPENDIX D

EXPLOSIVES MANAGEMENT PLAN

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APPENDIX D
EXPLOSIVES MANAGEMENT PLAN

REMOVAL ACTION
FORT JACKSON NATIONAL CEMETERY
RICHLAND COUNTY, SOUTH CAROLINA

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1.0 EXPLOSIVES MANAGEMENT PLAN

1.1 GENERAL

This Explosives Management Plan outlines the procedures that will be used to perform munitions and explosives of concern (MEC) identification and disposal operations at Fort Jackson National Cemetery (FJNC). HydroGeoLogic, Inc. (HGL) will acquire all required federal and state permits. Licenses or permits will be posted and available for inspection at the project site location where explosive materials are used. The procedures are in accordance with (IAW) the following:

- Federal Acquisition Regulation (FAR) 45.5
- Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) Publication (ATFP) 5400.7
- Defense Explosives Safety Regulation 6055.09
- Department of Transportation (DOT) regulations
- HGL Standard Operating Procedure (SOP) 501.01.1 Explosive Materials Accountability and Management
- Explosives Safety Submission

1.2 LICENSES/PERMITS

1.2.1 ATF

HGL holds an ATF Type 20, manufacturer of explosives, license to purchase and use explosives on project sites. The original license is posted at the HGL munitions response team headquarters in Huntsville, Alabama. A copy of this license will be posted at each project site where explosive materials are stored and used, and will be available for federal, state, or local inspections. Accountability and use of the explosives will remain with HGL unless custody is transferred to the U.S. Government or other agency with a current ATF explosives license.

1.2.2 State of South Carolina

HGL will comply with South Carolina state explosive licensing requirements.

1.3 ACQUISITION

1.3.1 Order Quantity

HGL will order the appropriate amount of demolition explosive materials from an authorized explosives dealer for MEC disposal operations.

1.3.2 Acquisition Source and Method of Delivery

1.3.2.1 HGL will order explosives from an ATF-licensed explosives dealer. The explosives dealer will be responsible for all permits and documentation required by federal, state, and local regulations for shipment and transportation of explosives.

1.3.2.2 Transportation of demolition explosives will be conducted IAW DOT regulations. HGL will maintain accountability/records for demolition explosives. The Senior Unexploded Ordnance (UXO) Supervisor (SUXOS) or other designee will be authorized to request and receive explosives from the commercial explosives dealer.

1.3.3 Listing of Proposed Explosives

Hazard Classification/Division 1.4 explosives will be used whenever possible because they are safer to handle, easier and less expensive to ship and store, and more readily available. The demolition explosive materials anticipated for use on this project are shown in Table D-1.1. Depending on site conditions or availability, alternate donor explosives may be used.

Table D-1.1
List of Proposed Explosives

Nomenclature	Description	Estimated Quantity	Hazard Classification
Blasting Cap, Nonel	Zero Delay	25 each	1.4B
Nonel, Lead-In Roll	Shocktube	15,000 feet	1.4B
Cord, Detonating	50- or 100-Grain	800 feet	1.4D
Perforator, Jet, 19-Gram	Shape Charge	50 each	1.4D
Binary Explosives, Liquid	Helix	As Required	Flammable 3 Oxidizer 5.1

1.4 INITIAL RECEIPT

Only those HGL employees listed on the explosives authorization list may sign for receipt of explosives from an explosives dealer. Upon the day of receipt of explosive materials at a project site, the SUXOS will check the lot number or manufacturer's marks, compare the nomenclature/description of each type of explosive item against the explosives dealer delivery manifest, and record this information on HGL Manufacturer of Explosives Record of Acquisition and Magazine Data Card - Daily Summary of Magazine Transactions forms.

1.4.1 Receipt of Explosives

The original acquisition receipt documents and explosive usage inventory will be maintained on file by the SUXOS. The Magazine Data Card - Daily Summary of Magazine Transactions form will be kept current and updated upon each delivery, issue, return, and inventory of explosive materials. At the completion of the project, all original explosive materials records will be sent to HGL's Huntsville office, where they will be maintained for a period of 5 years. Copies of these records will be included in the Site-Specific Final Report.

1.4.2 Reconciling Discrepancies

The SUXOS will first inventory explosives received by verifying the lot number/manufacturer's marks, nomenclature/description, and quantity of the items. The SUXOS will reconcile the delivery shipping documentation with the requested amounts ordered and received. Any shortages or overages will be reported to the Project Manager

(PM), who will contact the explosive materials distributor and reconcile any differences. HGL will then notify the explosives dealer and, when required, the ATF to reconcile any discrepancies.

1.5 STORAGE OF DEMOLITION EXPLOSIVES

1.5.1 Explosives storage facilities will be established IAW HGL SOP 501.01.1 Explosive Materials Accountability and Management, and HGL SOP 503.01.1 Explosives Storage Inspection and Security. Strict physical security and safeguarding of explosive materials will be strictly maintained at all times when explosive materials are stored, being delivered, or used. HGL will store the demolition explosive material on site in two Type 2 ATF-approved explosive storage magazines. The proposed magazine physical location is noted in Figure 4 in Appendix B. HGL will comply with ATF, and other federal, and local storage and compatibility criteria and procedures when siting explosives storage magazines, including the following:

- Use portable, approved ATF Type 2 explosive storage magazines.
- Maintain the magazine(s) in compliance with the explosive safety quantity distance requirements established by ATFP 5400.7 and Defense Explosives Safety Regulation 6055.9-.
- Install sufficient magazines or a type of magazine with an attached, separate detonator magazine to comply with explosive compatibility requirements, (for example, bulk explosives, initiating explosives).

1.5.2 Magazines will be placed within a chain link fence IAW DoD Manual 5100.76-M and Engineer Manual (EM) 385-1-97. Explosive storage magazine facilities will be inspected every 7 days by the SUXOS, UXO Quality Control Specialist (UXOQCS), or UXO Safety Officer (UXOSO) (or their qualified designee) to ensure the integrity of the enclosure. The SUXOS and UXOQCS will enforce access control and security of all explosives materials used on site.

1.6 TRANSPORTATION

Transportation of explosive materials will comply with all DOT (49 CFR, Parts 171-173), DoD, state, and local regulations. Even though permits are not required for transporting via public transportation routes the small quantities of explosives that will be used on site, the most expeditious route will be used when transporting explosive demolition materials. Blasting caps and high explosives (HEs) will be transported to the site in day boxes or in appropriate containers meeting federal explosives storage requirements and secured in the bed of a pickup truck. The transporter of the demolition explosives will transport explosives to the site by the least populated and safest route.

1.6.1 Vehicle Safety Requirements

1.6.1.1 Transport Checklist

The load will be braced and covered (placed in day boxes or in an appropriate container). Minimum requirements for vehicles transporting explosives or UXO/MEC are listed below:

- The vehicles will be inspected using the HGL Motor Vehicle Inspection-Hazardous Materials form.
- If required, the vehicle will be properly placarded per DOT requirements.
- The vehicles will be equipped with a first aid kit, 10-BC fire extinguisher(s), and a means of communication with the UXOSO.
- The engine will be off when loading or unloading explosives.
- The wheels will be chocked during loading and unloading to prevent movement.
- At no time will any bare explosives come into contact with spark-producing metal. Vehicle cargo beds will have wooden or plastic liners, dunnage, or sandbags to protect the explosives from contacting the metal bed and fittings.
- Explosives may be transported in vehicles with plastic bed liners if the explosives are in an authorized or original shipping container.

1.6.1.2 General Precautions

When transportation of explosives requires travel on public highways, the SUXOS and UXOSO will coordinate jointly to provide the UXO team with a safe transportation route plan. Every effort will be made to take a route with the least public exposure. For transportation of demolition material, HGL will comply with the following:

- Explosives will be placed in an ATF Type 3 magazine (day box) meeting the design specification of ATFP 5400.7, 27 CFR § 555.203(c) or transported in approved shipping containers.
- Initiating explosives, such as blasting caps, will remain separated from other explosives at all times. Blasting caps may be transported in the same vehicle as donor explosives as long as they are in a separate container conforming to Institute of Makers of Explosives standards and secured away from other explosive items.
- Separate containers will be used to transport blasting caps and donor explosives. The two containers will be placed in the bed of a vehicle, blocked, and braced separately using ratchet tie-down straps, bolts, or other suitable means to keep the containers from shifting.
- Compatibility requirements will always be observed.
- Only UXO-qualified personnel who have been “cleared” by the ATF will have access and authority to issue explosive materials. The receiving party will sign the receipt documents for accountability.

- Vehicle operators transporting explosives on public roads will be UXO-qualified HGL employees, ATF cleared, who possess a valid state driver's license.
- When transporting 1,000 pounds or less of Compatibility Group 1.4B and 1.4S, 99 pounds or less of Compatibility Group 1.4D (detonating cord explosive content does not exceed 100 grains per linear foot), a commercial driver's license and vehicle placarding are not required. If the above are not applicable, the driver will have a commercial Class C driver's license with a hazardous material endorsement when transporting hazardous material on public roads.
- If the above are not applicable, the driver will have a commercial Class C driver's license with a hazardous material (HAZMAT) endorsement when transporting HAZMAT on public roads. Additionally, the vehicle will be inspected using DoD Form 626.
- Vehicle operators will comply with posted speed limits but will not exceed a safe and reasonable speed for road/field conditions. Vehicles transporting explosives off road will not exceed 25 miles per hour.
- Personnel will not ride in the cargo compartment of a vehicle transporting explosives.

1.7 RECEIPT PROCEDURES

The SUXOS will strictly control access to all explosives. All issues, turn-ins, and inventories of explosives will be properly documented and verified, through physical count, by the SUXOS (or their designee).

1.7.1 Records Management and Accountability

Upon receipt, the type, quantity, and lot number of each explosive item will be checked against the manifest. ATF requires HGL to maintain explosives records for commercial purchases for a period of 5 years. Original copies of all explosive material purchases, receipts, issuances, inventories, and usage transaction records will be maintained on site by the SUXOS IAW 27 CFR § 555.13 and will be available for inspection by authorized agencies. Explosive items will be tracked by their respective manufacturer's marks of identification or lot numbers until the items are expended, transferred to Government control, or returned to the original ATF-licensed explosives dealer. Upon completion of project field operations, all original explosives records will be sent to HGL's Huntsville office for archiving throughout the life of HGL's explosives license. The SUXOS will maintain copies of all records on site by the SUXOS and make them available for inspection by authorized agencies.

1.7.2 Authorized Individuals

1.7.2.1 HGL is required to provide commercial suppliers with documentation of individuals authorized to request and receive explosives. The individual authorized to receive and issue explosives is the SUXOS, and if the SUXOS is not available, an identified and authorized UXO technician or manager. Only those HGL employees who are listed as cleared on the current HGL notice of clearance from the Federal Explosives Licensing Center and listed on

the authorized agent list will be permitted to purchase and receive explosive materials for a specific project site.

1.7.2.2 Only HGL UXO-qualified employees who have undergone a successful ATF background check IAW 18 U.S. Code § 843(h) and 27 CFR §§ 555.33 and 555.45(c) will have direct physical access to purchase, store, and transport explosive materials on HGL project sites. Every HGL employee who is required to handle, transport, or store explosives must clearly understand their responsibilities for properly safeguarding and securing explosive materials.

1.7.3 Certification

The SUXOS and UXO Technician III team leader performing demolition will sign and date the explosives usage record certifying that the explosives were used for their intended purpose.

1.7.4 Procedures for Reconciling Receipt Documents

The SUXOS will reconcile the delivery shipping documentation with the requested amounts ordered and received. Any shortages or overages will be reported to the explosives supplier to reconcile any differences.

1.8 INVENTORY

When explosives are received on site and once every 30 days thereafter the SUXOS and UXOQCS (or their qualified designee) will perform a true and accurate physical inventory of all explosive materials stored on site. All inventories will be properly documented on a Magazine Data Card - Daily Summary of Magazine Transactions form. The SUXOS will strictly control access to all explosives and will review all requests for explosives for the site.

1.9 MAGAZINE INSPECTION

The SUXOS and the UXOQCS (or their qualified designee) will be responsible for the explosive storage magazine inspections and security. Explosive storage magazine facilities will be inspected every seven days to ensure the integrity of the enclosure.

1.9.1 Project Startup Inspection

Prior to establishing explosive magazine storage and receiving explosive materials, the SUXOS and UXOQCS will conduct a joint explosives security survey inspection using the Explosive Storage and Security Survey Checklist located in HGL SOP 503.01.1 Explosives Storage Inspection and Security.

1.9.2 Seven-Day Inspections

Physical inspections will commence upon initial acquisition of explosive materials. The Explosive Storage Magazine Inspection Checklist will be used for conducting and documenting explosive storage inspections. Upon completion of this inspection, the checklist will be signed

by the individual conducting the inspection. This inspection checklist will be maintained with the site's project files. This inspection includes, but is not limited to, the following:

- Explosive storage magazine(s) grounding systems
- Placards and signage
- Fire hazards
- Posting of fire/chemical hazards and safety information
- Explosive compatibility
- Net explosives weight limits
- Housekeeping
- Explosive storage magazine integrity
- Evidence of forced entry, sabotage, tampering or vandalism
- Vegetation
- Magazine lock and key accountability
- Display of emergency point of contact information

1.9.3 Grounding Inspection

A qualified electrician will be contracted to perform grounding installation meeting the lightning protection system criteria of EM 385-1-97. The lightning protective system must be re-inspected by the electrician every 2 years.

1.10 REPORTING LOSS OR THEFT OF EXPLOSIVE MATERIALS

1.10.1 If it is confirmed that MEC or explosive materials are missing, the SUXOS will immediately notify the U.S. Army Corps of Engineers (USACE) and HGL PMs, and each agency identified below in the following order:

1. Local law enforcement authorities
2. Local ATF office
3. HGL Huntsville Office
4. USACE Contracting Officer. Notification must be immediately by telephone and in writing within 24 hours of the discovery
5. ATF U.S. Bomb Data Center (BDC). Notification must be within 24 hours of discovery. Report loss or theft of explosives telephonically using ATF E-Form 5400.5, Report of Theft or Loss-Explosive Materials and the following emergency contact information:

Emergency Contact Information		
Agency	**Telephone Number**	**Hours**
USACE Contracting Officer's Representative, Amy Doss	(256) 895-1979	Work hours
HGL PM, Derek Anderson	(706) 372-5138	Work and after hours
Local Law Enforcement	911	
ATF BDC	(800) 461-8841	Mon-Fri, 8:00 a.m. – 5:00 p.m. EST
	(888) 283-2662	After hours
	(866) 927-4570 (fax)	
HGL Huntsville Office	(256) 970-2103	Mon-Fri, 7:30 a.m. – 4:30 p.m. CST
	(256) 714-5808	After hours

1.10.2 Once all required notifications have been made, the completed Report of Theft or Loss–Explosive Material form (ATF E-Form 5400.5) will be faxed to the BDC ([866] 927-4570).

WARNING:

FAILURE TO REPORT THE THEFT OR LOSS OF ANY EXPLOSIVE MATERIALS MISSING FROM STOCK **WITHIN 24 HOURS** OF DISCOVERY TO THE APPROPRIATE FEDERAL AND LOCAL AUTHORITIES IS A FELONY OFFENSE.

1.11 PROCEDURES FOR RETURN TO STORAGE OF EXPLOSIVES NOT EXPENDED

The SUXOS and demolition supervisor (or their qualified designee) will return unexpended explosives to storage at the end of explosive operations and record the transaction as a return on the appropriate magazine data cards. Each explosive item will be counted. All containers will be opened and their contents counted. Any discrepancies will be noted. The original receipt document will be adjusted to reflect the returned material and will be signed by the individual returning the explosives and a second authorized HGL UXO technician.

1.12 PROCEDURES FOR DISPOSAL OF REMAINING EXPLOSIVES

ATF requires accurate accounting of all explosive materials purchased and used; therefore, when work is completed or temporarily suspended at a project site, all unused explosives will be either

- Disposed of by detonation; or
- Returned to the ATF-licensed dealer from which the explosives were originally purchased.

1.13 FORMS

HGL will use internal forms for receipt, issue, and inventory of explosives, and inspection of vehicles.

APPENDIX E

EXPLOSIVES SAFETY SUBMISSION

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Time Critical Removal Action and On-Site Construction Support Explosives Safety Submission

MILITARY MUNITIONS RESPONSE ACTION

Fort Jackson National Cemetery
Columbia, SC

Phase 2
Construction Area

25 July 2019

Prepared by
US ARMY CORPS OF ENGINEERS
Engineering and Support Center, Huntsville

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1. **Site:**
   a. Name: Fort Jackson National Cemetery (FJNC) Phase 2 Construction Area (See Figure 1-1).
   b. State: South Carolina

2. **Anticipated Dates:**
   a. Start: September 2019
   b. Completion Date: December 2020

3. **Purpose:**
   a. The primary objective of the Time Critical Removal Action (TCRA) and Onsite Construction Support at the FJNC Phase 2 Construction Site is to mitigate and minimize the threat posed by the proximity of munitions items to cemetery construction workers, visitors, and cemetery employees
   b. Clarifies that Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 18 qualified Unexploded Ordnance (UXO) personnel will perform all Munitions and Explosives of Concern (MEC) related activities at the site.

4. **Site Background and Current Conditions**

   a. FJNC was established following a Memorandum of Agreement between the United States Army Fort Jackson and the Department of Veterans Affairs in April 2008 followed by the transfer of land by the U.S. Department of Defense to the Department of Veterans Affairs in April 2010. The transferred land belongs to the Department of Veterans Affairs. FJNC is on the North border of Fort Jackson and the land was previously used for field training exercises.

   b. During Phase I construction of the FJNC in 2009 (which is immediately West of the Phase 2 location), three landmines were unearthed. As a result, a Removal Action (RA) was conducted between December 2009 and February 2010. A total of 157 munitions and explosives of concern (MEC) were encountered in the 120 acres that were surveyed, including 44

landmines (42 M1 practice mines and 2 M7A1 practice mines), 24 M1 landmine fuzes, 38 illuminating personal flares, 48 grenades (31 rifle grenades, 15 smoke grenades, and 2 M26 hand grenades), 2 60 mm illuminating candles, and one 75mm AP-T projectile. An additional removal action was performed in September 2010 to provide construction support in additional areas totaling approximately 4 acres. During the RA, one M7B1 Box Mine was discovered at a depth of 4 inches.

5. Executing Agencies:

a. US Army Corps of Engineers (USACE), Charleston District

b. US Army Corps of Engineers (USACE), Huntsville Center

c. Contractor, HydroGeoLogic Inc. (HGL)

6. Scope of Removal Action:

a. When necessary, vegetation will be cut using hand-held or mechanical cutting equipment, and will be cut within 6 inches of the ground surface. No vegetation will be burned.

b. Mechanized MEC Activities will not be performed during this Removal Action or On-site Construction Support activities.

7. Safety Criteria:

a. The M26A2 Hand Grenade, M17 rifle grenade, and M31 rifle grenade are chosen as the Munitions with the Greatest Fragmentation Distances (MGFDs) based on them having the largest fragmentation distances of the MEC items encountered in the Phase 1 Clearance Area which is located directly west of the Phase 2 project. It is considered unlikely that larger items are below the ground surface. During the course of this Removal Action and On-site Construction Support, if a MEC item with a greater fragmentation distance than the MGFD is encountered, the Minimum Separation Distance (MSD) will be adjusted in accordance with DDESB Technical Paper 16 (Revision 5), operations will continue, and an amendment to this TCRA ESS submitted expeditiously for approval.

b. Any occupied buildings and/or public roadways in the MSD areas during

MEC operations will be evacuated and roadways blocked to prevent non-essential personnel from entering during MEC operations. Alternatively, spotters may be used to stop work when non-essential personnel enter the MSD arc on a roadway during MEC operations.

Table 7-1							
Minimum Separation Distances (MSD)							
		MSD (ft)[1]					
		For Unintentional Detonations			For Intentional Detonations [2]		
Area	MEC	Team Separation Distance (K40)	Hazardous Fragment Distance (HFD)	To Sides and [3] Rear using MOFB	Without Engineering Controls	Using Sandbag Mitigation	Using Double Sandbag Mitigation
FJNC Phase 2 Construction Area	M26A2 Hand Grenade	30	***288***	30	312	25	12.5
FJNC Phase 2 Construction Area	M17 Rifle Grenade	*11*	47	***30***	***805***	25	12.5
FJNC Phase 2 Construction Area	M31 Rifle Grenade	***36***	92	*30*	*500*	**125**	12.5
Notes:							
All Values in Bold Italics are the MSDs for unintentional detonations that must be used on-site.							
[1]See Appendix B for calculation sheet documenting MSD.							
[2] The maximum NEW that may be collected at a collection point is 373 lbs. based on the HFD of 288 ft.							
[3] MOFB - Miniature Open Front Barricade (in accordance with HNC-ED-CS-S-98-1 Revision 1).							

c. The MSD restrictions from MEC areas to non-essential personnel will be applied during all MEC operations. The MSD identified by the US Army Engineering and Support Center, Huntsville (USAESCH) for the Phase 2 Construction Area is presented in Table 7-1. Preliminary site work such as surveying, laying grid lanes and anomaly detection do not require the establishment of a MSD for Quantity Distance (Q-D) purposes. Essential personnel are defined as those on-site contractor and DoD personnel required to participate in the MEC removal, along with those approved

and authorized visitors. All other personnel are non-essential personnel. The outer boundaries of the MSD arcs are depicted on the Q-D map on Figure 7-1).

d. The Miniature Open Front Barricade (MOFB) may be used as necessary during intrusive operations in accordance with HNC-ED-CS-S-98-9, (report will be available on site) in areas where the terrain allows.

e. The team separation distance at this site will be the K40 overpressure distance shown in Table 7-1. Positive control of the exclusion zone (EZ) based on the MSD will be maintained at all times that MEC operations are being conducted. Prior to beginning MEC operations, the contractor will ensure that there are no non-essential personnel within the EZ and the contractor will ensure that the EZ remains clear of non-essential personnel throughout the MEC operations. Non-Mechanized MEC Removal and identification of anomalies will be performed using the criteria and procedures outlined below. Only TP 18 qualified personnel will perform excavation and investigation of anomalies. To gain access to a subsurface anomaly, excavation will be initiated to the side of the anomaly, and will not be conducted directly over the anomaly until such time as the depth of the anomaly can be ascertained. Earth Moving Machinery (EMM) excavation of the soil overburden may be performed for anomalies deeper than 2 feet below ground surface for the purpose of removing overburden. However, the EMM will not be used within 12 inches directly over the anomaly. Additional excavation will be conducted in approximately 1 foot lifts using anomaly avoidance to a depth of 6 ft.

f. A detailed accounting of all MEC located at each site will be made and maintained by the Senior UXO Supervisor (SUXOS). A log entry will be made for each MEC or DMM item indicating the item's identity, its explosive hazards, location (x, y, and z measurements) and final disposition.

8. Methods of Disposal:

a. If disposal activities are required, they will be performed by personnel

qualified in accordance with TP 18 within the MRS. The MSDs for intentional detonations are shown in Table 7-1 and Q-D Arcs are shown on Figure 7-1.

b. Total control of explosives will be maintained while the explosives are on site. Items requiring explosive demolition will be guarded until explosives are delivered and the demolition accomplished.

c. All vehicles transporting explosives will be properly inspected, equipped, and placarded prior to the loading of explosives onto the vehicle, and DD Form 626 “Motor Vehicle Inspection” completed.

d. Sandbags (HNC-ED-CS-S-98-7 Amendment 2 with DDESB Approval 20 November 2014, HNC Safety Advisory dated 7 November 2011, and the DDESB Memorandum “Revision of DDESB Approval for Use of Sandbags for Mitigation of Fragmentation and Blast Effects Resulting from the Intentional Detonation of Munitions”, May 22 2014) or Water Mitigation (HNC-ED-CS-S-00-3) may be used to reduce the intentional detonation MSD. Double Sandbag Mitigation is authorized for robust and non-robust items with fragmentation characteristics and a net explosive weight not exceeding that of a 75 mm M48 projectile, and a minimum withdrawal distance of 12.5 feet applies. Tamping (single or multiple items) may be used in accordance with DDESB Technical Paper 16 and the Buried Explosion Module (BEM) version 6.3.3. or later (Note: the most recent DDESB approved version of the BEM is available in DDESB TP 16 on the DDESB's secure website at http://www.ddesb.pentagon.mil/.). These reports will be on site for all mitigation methods used.

e. All Material Potentially Presenting an Explosive Hazard (MPPEH) procedures will be in accordance with DoDI 4140.62. MPPEH will be assessed and its explosives safety status determined and documented prior to transfer within the DoD or release from DoD control. Prior to release to the public, MPPEH will be documented by authorized and technically qualified personnel as Material Documented as Safe (MDAS) after a 100% inspection and an independent 100% re-inspection to determine that it is safe from an explosives safety perspective. All

munitions debris recovered during removal activities will be removed from the site.

f. The MGFD for the Phase 2 Construction Area is shown in Table 7-1. Items with smaller fragmentation distances may be found. Demolition of these items may be done using the item-specific minimum separation distances and engineering controls in accordance with DDESB TP 16 Fragmentation Database. For items not in the DDESB TP 16 Fragmentation Database, the maximum fragment distance may be calculated in accordance with the generic equations in DDESB TP 16. (Note: the most recent DDESB approved version of the Generic Equation Calculator (GEQ) is available in DDESB TP 16 on the DDESB's secure website at http://www.ddesb.pentagon.mil/.)

g. All explosive operations will follow the procedures outlined in the project Work Plan, Standard Operating Procedure, and the EM 385-1-97, Explosives Safety and Health Requirements Manual, demolition operations will be performed daily or items properly guarded until operations can be conducted.

h. Collection points are those areas used to temporarily accumulate MEC, determined to be acceptable to move by the Senior Unexploded Ordnance Supervisor (SUXOS) and Unexploded Ordnance Safety Officer (UXOSO), pending destruction at the end of the day using consolidated shots. MEC items at collection points must be laid out as shown in “Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (OE) Sites”. The maximum net explosive weight (NEW) at a collection point will be limited such that the K40 overpressure distance for the total NEW does not exceed the MSD for Collection Points (301 ft.) for the area (see Table 7-1, footnote 2).

i. Consolidating multiple MEC within the Phase 2 Construction Area is anticipated for this project. US Army Engineering and Support Center, Huntsville (USAESCH) publication “Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (OE) Sites”, dated March 2000 will be used and a copy of this report will be available

on site. The maximum net explosive weight (NEW) for a consolidated shot will be limited such that the K328 overpressure distance for the total NEW (including donor charges) does not exceed the MFD-H for the intentional detonation.

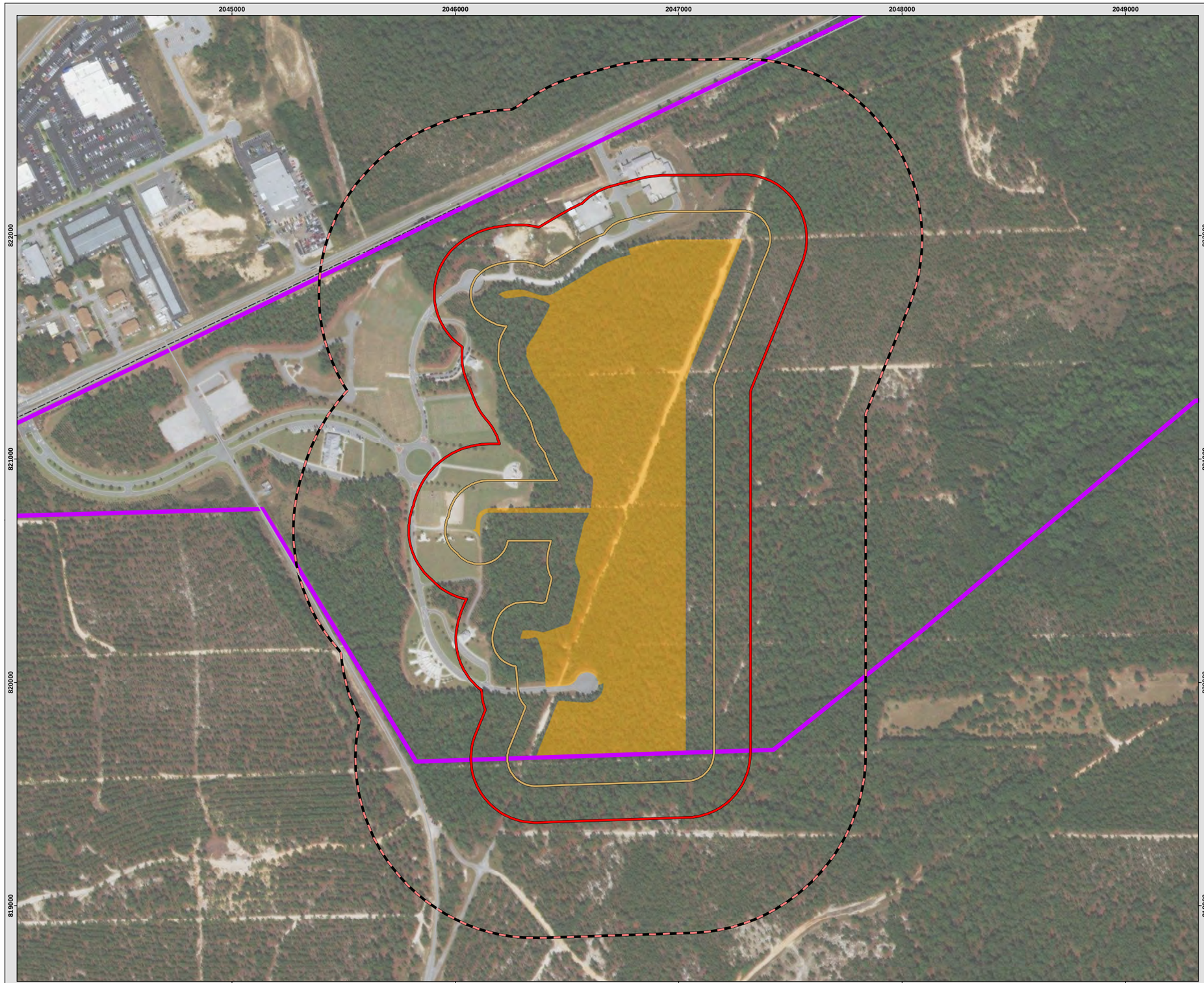
j. On-call explosives delivery will not be implemented. One un-barricaded ATF Type II magazine with attached cap box will be used for the storage of donor explosives. There are two optional locations for the magazine (See Figure 8-1). The total maximum net explosive weight (NEW) stored in the magazine will not exceed 31 pounds. These commercial explosives will have assigned DOD hazard division/storage compatibility groups (HD/SCG) and will be stored in accordance with the Defense Explosive Safety Regulation (DESR) 6055-09 Edition 1, DA Pam 385-64 and any local regulations. The magazine will be positioned in accordance with EP 1110-1-18, EM 385-1-97, Section 55.206 of ATFP 5400.7, “Alcohol, Tobacco, and Firearms (ATF) Explosives Law and Regulations”, and all other applicable federal and local regulations. The lightning protection system will be installed, inspected, and tested in accordance with DA PAM 385-64. Anomaly avoidance will be used for placement of the magazine and grounding rod in accordance with DA PAM 385-64, paragraph 4-5(2)(c). DESR 6055-09 Edition 1, Table V3.E3.T2. “Structure” column lists the inhabited building distance (IBD) for a NEW of 31 pounds as 200 feet for magazines that are not earth-covered. There are no buildings within the IBD of either of the optional magazine locations.

The traffic in the vicinity of each of the optional magazine locations is less than 400 car/rail passengers per day. Therefore, no Minimum Fragment Distance (MFD) is required for public traffic route (PTR) distance (DA PAM 385-64 Section 5-5, and DESR 6055-09 Edition 1 Section V3.E3.1.2.1.1.5.3). The PTRD is 120 ft. based on the total NEW of 31 pounds that will be stored in the magazine.

There will be a fence that will restrict access, and the gate will be locked at all times when not under supervision.

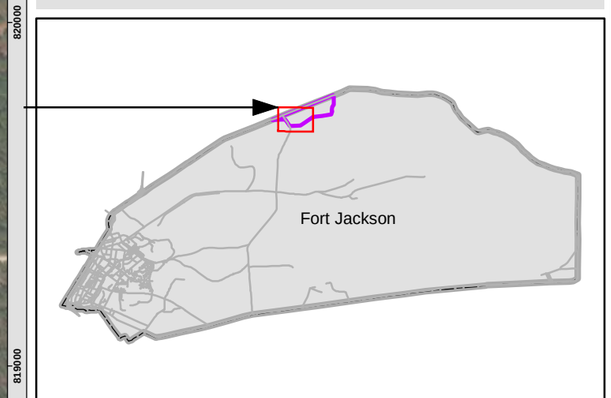
APPENDIX A
MAPS

Figure 7-1
Q-D Arcs
Fort Jackson National Cemetery
Columbia, SC



Legend

- National Cemetery
- Phase II Cemetery Construction Boundary (30.8 Acres)
- Sandbag Mitigation - 125 ft
- HFD - 288 ft
- MFD-H 805 ft



0 500 1,000 1,500
Feet

GDW	Date/Time: 8/23/2019 4:41:19 PM
Imagery/Background: ESRI© and its suppliers	

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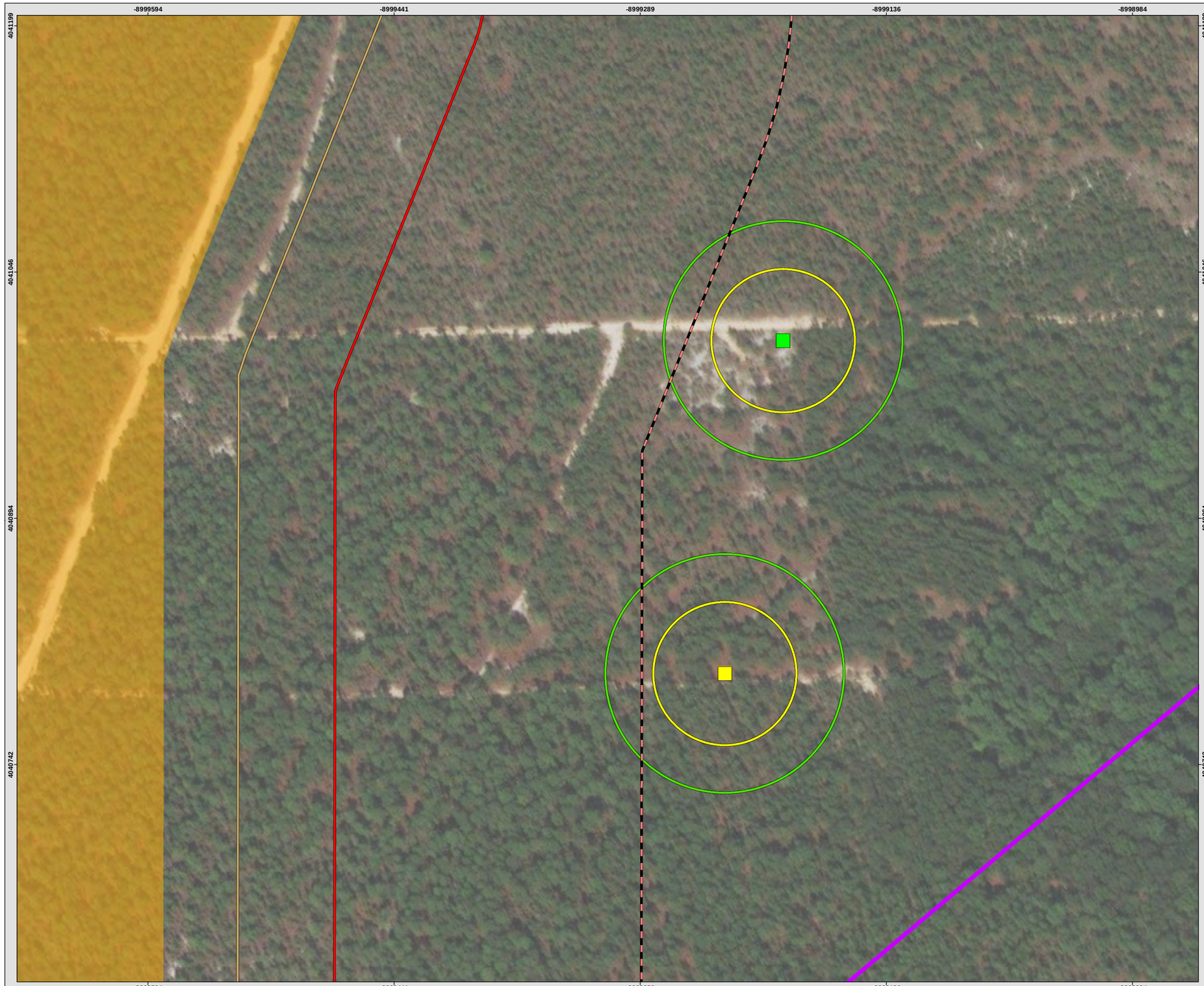
Grid Coordinate System: NAD3 HARN StatePlane South Carolina Feet_Intl

U.S. Army Engineering & Support Center Huntsville

DISCLAIMER - The data represent the results of data collection/processing for a specific U.S. Army Corps of Engineers activity and indicates the general existing conditions. As such, it is only valid for its intended use, content, time and accuracy specifications. The user is responsible for the results of any application of the data for other than its intended purpose.

Figure 8-1
Magazine Location Map
Fort Jackson National Cemetery
Columbia, SC

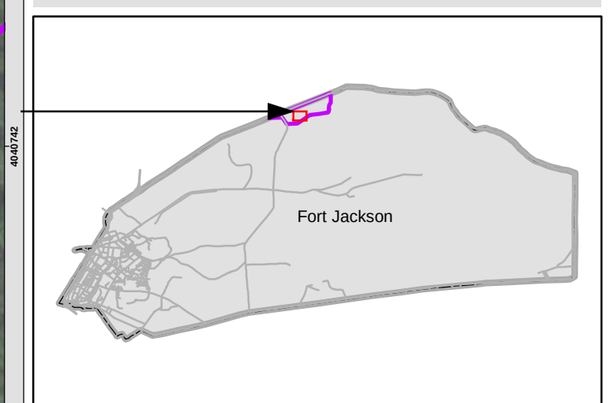


Legend

- National Cemetery
- Phase II Cemetery Construction Boundary (30.8 Acres)
- Sandbag Mitigation - 125 ft
- HFD - 288 ft
- MFD-H 805 ft

Explosive Storage Options

- Magazine Option 1
- Magazine Option 2
- PTRD (120 ft)
- IBD (200 ft)



U.S. Army Engineering & Support Center Huntsville

DISCLAIMER - The data represent the results of data collection/processing for a specific U.S. Army Corps of Engineers activity and indicates the general existing conditions. As such, it is only valid for its intended use, content, time and accuracy specifications. The user is responsible for the results of any application of the data for other than its intended purpose.

0 100 200 300 400 500 600
Feet

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Grid Coordinate System: NAD3 HARN StatePlane South Carolina Feet_Intl

APPENDIX B
CALCULATION SHEETS

Fragmentation Data Review Form

Database Revision Date 5/3/2018

Category:	Grenades & Mines
Munition:	M26A2 Grenade
Case Material:	Steel, Mild
Fragmentation Method:	Pre-formed Fragmenting
Secondary Database Category:	Hand Grenade
Munition Case Classification:	Non-Robust

DODIC:	
Date Record Created:	9/30/2009
Record Created By:	SDH
Last Date Record Updated:	5/3/2018
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	Composition B
Explosive Weight (lb):	0.3625
Diameter (in):	2.3750
Cylindrical Case Weight (lb):	0.30954
Maximum Fragment Weight (Intentional) (lb):	0.0003
Design Fragment Weight (95%) (Unintentional) (lb):	0.0003
Critical Fragment Velocity (fps):	7978

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	288
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	312
MFD-V [Maximum Fragment Distance, Vertical] (ft):	256

Overpressure Distances

TNT Equivalent (Pressure):	1.16
TNT Equivalent Weight - Pressure (lbs):	0.421
3.5 psi, K18 Distance (ft):	13
2.3 psi; K24 Distance (ft):	18
1.2 psi, K40 Distance (ft):	30
0.0655 psi, K328 Distance (ft):	246

"NOTE: Values shown within this section only address overpressure hazards and do not account for applicable distance values for fragments and debris as required per DoD 6055.09-M."

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1.14
TNT Equivalent Weight - Impulse (lbs):	0.413
Kinetic Energy 10^6 (lb-ft²/s²):	0.0097

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	12
Expected Max. Throw Distance (ft):	25
Minimum Separation Distance (ft):	25

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	24
Expected Max. Throw Distance (ft):	10
Minimum Separation Distance (ft):	12.5

Water Mitigation

Minimum Separation Distance (ft):	200/200
Water Containment System:	5 gal carboys/ inflatable pool

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation (in)

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	1.42	1.42
Mild Steel:	0.26	0.26
Hard Steel:	0.22	0.22
Aluminum:	0.61	0.61
LEXAN:	2.36	2.36
Plexi-glass:	1.26	1.26
Bullet Resist Glass:	0.90	0.90

Item Notes

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Fragmentation Data Review Form

Database Revision Date 5/3/2018

Category:	Grenades & Mines
Munition:	M17 Rifle Grenade
Case Material:	Cast Iron, Grey, CL35
Fragmentation Method:	Pre-formed Fragmenting
Secondary Database Category:	Rifle Grenade
Munition Case Classification:	Extremely Heavy Cased

DODIC:	
Date Record Created:	1/9/2013
Record Created By:	SDH
Last Date Record Updated:	5/3/2018
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	Black Powder
Explosive Weight (lb):	0.048125
Diameter (in):	2.0100
Cylindrical Case Weight (lb):	0.76600
Maximum Fragment Weight (Intentional) (lb):	0.0373
Design Fragment Weight (95%) (Unintentional) (lb):	0.0373
Critical Fragment Velocity (fps):	1429

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	47
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	805
MFD-V [Maximum Fragment Distance, Vertical] (ft):	567

Overpressure Distances

TNT Equivalent (Pressure):	0.43
TNT Equivalent Weight - Pressure (lbs):	0.021
3.5 psi, K18 Distance (ft):	5
2.3 psi; K24 Distance (ft):	7
1.2 psi, K40 Distance (ft):	11
0.0655 psi, K328 Distance (ft):	90

"NOTE: Values shown within this section only address overpressure hazards and do not account for applicable distance values for fragments and debris as required per DoD 6055.09-M."

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	0.43
TNT Equivalent Weight - Impulse (lbs):	0.021
Kinetic Energy 10^6 (lb-ft²/s²):	0.0380

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	12
Expected Max. Throw Distance (ft):	25
Minimum Separation Distance (ft):	25

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	24
Expected Max. Throw Distance (ft):	10
Minimum Separation Distance (ft):	12.5

Water Mitigation

Minimum Separation Distance (ft):	200/200
Water Containment System:	5 gal carboys/ inflatable pool

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation (in)

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	2.22	2.22
Mild Steel:	0.16	0.16
Hard Steel:	0.13	0.13
Aluminum:	0.32	0.32
LEXAN:	1.75	1.75
Plexi-glass:	1.02	1.02
Bullet Resist Glass:	0.81	0.81

Item Notes

The projectile for this item is similar to the Mk II grenade body with Black Powder fill instead of TNT. Limited information was available for the development of the model. Additionally, the Mk II grenade model with the fragmentation database is based h

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Fragmentation Data Review Form

Database Revision Date 5/3/2018

Category:	Grenades & Mines
Munition:	M31 Rifle Grenade
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Rifle Grenade
Munition Case Classification:	Non-Robust

DODIC:	G970
Date Record Created:	7/24/2007
Record Created By:	MMC
Last Date Record Updated:	5/3/2018
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	Composition B
Explosive Weight (lb):	0.62
Diameter (in):	2.6160
Cylindrical Case Weight (lb):	0.27137
Maximum Fragment Weight (Intentional) (lb):	0.0013
Design Fragment Weight (95%) (Unintentional) (lb):	0.0002
Critical Fragment Velocity (fps):	9250

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	92
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	500
MFD-V [Maximum Fragment Distance, Vertical] (ft):	409

Overpressure Distances

TNT Equivalent (Pressure):	1.16
TNT Equivalent Weight - Pressure (lbs):	0.719
3.5 psi, K18 Distance (ft):	16
2.3 psi; K24 Distance (ft):	22
1.2 psi, K40 Distance (ft):	36
0.0655 psi, K328 Distance (ft):	294

"NOTE: Values shown within this section only address overpressure hazards and do not account for applicable distance values for fragments and debris as required per DoD 6055.09-M."

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1.14
TNT Equivalent Weight - Impulse (lbs):	0.707
Kinetic Energy 10^6 (lb-ft²/s²):	0.0654

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	20
Expected Max. Throw Distance (ft):	125
Minimum Separation Distance (ft):	125

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	48
Expected Max. Throw Distance (ft):	10
Minimum Separation Distance (ft):	12.5

Water Mitigation

Minimum Separation Distance (ft):	264/200
Water Containment System:	5 gal carboys/ inflatable pool

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation (in)

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	3.69	1.65
Mild Steel:	0.60	0.28
Hard Steel:	0.50	0.23
Aluminum:	1.35	0.66
LEXAN:	3.81	2.39
Plexi-glass:	2.39	1.28
Bullet Resist Glass:	1.80	0.90

Item Notes

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APPENDIX F

FORMS

Form 15.02 Manufacturer of Explosives Record of Acquisition
Form 15.03 Daily Summary of Magazine Transactions (Magazine Data Card)
Form 15.04 Munitions and Explosives of Concern/Unexploded Ordnance Accountability Record
Form 15.05 Explosive Material Disposition Record-Bill of Lading
Form 15.06 Motor Vehicle Inspection-Hazardous Materials
Certification Chain of Custody (CoC) for Non-Hazardous Munitions and Range-related Debris
DD Form 1348-1A
Analog Instrument Test Strip Form
Form 15.10 Preparatory Phase Inspection Form
Form 15.11 Initial Phase Inspection Form
Form 15.13 Noncompliance and Corrective Action Report
Form 15.14 Daily Quality Control Report
Site Daily Production Report
Form 15.18 Safety Meeting/Training Attendance Log
Form 15.19 Tailgate Safety Meeting Log
Form 15.21 Health and Safety Site Visitor Log

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Manufacturer of Explosives Record of Acquisition

Site Name/Location:	HGL License Number: 1-AL-089-20-7F-00632
Project Site Activity: MMRP Project	Supervisor's Name/Position:

Date of Manufacture or other Acquisition	Lot Number or Manufacturer's Marks of Identification	Brand Name, Nomenclature or Description and Size-(when mixing binary materials)	Quantity Acquired	Name, Address and License or Permit Number of Distributor

HGL MR Form 15.02

Page _____ of _____.

Daily Summary of Magazine Transactions (Magazine Data Card)

Nomenclature/Brand Name of Manufacturer:	Lot Number/Manufacturer Mark:	Hazard Class/Division:
Site Location/Name:	GPS Coordinate:	HGL License Number: 1-AL-089-20-7F-00632

Date	Quantity In	Quantity Out	Current Balance	Action/Purpose (Receipt/Issue/Inventory)	Printed Name

HGL MR Form 15.03 (Revised January 2014)

Page _____ of _____.

Munitions and Explosives of Concern/Unexploded Ordnance Accountability Record

Site Location:			
Contract Number:		**Delivery/Task Order Number:**	

Grid Coordinates	Anomaly No.	Identification	Date Located	Date Disposed	Method of Disposal	Comments

Reviewed and Accepted (print name)	**Senior UXO Supervisor Signature**	**Date**

HGL MR Form 15.04 (Nov 2010)

Explosive Material Disposition Record – Bill of Lading

Date:	Site Name/Location:	Grid #/Area or GPS coordinate:	Distributee Explosive License #:
			1-AL-089-20-7F-00632

This form will be used as a Bill of Lading anytime explosives are transported in a HGL vehicle under DOT regulations and kept with the explosive driver in the vehicle until the explosives are issued, expended or returned to storage.

SECTION I. Explosive Material Issued for Demilitarization/Demolition Operations:

Lot Number/Manufacturer's Marks of Identification	Brand Name, Nomenclature or Description	Quantity	Hazard/ Class	Receipt Initials

Print Explosive Driver Name:	Explosive Driver Signature:
N/A	N/A

SECTION II. Explosive Material Expended by Detonation:

Lot Number/Manufacturer's Marks of Identification	Brand Name, Nomenclature or Description	Quantity	Hazard/ Class	Receipt Initials

SECTION III. Explosive Material Returned to Storage:

Lot Number/Manufacturer's Marks of Identification	Brand Name, Nomenclature or Description	Quantity	Hazard/ Class	Receipt Initials

Demolition Supervisor Signature:	SUXOS Signature:

Motor Vehicle Inspection–Hazardous Materials

Section 1 – Documentation and Instructions

1. This form applies to all vehicles which must be marked and placarded in accordance with DOT Title 49 CFR and will be retained in the cab of the vehicle with the driver operator.
2. This form will be completed in conjunction with the Vehicle Inspection Checklist and Bill of Lading forms.
3. Upon completion of explosive transportation operations this form will be retained in the project files and will be submitted to the HGL Huntsville office, attention UXO Operations Manager at the completion of field activities.

Company:	
Date of inspection:	
Time of inspection:	
Location of inspection:	
Operator's name:	
Operator's license number:	

Medical examination current: ☐ Yes ☐ No

Valid CDL with Hazardous Materials endorsement: ☐ Yes ☐ No

Route plan and map: ☐ Yes ☐ No

Hazardous Materials Compliance Handbook in vehicle: ☐ Yes ☐ No

Vehicle Inspection Checklist HGL MR Form 15.23 completed and retained in vehicle: ☐ Yes ☐ No

Bill of Lading HGL MR Form 15.05 completed and retained in vehicle: ☐ Yes ☐ No

Section 2 – Mechanical Inspection *(place "X" in the applicable box, if rejected, explain in block 3*:

	Satisfactory	Unsatisfactory		Satisfactory	Unsatisfactory
Horn operative	☐	☐	Tires, wheels and rims	☐	☐
Steering system	☐	☐	Wheel chocks set	☐	☐
Windshield/wipers	☐	☐	Tailgate and doors	☐	☐
Mirrors	☐	☐	Cargo space clear	☐	☐
Warning signals	☐	☐	Non-sparking bed liner	☐	☐
Spare fuses	☐	☐	Tarpaulin and straps	☐	☐
Electrical wiring	☐	☐	Two 10-lb fire extinguishers	☐	☐
Lights and reflectors	☐	☐	Properly placarded on all sides	☐	☐
Fuel system	☐	☐	Detonator box	☐	☐
Exhaust system	☐	☐	Type 3 day box (IME 122)	☐	☐
Brake system	☐	☐	Explosives properly segregated	☐	☐
Suspension	☐	☐	Other (explain in Block A.)	☐	☐

Inspection result *(If rejected provide reason in block 3)*: **ACCEPTED** ☐ **REJECTED** ☐

A. Remarks:

B. Inspector signature (origin):	**C.** Driver signature (origin):
D. Inspector signature (destination):	**E.** Driver signature (destination):

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Section I – Generator Release (continued on page 3)

Certification Chain of Custody (CoC) for Non-Hazardous Munitions and Range-related Debris	**1a.** Project location and contract number**:**

1b. Generator name and mailing address: HydroGeoLogic, Inc., 4835 University Square Suite 15 Huntsville, AL 35816	Telephone number: 256-970-2106
1c. Project site name and location:	Telephone number:

1d. Container Number(s):	**1e.** Unique Seal Identification Number(s):	**1f.** Gross weight (lbs):	**1g.** Net weight (lbs):	**1h.** Tare weight (lbs):

1i. Material description:	1j. Material type:	1k. Units (weight/volume):
Material Documented as Safe	Mixed Metals	

1l. Inert certification:

"This certifies and verifies that the material listed has been 100 percent inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials"

1m. Generator Inspector/Certifier—Unexploded Ordnance Quality Control Specialist:		
Print or type name:	Signature:	Month/Day/Year:

1n. Generator Inspector/Certifier—Site Senior Unexploded Ordnance Supervisor:		
Print or type name:	Signature:	Month/Day/Year:

1o. Generator Release—I am the Project Site Manager and acknowledge release of this material:		
Print or type name:	Signature:	Month/Day/Year:

Section II –Transporter

2a. Transporter company name and mailing address:	Telephone Number:	Dispatcher Name:

2b. Transporter Receipt—I acknowledge receipt of this material and have verified that each container is sealed and intact:		
Print or type name:	Signature:	Month/Day/Year:

2c. Transporter Release— I acknowledge release of this material:		
Print or type name:	Signature:	Month/Day/Year:

Section III – Qualified Receiver

3b. Qualified Receiver Storage Manager Receipt Acknowledgement:

I acknowledge receipt of the unopened labeled container(s) listed herein each with its unique identified and unbroken seal ensuring a continued chained of custody, and after reviewing and agreeing with all the provided supporting documentation, I sign for having received the provided documentation that the sealed containers contained no explosive hazards when received.

Print or type name:	Signature:	Month/Day/Year:

3c. Demilitarization/Destruction Processor Acknowledgement:

I acknowledge this material has undergone demilitarization/destruction in accordance with DoDI 4140.62 and EM 385-1-97 and that the contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content.

Print or type name:	Signature:	Month/Day/Year:

3e. Qualified Receiver Manager Demilitarization/Destruction Certification:

I acknowledge this material has undergone demilitarization/destruction in accordance with with DoDI 4140.62 and EM 385-1-97 and that the contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content.

Print or type name:	Signature	Month/Day/Year:

4a. Special Instructions:

1. The SUXOS will produce the required number of the original CoC certification copies for distribution in accordance with HGL MMRP SOP for MPPEH Processing.
2. The *Transporter* will be provided *1 original CoC certification copy* and complete Section II, blocks 2a. through 2.c.with signature.
3. The *Transporter* will turn over *this CoC certification copy* to the Qualified Recycler Manager upon delivery.
4. The *Qualified Recycler Manager* upon receipt of the material will verify and certify the CoC certification document information is complete and accurate by completing Section III. 3a.through 3e. with signatures.
5. The *Qualified Recycler Manager* after completing the demilitarization/destruction of the material listed on this CoC certification document will provide the Generator with a signed company letterhead stating:

   "Upon receiving the unopened labeled containers each with its unique identified and unbroken seal ensuring a continued chained of custody, and after reviewing and concurring with all the provided supporting documentation, sign for having received and agreeing with the provided documentation that the sealed containers contained no explosive hazards when received. The contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content".
6. The *Qualified Recycler Manager* will complete the attached DD FORM 1348˜ Issue Release/Transfer Document, blocks 22 and 23 and return this form along with this CoC certification document and Certificate of Destruction letter to the Generator address shown in block 1b.

4b. Discrepancies.

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3 4 5 6 7	23 24 25 26 27 28 29	45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80	1. TOTAL PRICE	2. SHIP FROM	3. SHIP TO
DOCUMENT	RI FROM / M&S	UNIT / ISS / QUANTITY / SER / SUPPLEMENTARY ADDRESS / SIG / FUND / DISTRIBUTION / PROJECT / PRI / REQD / DELDATE / ADV / RI / O/P / COND / MGT	UNIT PRICE DOLLARS / CTS / DOLLARS / CTS		4. MARK FOR

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS
			MDAS	

10. QTY. REC'D	11.UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

Mixed Metal - Steel, Brass and Copper,

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE

22. RECEIVED BY	23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

"This certifies and verifies that the material listed has been 100 percent inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials"

25. NATIONAL STOCK NO. & ADD (8-22)

DoD Contractor Title: Senior UXO Supervisor (SUXOS)
Print Name:
Signature:_____
Company: HydroGeoLogic, Inc.,
Address: 4835 University Square Suite 15 Huntsville, AL 35816
Phone:

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

DoD Contractor Title: UXO Quality Control Specialist (UXOQCS)
Print Name:
Signature:_____
Company: HydroGeoLogic, Inc.,
Address: 4835 University Square Suite 15 Huntsville, AL 35816
Phone:

27. ADDITIONAL DATA

Container and Serial Number:

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

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Analog Instrument Test Strip Form

Team_____ Team Leader________________________________ Dates _____________ through _____________

Instrument IDs (fill out completely for first week, then only add when new sensors are introduced, do not reuse IDs. IDs should be simple and labeled on the instrument (e.g. 3C, Team 3 instrument C)

ID	SN	ID	SN

Date	Operator Name	ID	Pass/Fail/Comments

Comments (*Instruments taken out of service and reason, personnel changes*):

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HGL HydroGeoLogic, Inc MUNITIONS RESPONSE TEAM

PREPARATORY PHASE INSPECTION FORM

Contract No.:	Project:	Date:

1. Definable Feature of Work (Project Specific)

☐ Mobilization	☐ MEC Surface Removal	☐ Anomaly Reacquisition
☐ Location Surveying & Mapping	☐ Geophysical Data Processing	☐ MEC Subsurface Removal
☐ Anomaly Reacquisition	☐ Intrusive Investigation	☐ Munitions Debris/Scrap Disposal
☐ Vegetation Removal	☐ Geophysical Data Collection	☐ MEC Disposal
☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☐	☐

2. References (Planning Document Section)

3. Personnel Present

Government Rep Notified:	☐ Yes	☐ No	☐ N/A	**Hours in Advance:**

Name	**Position**	**Organization**

4. Submittals:

Review submittals and/or submittal log. Have all submittals been approved?	☐ Yes		☐ No
If No, what items have not been submitted?			
Are all materials on hand?	☐ Yes	☐ No	☐ N/A
If No, what items are missing?			
Check approved submittals against delivered material. (This should be done as material arrives.) Comments:			

5. Material Storage:

Are materials stored properly?	☐ Yes	☐ No	☐ N/A
If No, what action is taken?			

6. Specifications:

Review each paragraph of specifications.
Discuss procedures for accomplishing the work:

7. Preliminary Work and Permits:

Is preliminary work correct and permits on file?	☐ Yes	☐ No	☐ N/A
If No, what action is taken?			

8. Testing:

Identify test to be performed, frequency, and by whom:			
When is it required?			
Where is it required?			
Review Testing Plan:			
Has the test facility been approved?	☐ Yes	☐ No	☐ N/A
If not, what action has been taken?			

9. Results of Surveillance			
☐ Acceptable	☐ Unacceptable	Deficiency #:	NCR #:
Conducted By:		Signature:	

HGL HydroGeoLogic, Inc MUNITIONS RESPONSE TEAM

INITIAL PHASE INSPECTION FORM

Contract No.:	Project:	Date:

1. Definable Feature of Work (Project Specific)

☐ Mobilization	☐ MEC Surface Removal	☐ Anomaly Reacquisition
☐ Location Surveying & Mapping	☐ Geophysical Data Processing	☐ MEC Subsurface Removal
☐ Anomaly Reacquisition	☐ Intrusive Investigation	☐ Munitions Debris/Scrap Disposal
☐ Vegetation Removal	☐ Geophysical Data Collection	☐ MEC Disposal
☐	☐	☐
☐	☐	☐

2. References (Planning Document Section)

3. Planned Attendants

Name	Position	Organization

4. Observed Condition/Activities:

A. Materials being used are in strict compliance with the contract plans and specifications:	☐ Yes	☐ No	☐ N/A
If not explain:			
B. Procedures and/or work methods witness are in strict compliance with the contract specifications:	☐ Yes	☐ No	☐ N/A
If not explain:			
C. Workmanship is acceptable:	☐ Yes	☐ No	☐ N/A
State areas where improvement is needed:			
D. Safety violation noted:	☐ Yes	☐ No	☐ N/A
If yes, corrective action taken:			

5. Results of Surveillance

☐ Acceptable	☐ Unacceptable	Deficiency #:	NCR #:
Conducted By:		Signature:	

Noncompliance and Corrective Action Report

Report No.:	Site Name and Location:	Gird No. (when required):
Prepared by:	Position:	Date:

Nonconformance

Representative Notified:	Date Notified:	Date Corrective Action Plan Due:

Description of the Nonconformance:

Potential Harm:

Cause:

Corrective Action Plan

Corrective Actions:

Actions to Prevent Recurrence:

Estimated Completion Date:	
Signature:	Date:
Corrective Action Approval Signature:	Date:
Agency Representative Signature :	Date :

Corrective Action Closure

Comments:

Approval Signature:	Date:

Daily Quality Control Report

Contract No:	Delivery/Task Order:

Site/Installation Name:	City:	State:	Date:

Site Management

Employer:	Position:	Name:	Activity:
HGL	Project Manager		Management
HGL	Senior UXO Supervisor		Management
HGL	Senior Geophysicist		Geo Supervisor
HGL	UXO Quality Control Specialist		Quality Control
HGL	UXO Safety Officer		Safety

Team ONE

HGL	TIII		UXO
HGL	TII		UXO
HGL	TII		UXO
HGL	TII		UXO
HGL	TII		UXO
HGL	TI		UXO
HGL	TI		UXO

Team TWO

Parsons	Geophysicist		DGM
Parsons	UXO Escort		Avoidance
Parsons	UXO Escort		Avoidance
Parsons	Geophysicist		DGM
Parsons	Geophysicist		DGM

Team THREE

Team FOUR

1. Work performed today:

2. Worked performed today by subcontractors:

3. Inspections performed (include name of team present, specifications, plans and submittals required for definable feature of work [DFOW]). Indicate 3-Phase inspection level with by inserting: Preparatory = P; Initial = I; Follow-up = F.

Phase	Team name:	DFOW (Insert project specific DFOWs)	Comments
	Site	Mobilization	Complete
F	CMS Biologist	Environmental Survey and Beach Monitoring	Ongoing
	Site	Site Preparation	Complete
F	Parsons Geo	Conduct Validation Seeding, QC Seeding, and Construct IVS	Ongoing
F	Parsons Geo	Assemble and Verify Correct Operation of Geophysical Sensor to be used for the Detection Survey (IVS Data Collection)	Ongoing
F	Parsons Geo	Conduct Detection Survey	Ongoing
F	Parsons Geo	Conduct Detection Survey Processing and Target Selection	Ongoing
F	Parsons Geo	Validate Dynamic Survey and Cued Target List	Ongoing
F	Parsons Geo	Assemble Advanced Geophysical Sensor and Test Sensor at IVS	Ongoing
F	Parsons Geo	Collect Cued Data	Ongoing
F	Parsons Geo	Conduct Cued Data Processing	Ongoing
	Parsons Geo	Classify Anomalies and Make Dig/No-Dig Decisions	
	Parsons Geo	Validate Cued Survey and Classification	
F	UXO 1	Intrusive Investigation	Ongoing
F	UXO 1	Verify Intrusive Results	Ongoing

Daily Quality Control Report

		Conduct Final DUA					
F	**UXO 1**	**Analog Removal**			**Ongoing**		
F	**UXO 1/SUXOS**	**MPPEH/MEC Handling, Certification, and Disposal**			**Ongoing**		
P, I		**Demobilization**					
		MC Sampling					
Grid #	**Grid #**	**Grid #**	**Grid #**	**Grid #**	**Grid #**	**Grid #**	**Grid #**

GRID INSPECTIONS PERFORMED:

QC inspections completed to date:			QA inspections completed to date:		
Pass	**Fail**	**Total**	**Pass**	**Fail**	**Total**
0	0	0	0	0	0

General Site Inspection	**Team (indicate by: UXO = U; or Geo = G; and No:**					**Pass**	**Fail**	**NA**
Proper work attire (PPE)	U	G				X		
Equipment calibration check	U	G						X
Vehicle condition	U	G				X		
Equipment condition	U	G				X		
Emergency equipment	U	G				X		
Proper grid layout	U	G						X
Proper search techniques	U	G						X
Team leader daily log	U	G				X		
SUXOS daily log	U							X
GIS and map data		G						X
Exclusion zone	U							X
Field office interior	U					X		
Field office exterior	U					X		
Proper demolition operations								X
Safety violations						None		

4. Soil samples taken:

Post-Detonation: ☐ No ☐ Yes ☒ None required

5. Verbal instructions received by the Government representative or client and actions taken:

None

6. Non-conformances/deficiencies reported:

None

CERTIFICATION: *I certify the above information is complete and correct and that I, or my representative, have inspected all work identified on this report performed by HGL and our subcontractor(s) and have determined to the best of my knowledge and belief that noted work activities are in compliance with the plans and specifications, except as may be noted above.*

UXO Quality Control Specialist	Signature

Contract No: Click here to enter **Date:** Click here to enter

Task Order No:

1. Location of Work:	

2. Personnel Summary:

Position/Company if not HGL	Position/Team Assigned	Name
SUXOS		
UXOSO/UXOQCS		
UXO III		
UXO II		
UXO II		
UXO II		
UXO II		
UXO I		
UXO I		

3. Field Manpower Summary

Position	Total Positions Assigned	Hours Per Position	Daily Total Hours
SUXOS			
UXOSO/ UXOQCS			
UXO III			
UXO II			
UXO I			
Subcontractors			

4. Work Summary

Project totals may be estimated daily and periodically updated once data is processed.

Work Activity	Daily Total	Project Total
Anomalies Dug		
Grids Completed (By Teams)		
MEC Discovered		
MDAS Pounds		
Other Debris Pounds		

Summary of work activities:

-

Contract No: Click here to enter **Date:** Click here to enter

Task Order No:

5. Inspections: QC/QA inspection data may lag as data transfer is completed. Once QC/QA data received, totals will be updated.

Inspection	Total Daily		Total Project	
	Pass	Fail	Pass	Fail
UXOQCS QC Complete				
Grids QA'd (OESS)				

6. Explosive Usage:

Item	Quantity	Comments

7. MEC Summary:

Item	Grid	Classification			Disposition
		UXO	DMM	MC	

8. HGL Equipment:

Item Description	Quantity	Comments
Demo Kit		
RFD		
Garretts		
Schonstedt		
Day Box		

9. Rental Equipment: (rental equipment descriptions will be updated throughout project)

Item Description	Quantity	Vendor	Start Date - End Date
Portable Toilet			
Truck SUXOS			
Truck UXOSO/QCS			
Truck Team			
Skid Steer w/ Rotary Drum			

10. Visitors

N/A

11. Discrepancies.

N/A

12. Guidance or Instructions Received from Client.

N/A

Contract No: Click here to enter **Date:** Click here to enter

Task Order No:

13. Attachment Summary.	
Attachment 1: Site Pictures	

14. Signature.	
CERTIFICATION: I certify the above information is complete and correct, and that I have determined to the best of my knowledge and belief that noted work activities are in compliance with the plans and specifications, except as may be noted above.	
Site Manager/SUXOS	

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Safety Meeting/Training Attendance Log

Date:		**Time:**		**Conducted by:**	
Site Name/Location:					
Contract Number:				**Delivery/Task Order Number:**	
Project Manager:				**Site Manager** (when applicable)**:**	N/A
(Senior) UXO Supervisor:				**Site Safety Officer/Unexploded Ordnance Safety Health Officer:**	

Training Provided: ☐ Initial Site Hazard ☐ Daily Safety Meeting ☐ Other: ☐ Weekly Safety Training ☐ Task/Hazard Specific

Weather Conditions: ☐ Fair ☐ Poor **Temperature (Low/High):** to °F **Wind speed:** mph **Direction:** **Precipitation:** % **Humidity:** %

I. TRAINING TOPICS COVERED

☐ Planned Site Activities	☐ Heat or Cold Stress	☐ Respirator Use
☐ Demolition Operations	☐ Biological Hazards	☐ Decontamination Procedures
☐ Site Controls	☐ Chemical Hazards	☐ Emergency Procedures/Route
☐ Exclusion Zone/Personnel Limits	☐ Routes of Chemical Exposure	☐ First Aid Procedures
☐ Site Communications	☐ Chemical Exposure Symptoms	☐ Buddy Team Procedures
☐ Physical Hazards	☐ Level/Type of PPE	☐ Other (describe topic(s) below)

Explain: _____

_____ .

Hospital/Clinic:	**Address:**	**Phone:**

II. SITE PERSONNEL / TRAINING ATTENDEES (Continued on 2nd page)

	Name	Signature	Company
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

III. SAFETYBRIEF / TRAINING VERIFICATION

I certify that the personnel listed on this roster have received the safety and health training described above.

_____ _____

Site Manager or Senior UXO Supervisor Site Safety and Health Officer or UXO Safety Officer

HGL MR Form 15.18

II. SITE PERSONNEL / TRAINING ATTENDEES (continued from 1st page)			
	Name	Signature	Company
11.			
12.			
13.			
14.			
15.			
16.			
17.			
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50.			

Tailgate Safety Meeting Log

Date:	Time:	Team No:
Site Name/Location:		Grid/Location:

1. SAFETY TOPICS DISCUSSED:

- ☐ Site Description
- ☐ Site Controls
- ☐ Personal Protective Equipment
- ☐ Emergency Procedures / Equipment
- ☐ Site Evacuation
- ☐ Physical/Biological Hazards
- ☐ Heat or Cold Stress
- ☐ Communication/Radio Procedure
- ☐ Environmental Concerns/Hazards
- ☐ Emergency Procedures/Route
- ☐ First Aid Procedures
- ☐ Injury Reporting
- ☐ Safe Work Practices
- ☐ Other:
- ☐ Other:
- ☐ Other:

2. TASK OPERATION AND REMARKS:

_____

_____

3. ATTENDEES:

	Print Name	Signature	Company
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			

Meeting Conducted by:	Signature:

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Health and Safety Site Visitor Log

Project Name:	CSAR / SWPRR TCRA	Project Number:	W9128F-15-D-0023	Delivery/Task Order:	003
Site Name:	CSAR /SWPRR	Location:	Moffat County, CO		

This form shall be used to track entry into and departure from the ***EXCLUSION ZONE, CONTAMINATION REDUCTION ZONES, OR OTHER WORK ZONES*** on all HydroGeoLogic, Inc. sites. All Personnel shall sign in and out on the form by printing their name, initializing the form and noting the time in/out.

Date	Name	Representing	Purpose of visit	Escort Required		Equipment/ PPE Level	Time	
				Yes	No		In	Out

HGL HydroGeoLogic, Inc MUNITIONS RESPONSE TEAM

Health and Safety Site Visitor Log

Date	Name	Representing	Purpose of visit	Escort		Equipment/ PPE Level	Time	
				Yes	No		In	Out

APPENDIX G

FIELD STANDARD OPERATING PROCEDURES

SOP 500-3 Production Area Seeding
SOP 501.01 Explosive Materials Accountability and Management
SOP 502.01 Explosive Demolition Operations
SOP 503.01 Explosives Storage Inspections and Security
SOP 504.01 MPPEH Inspection and Management
SOP 506.01 Analog and Digital MEC Operations
SOP 509.01 Vegetation Removal Operations on MMRP Sites
SOP 510.01 MEC Anomaly Avoidance Support
SOP 511.01 Munitions and Explosives of Concern Construction Support
SOP 522.01 Remote Mechanical Demilitarization
SOP 551.01 Digital Geophysical Mapping Using a Geonics EM61-MK2
SOP 552.01 Analog Geophysical Mapping

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HGL HydroGeoLogic, Inc Exceeding Expectations	**STANDARD OPERATING PROCEDURE**

Production Area Seeding	**SOP 500-3**
	SOP Category: 500 – MMRP and Geophysics
	Revision No.: 2
	Revision Date: December 10, 2018
	Review Date: December 2019

Approved by:

Kool, Jan Ph.D.

Digitally signed by Kool, Jan Ph.D.
Date: 2018.12.14 08:10:03 -05'00'

12/14/2018

Jan Kool, Ph.D.
Corporate QA Manager

Date

Digitally signed by Neil Feist
Date: 2018.12.14 08:22:22 -06'00'

Neil Feist
MMRP Operations Manager

Date

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1.0 PURPOSE

This standard operating procedure (SOP) describes procedures for blind (quality control [QC]) seeding, which is performed when required by the project objectives to monitor the overall quality of digital geophysical mapping (DGM) and/or an advanced geophysical classification (AGC) survey. Blind seeds provide useful information on all aspects of a munitions response project including equipment sensitivity and functionality, data acquisition parameters and site coverage, data processing and interpretation, and anomaly reacquisition and the intrusive investigation.

2.0 SUMMARY OF METHOD

QC and validation seeds are emplaced in the project area to verify that applicable measurement quality objectives (MQOs) identified in Worksheet 22 of the Quality Assurance Project Plan (QAPP) or in the Work Plan are achieved and to validate the DGM and/or AGC process for the client and stakeholders. Typically, the contractor is responsible for QC seeds and the client (e.g., U.S. Army Corps of Engineers, U.S. Navy) is responsible for validation seeds.

The blind seeding program is administered by the Project and/or QC Geophysicist in conjunction with the Military Munitions Response Program (MMRP) organization within the Engineering and Construction Division of HydroGeoLogic, Inc. (HGL). The Project and/or QC Geophysicist design the blind seed program in conjunction with the HGL Project Manager and clients. **Whenever possible, personnel involved with the blind seeding program should not be associated with DGM or AGC production activities**. **The preparatory inspection form for the seeding activity documents the names of seed personnel so the site manager can easily recognize restrictions when assigning personnel duties after the seed program is completed.** In some cases, the DGM acquisition crew must be involved with blind seeding (e.g., data collection over one-dimensional transects); however, the data processor and interpreter must be unaware of the actual locations and depths of the blind seeds.

Blind seeds are usually restricted to areas where “full coverage” DGM is performed; however, they can also be placed along one-dimensional transects if required by the project delivery team (PDT) for a specific application. For most applications, the blind seeds are placed at depths and orientations so that the anticipated response from the DGM sensor is no less than 4 to 5 times the anticipated site “noise.”

Blind seeds are placed within the project survey area to optimize the probability that each DGM team encounters a minimum of one blind seed item per day throughout the project or as per project planning documents. The rate of seeding is usually increased for projects that use AGC.

The QC Seed Plan documents the details of the seed program, including the type(s) of blind seeds proposed for use (e.g., industry standard objects [ISOs], surrogates, inert Munitions and Explosives of Concern [MEC] items, and frag), range of depth and orientation, number of seeds anticipated for use, accuracy requirements for placement, and specific details for the management of the information. The QC Seed Firewall Plan is used to designate project personnel who can access the

QC seed information. For some projects, a QC Seed Plan and a QC Seed Firewall Plan are not be required.

3.0 DEFINITIONS

AGC	advanced geophysical classification
AHA	activity hazard analysis
cm	centimeter
DGM	digital geophysical mapping
GPS	global positioning system
HASP	health and safety plan
HGL	HydroGeoLogic, Inc.
ISO	industry standard object
MEC	Munitions and Explosives of Concern
MQO	measurement quality objective
NAD	North American Datum
PDT	project delivery team
QAPP	quality assurance project plan
QC	quality control
RTK	real time kinematic
RTS	robotic total station
SOP	standard operating procedure
UTM	Universal Transverse Mercator
UXO	unexploded ordnance
UXOQCS	unexploded ordnance quality control specialist

4.0 PERSONNEL

This section describes the personnel, responsibilities, and qualifications required to implement this SOP. The personnel who perform blind seeding in the field at sites where munitions are present should have requisite experience in unexploded ordnance (UXO) safety and civil survey methods. An experienced, certified UXO technician who meets the requirements of Department of Defense Explosive Safety Board Technical Paper 18 is required, and a second professional may be required when positioning systems such as a real-time kinematic (RTK) global positioning system (GPS) or a robotic total station (RTS) unit are used. For some projects, a professional or registered land surveyor must be present to meet the requirements in the statement of work.

The following individuals are involved in production area seeding:

- **Project Geophysicist or QC Geophysicist:** designs QC seed program and produces the QC Seed Plan.

- **QC Geophysicist:** reviews emplaced locations and information compared to the QC Seed Plan, produces the QC Seed Report, and conducts periodic reviews of geophysical data during the project to ensure that applicable MQOs in Worksheet 22 are achieved.
- **Seed Team:** emplaces seed items in accordance with the QC Seed Plan and uploads and maintains information in a secure database or spreadsheet. Team members cannot be involved with any other elements of the DGM or AGC programs unless approval is granted by the client.
- **UXO QC Specialist (UXOQCS) or UXO Technician:** performs anomaly avoidance during emplacement of seed items.

UXO personnel are responsible for overall daily site access and safety aspects of the project, compiling subcontractor health and safety documents, conducting daily safety briefings, and performing MEC avoidance, as needed, in the field. Information on the specific qualifications for various UXO personnel support roles can be found in the project Health and Safety Plan (HASP).

The qualifications of the personnel implementing this SOP are documented in Worksheets 4, 7, and 8 of the QAPP for the applicable project.

5.0 EQUIPMENT AND SUPPLIES

The equipment required is determined by the environmental conditions at the site (e.g., vegetation density, canopy, and terrain) and the accuracy requirement for the blind seeds. The coordinates for the blind seed items are determined with standard survey methods using equipment such as RTK GPS, RTS, or calibrated tape measures. In addition to the survey supplies and equipment, the following items are usually necessary:

- Inert munitions and/or appropriate ISOs;
- Identification equipment (e.g., bar scanner, indelible ink, plastic ID tags, paint) to mark each seed item;
- Handheld geophysical sensor (typically a Schonstedt magnetic locator or an all-metals detector such as a White's or Minelab);
- Hand tools including shovels, pick axes, and breaker bars to emplace the seeds;
- Excavators if required by the QC Seed Plan;
- RTK GPS or RTS unit to record the location of seed items;
- Hammer and 6- to 8-inch nails (for anchoring measuring tapes when used for locating seeds with relative coordinates);
- Rigid measuring device (tape measure) and straight edge to measure the depth of the seeded items;

- Level or inclinometer and compass (or appropriate application on cell phone) to measure the inclination (dip) and orientation (azimuth) of the seed items;
- Digital camera or phone for photographs of the seed items in the open hole; and
- Logbook for recording field notes.

6.0 SAFETY

The personnel who perform the seeding must consult the site HASP and be aware of any site-specific hazards during performance of the task. Proper eye and hand protection is necessary when using tools identified by the activity hazard analysis (AHA). Before a blind seed is buried, a UXO technician clears the location with a handheld detector for safety purposes.

7.0 PROCEDURES

The QC Seed Plan provides a list of proposed seed types, locations, depths, and orientations. When emplacing the seeds, the emplacement team should employ anomaly avoidance techniques as described in Section 7.1 and use the emplacement procedure described in Section 7.2.

The blind seed items are positioned throughout the survey area before DGM data collection begins. If the two phases of work occur simultaneously, the blind seed and DGM team(s) must communicate to ensure that the blind seeds in an area are placed before DGM activities there begin.

RTK GPS and RTS are the preferred positioning methods for dynamic DGM/AGC, cued data acquisition, and coordinate determination of the seed items. If environmental conditions prevent the use of these positioning systems for data acquisition or surveying the seeds, tape measures are used to locate the seeds in relative coordinates. MQOs appropriate for line and fiducial positioning and dynamic and cued seed detection are defined in the QAPP or Work Plan.

7.1 ANOMALY AVOIDANCE

Most survey areas contain some metallic items or electromagnetically active geology. These conditions produce anomalies in data collected with a magnetometer or electromagnetic induction instrument. The emplacement team should avoid emplacing seeds in the immediate vicinity of any strong anomalies. Figure 1 shows the process that should be used to avoid strong anomalies when emplacing a seed. First, the emplacement team should acquire the seed's intended location. Then, the team should use a handheld instrument to survey the immediate vicinity (30- to 40-centimeter (cm) radius, or as designated in the QAPP or Work Plan) of the intended location. If no strong anomalies are noted in the immediate vicinity, then the team should emplace the seed at the intended location. If, however, the intended location is in the immediate vicinity of a strong anomaly, then the team should select a new location for the seed, as close as safety allows. The new location should ***not*** be within the immediate vicinity of any strong anomaly and should ***not*** be within 60 cm of another seed. For most applications, place the blind seed in an area with uniform terrain that does not contain branches, logs, larger rocks, and similar items.

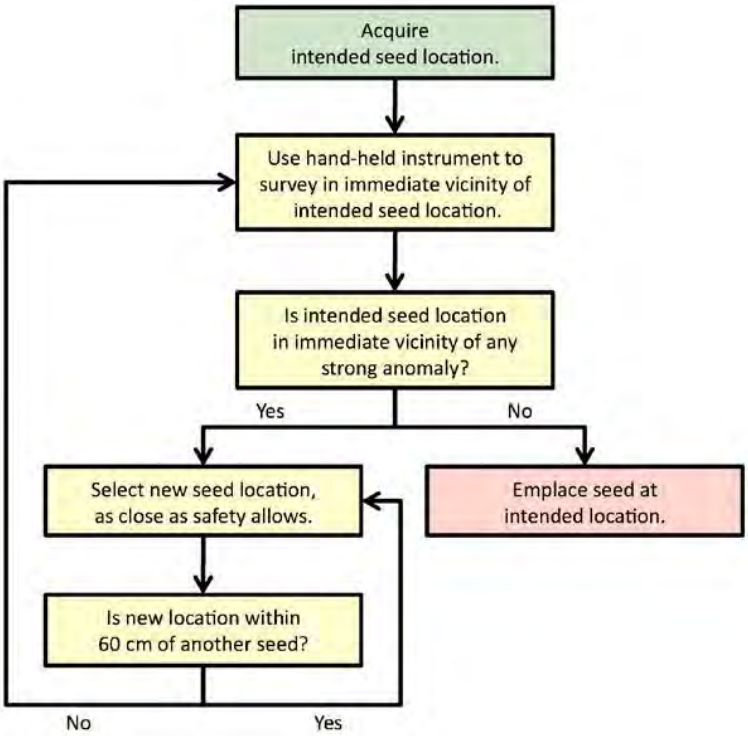


Figure 1. Anomaly Avoidance During Seed Emplacement.

7.2 SEED EMPLACEMENT

An AGC project attempts to reconstruct the physical parameters of buried targets, such as location, depth, inclination, azimuth, and size. Therefore, the ***actual locations and attitude*** of the buried seeds must be surveyed and recorded as accurately and precisely as possible. To that end, the emplacement team should perform seeding in a fashion that minimizes seed migration (e.g., settling) or disturbance after burial. This can be accomplished by compacting the soil at the bottom and sides of the hole (when possible) before placing the seed item.

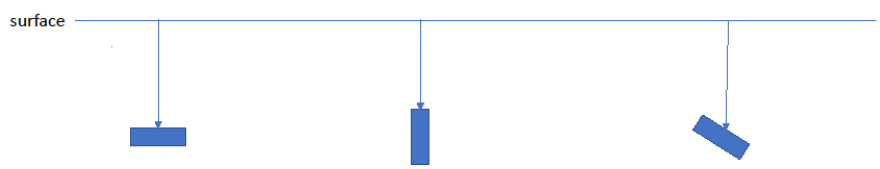
The QC Seed Plan (if required) specifies the seeds' intended burial parameters. The intended accuracy is given to 1-cm precision, with the intended depths to 2-cm precision and the intended inclinations and azimuths to 15-degree precision. All locations should be acquired as accurately and precisely as possible before digging begins. Locations should be surveyed relative to a cm-level control point (e.g., RTK GPS base station location).

When an RTK GPS or robotic total station RTS is used, upload the proposed coordinate and burial information for each blind seed to the positioning system at the start of the activity. As this information cannot be shared with the data processor or interpreter, the QC Geophysicist performs a task-specific review prior to the activity to ensure that the information remains secure.

This plan is merely a ***guide*** for seed emplacement. The seed team may allow small deviations from the intended burial parameters in the QC Seed Plan. The exact "as emplaced" parameters (depth to top, inclination, azimuth, etc.) should be recorded by the seed team during burial. For example, the inclinations are specified to within 45 degrees of horizontal or vertical down. In addition, the seed team should adjust the inclination angles of the seeds to ensure a minimum of 5 cm of overburden.

After emplacing a seed in the ground, but before backfilling, the following information should carefully be recorded:

- The x, y, and z coordinates for the center of the seed in the open hole, with coordinates reported in Universal Transverse Mercator (UTM) (North American Datum [NAD] 83 or World Geodetic System 84) meters. If relative coordinates are used as the final product for DGM, use a tape measure to document the location of each item from a referenced location (e.g., from the southwest corner of the grid, coordinates 0 east, 0 north, or another grid corner).The coordinates of the ends of seeds equal to or larger than a medium ISO should also be recorded. The blind seed ID and civil survey ID must be the same, and the IDs must be documented for each location.
- The depth of the seed, meaning the vertical distance from the bottom of a straight edge placed across the opening of the hole down to the **top** of the seed as referenced in the image below. The Project or QC Geophysicist determines the depth to the center of mass based on seed orientation.



XY coordinate measurement location and depth reference for horizontal, vertical, and inclined seeds

- <u>A photograph of the seed in the open hole</u>, showing its identification code (if possible). A ruler or similar scale should also be included in the photograph.

For each seed, the seed team should also perform the following:

- Ensure that any inert munitions used as seeds are marked with light blue (or other color depending on the seed plan) paint and a tag indicating the status of the munitions as "inert" (inert munitions only); and
- Backfill the hole as completely and level as possible, preferably capping it with a grass plug (if applicable).

7.3 BLIND SEEDING FOR ONE-DIMENSIONAL TRANSECTS

The following procedures should be followed for seeding one-dimensional transects:

- Place two pin flags (or survey lathe with a unique color of survey flagging) along the proposed transect route, separated by 6 to 10 meters, or at a distance indicated in the QC Seed Plan.
- Place the blind seed in a straight line between the flags or survey lathe (tolerance for the offset from the straight-line segment is ± 0.3 meter).
- If a 10-meter distance is used, position the seed item within the flagged region within a 2- to 8-meter region from one end of the segment.

8.0 INTERFERENCES

Site features such as terrain, geology, soils, vegetation, and cultural features (e.g., above- and below-ground utilities, monitoring wells, structures) as well as existing subsurface metal (anomalies) can affect the emplacement of seeds. The seed team should place seeds in relatively uniform terrain (no significant undulations and clear of relatively large branches, rocks, etc.). The seed team uses its logbook to document site conditions. Digital copies of the logbook and the location data for the seeds and photos are sent to the Project or QC Geophysicist daily.

9.0 DATA AND RECORDS MANAGEMENT

The designated representative (e.g., the QC Geophysicist or the UXO QC Supervisor) must organize and update the QC Seed Tracking Log on a regular basis during the blind seeding process. The tracking log must be stored on a secure HGL server. Upon request, the database can be transferred to members of the PDT. If required, a QC Seed Report is distributed to team members identified in the Blind Seed Firewall Plan.

The Project or QC Geophysicist maintains access to the final processed data, maps, and target lists for the project and uses this information to compare the interpreted locations and predicted target parameters for AGC to the actual locations and burial characteristics for the blind seeds. The QC Geophysicist generates a status report at regular intervals during project operations to document conformance or nonconformance to MQOs based on the results of the analysis.

9.1 INPUT DATA REQUIRED

A QC Seed Plan that contains a table of seed items, proposed locations, and depths and orientations is required to comply with this SOP.

9.2 OUTPUT DATA

The output data that results from following this SOP is presented in the final QC Seed Report. This report consists of a brief narrative describing the seed emplacement and a discussion of significant deviations from the seed plan (if applicable).

The bulk of the report consists of a seed location table, or a "seed tracking log," that includes the "as emplaced" identity, location, depth, and orientation of each of the emplaced seeds accompanied by a photograph of the item in the ground before being covered.

10.0 REPORTING

The QC Seed Plan, Blind Seed Firewall Plan, and QC Seed Tracking Log and Report document the activities with blind (QC) seeding. The QC Seed and Blind Seed Firewall Plans and the QC Seed Report are not required for every project.

For AGC projects only, the steps in this procedure are documented by completing the Preparatory QC Checklist in Attachment 1. Production area seeding is documented in the QC Seed Report and/or a database/spreadsheet.

11.0 QUALITY CONTROL

For the purposes of this SOP, the MQO for an AGC project (QAPP Worksheet 22) is verification that all seeds have been emplaced with the specified precision.

12.0 REFERENCES

Department of Defense Explosives Safety Board. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities*, September 2016.

HydroGeoLogic, Inc. Standard Operating Procedure 551.01: *Digital Geophysical Mapping Using a Geonics EM61-MK2*.

U.S. Army Corps of Engineers. *Ordnance and Explosives Digital Geophysical Mapping Guidance - Operational Procedures and Quality Control Manual (DGM QC Guidance)*. Prepared by NAEVA Geophysics, Inc., December 2003.

U.S. Army Corps of Engineers. *Technical Guidance for Military Munitions Response Actions* (EM-200-1-15), October 2015.

13.0 REVISION HISTORY

Revision 0 July 24, 2017 Initial release

Revision 1 July 29, 2018 Editorial changes based on execution of multiple AGC projects.

Revision 2 November 28, 2018 Merged blind seed SOPs for DGM and AGC into one document and added requirement to document names of personnel on preparatory inspection form.

ATTACHMENT 1
PREPARATORY PRODUCTION AREA SEEDING QC CHECKLIST
(AGC Projects)

This checklist is to be completed by the QC or Project Geophysicist following completion of production area seeding. Emplacement of the production area QC seeds must be observed by the QC Geophysicist or Geoscientist/UXOQCS and verified in the Daily QC Report.

QC Step	QC Process and Guidance Reference	Yes/No	Initial of Field or Project Geophysicist
1. Qualifications	Have the qualifications of the Project and QC Geophysicists listed in QAPP Worksheets 4, 7 and 8 been verified?		
2. Preparation	Have appropriate production area seed items been selected and procured?		
3. Seed Emplacement	Is the positioning method used to determine the coordinates of the seed items consistent with the anticipated positioning method for dynamic data collection?		
4. Seed Emplacement	Were the seeds buried appropriately, measured, photographed, and backfilled?		
5. QAPP	Are the MQOs for seed detection consistent with the positioning methods used for burial of the seeds and dynamic and cued data collection?		
6. Completion of Task	Has the QC Seed Report been prepared in accordance with this SOP?		

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HGL HydroGeoLogic, Inc Exceeding Expectations	STANDARD OPERATING PROCEDURE
Explosive Materials Accountability and Management	**SOP No.: 501.01** **SOP Category: MMRP and Geophysics** **Revision No.: 3** **Revision Date: February 27, 2019** **Review Date: February 2021**

Approved by:

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2/28/2019

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Date

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Attachment 7 Motor Vehicle Inspection - Hazardous Materials
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1.0 PURPOSE

This standard operating procedure (SOP) guides HydroGeoLogic, Inc. (HGL) employees in accountability for and management of explosive materials encountered on project sites. It also ensures that all explosive operations described in this SOP are conducted in compliance with the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) Publication (ATFP) 5400.7, *Federal Explosives Law and Regulations*, and the *Defense Explosives Safety Regulation 6055.09, Edition 1* (DESR 6055.09).

2.0 SCOPE AND APPLICATION

This SOP applies to HGL employees assigned to Military Munitions Response Program (MMRP) project-specific explosive operations. Only those individuals listed as "*cleared*" on the most recent ATF Federal Explosive Licensing Center (FELC) Notice of Clearance may have direct physical access to explosive materials during explosive operations. The current FELC Notice of Clearance is on file at the HGL Huntsville, Alabama, office if needed to verify individual clearance status.

Personnel who use this procedure must complete the SOP Acknowledgement Sheet (see Attachment 1) and submit it to the project Senior UXO Supervisor (SUXOS) as evidence that they have read and understand this SOP. The UXO Quality Control Specialist (UXOQCS) retains this document in the project file.

Deviations from specified requirements must be approved by the MMRP Operations Manager before they can be implemented. The MMRP Operations Manager will discuss and include approved deviations in the project plans. Any approved deviation cannot compromise federal law, and both the deviation and the newly modified process must be described fully in the justification documentation.

3.0 DEFINITIONS

3.1 DEFINITIONS

Employee Possessor (EP): Any employee under HGL's explosive license who has or will have actual physical possession (direct access) of explosive materials or who has or will have constructive possession of explosive materials. This includes HGL employees assigned to UXO positions who directly handle explosive materials as part of the production process, employees who handle explosive materials to ship or transport them, and employees who use explosive materials, such as blasters and their helpers.

Responsible Person (RP): An employee under HGL's explosive license who has the power to direct the management and policies pertaining to explosive materials.

3.2 ACRONYMS

ATF	Bureau of Alcohol, Tobacco, Firearms and Explosives
ATFP	ATF Publication
CFR	Code of Federal Regulations
CMV	commercial motor vehicle
CSP	Chemical Site Plan
CSS	Chemical Safety Submission
DDESB	DoD Explosive Safety Board
DoD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DSMT	Daily Summary of Magazine Transactions
EP	ATF "Employee Possessor"
EPQ	employee possessor questionnaire
ESP	Explosives Site Plan
ESS	Explosives Safety Submission
FELC	Federal Explosive Licensing Center
HAZMAT	hazardous material
HGL	HydroGeoLogic, Inc.
IAW	in accordance with
IME	Institute of Makers of Explosives
MEC	munitions and explosives of concern
MERA	Manufacturer of Explosives Record of Acquisition
MMRP	Military Munitions Response Program
MR	munitions response
NEW	net explosive weight
PTR	public transportation route
RP	ATF "Responsible Person"
SOP	standard operating procedure
SUXOS	Senior Unexploded Ordnance Supervisor

USACE	U.S. Army Corps of Engineers
USBDC	U.S. Bomb Data Center
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer

4.0 EXPLOSIVE ACCOUNTABILITY AND MANAGEMENT PROCEDURES

For this SOP, the SUXOS position also refers to all instances when a UXO Technician III is assigned the Demolition Supervisor responsibilities on HGL projects involving munitions and explosives of concern (MEC) support during construction activities.

Employees must perform all explosive operations in a manner consistent with ATFP 5400.7, DESR 6055.09, and this SOP. For all HGL project sites where explosive operations are conducted, include a section in the work plan that describes specific procedures for accountability and management of explosive materials associated with that site.

– W A R N I N G –

HGL employees who transport, store, or use explosive materials must clearly understand their responsibilities for properly safeguarding, securing, and storing explosive materials.

Disregarding these procedures will result in being denied physical access to explosive materials and possible termination of employment.

Any violation of the Federal Explosive Law and Regulations could result in being charged with a criminal offense.

4.1 GENERAL

This section outlines the procedures for proper accountability and management of explosives materials purchased, stored, transported, and used on HGL project sites. These procedures were developed using the following references:

- ATFP 5400.7 (27 Code of Federal Regulations [CFR] Parts 555 and 841 §§ A to K)
- ATFP 5400.15
- ATFP 5400.17
- ATFP 5400.20
- DESR 6055.09
- U.S. Department of Transportation (DOT) (49 CFR §§ 146 to 149)

4.2 EXPLOSIVE LICENSE

HGL holds an ATF Type 20 - Manufacturer of High Explosives license to purchase and use explosives on project sites (see Attachment 2). The original license is posted at the HGL office in Huntsville, Alabama.

– N O T I C E –

Post a copy of this license at each HGL project site where explosive materials are stored and used; ensure it is available for Federal, State, or local inspections.

4.3 HGL AUTHORIZED INDIVIDUALS

Only HGL employees listed on the FELC Notice of Clearance are authorized to have direct access to explosive materials. The SUXOS and the UXO Safety Manager determine which project personnel are required to have direct access to explosive materials and confirm that they are listed on the FELC Notice of Clearance.

HGL is required to provide commercial explosives suppliers with a list of employees who are authorized to receive and issue explosives. For HGL projects, this individual is the SUXOS; if the SUXOS is not available, the individual will be an identified and authorized UXO technician.

4.3.1 Responsible Person

HGL employees who are designated by the HGL Chief Operating Officer to fill a "Responsible Person" position must submit the following to the MMRP Operations Manager:

- An ATF Form 5400.28 employee possessor questionnaire (EPQ)
- An FD-258 fingerprint card
- A 2- by 2-inch color photograph

The MMRP Operations Manager verifies that all forms are properly completed and submitted to the FELC.

4.3.2 Employee Possessor

HGL employees who are EPs and therefore required by their position to have direct access to explosive materials must complete and submit a completed ATF 5400.28 EPQ to the UXO Safety Manger. The UXO Safety Manager then verifies proper completion of the form and submits it to FELC. Once FELC receives the EPQ, the employee is authorized to have direct access to explosive materials, unless denied by ATF.

4.4 ACQUISITION OF EXPLOSIVE MATERIALS

Record all explosive materials acquisitions on the day of the acquisition, manufacture, or receipt using the Manufacturer of Explosives Record of Acquisition (MERA) form in accordance with (IAW) ATFP 5400.7 (27 CFR § 555.123(b)) (see Attachment 3). Submit an electronic copy of this form to the UXO Safety Manager within 48 hours of the acquisition.

Coordinate acquisition arrangements with the sources (commercial explosive dealers) identified in the project work plan.

4.4.1 Binary Explosives

Mixing binary explosive materials into a single solution and holding it for storage is considered "*manufacturing explosives.*" Record this action as an "*acquisition*" on the MERA within 24 hours of mixing and follow the procedures outlined in Section 4.4. Until the compounds are mixed, they are not classified as explosives and, therefore, are not subject to control. However, once mixed, binary explosives are "explosive materials" and are subject to all applicable federal requirements.

– E X C E P T I O N –

IAW ATFP 5400.7 (27 CFR § 555.123(d)(3)), a licensed manufacturer is exempt from recordkeeping requirements if the explosive materials are manufactured for their own use and used within a 24-hour period at the same site. For example, mixing binary explosives.

4.4.2 Order Quantity

The SUXOS for each project site coordinates with the Project Manager to purchase and have available an initial quantity of commercial explosives before beginning MEC demilitarization and disposal operations. Based on usage requirements and demand, they may increase the quantity in stock.

Do not at any time allow the net explosive weight (NEW) to exceed the storage limit established by the DoD Explosives Safety Board (DDESB)-approved Explosive Safety Submission (ESS), Explosives Site Plan (ESP), Chemical Safety Submission (CSS), or Chemical Site Plan (CSP) for the project site.

4.4.3 Acquisition Source and Delivery

HGL purchases commercial explosives only from ATF-licensed explosive dealers that deliver explosive materials to the project site. The SUXOS coordinates with the MMRP Operations Manager to ensure the following:

- All project explosive materials acquisition sources are identified.

- A listing of explosive material requirements is developed during the project planning phase.
- Purchase orders are submitted to the explosive dealer(s) for the required amount of explosive materials.
- The explosive dealer receives a copy of the HGL Authorized Agent list of the site employees who are authorized to purchase and receive explosive materials.
- The explosive dealer receives a copy of the HGL Manufacturer of Explosives - Type 20 license with the original signature of an HGL cleared RP.
- Explosive material delivery arrangements are established.

4.5 INITIAL RECEIPT OF EXPLOSIVE MATERIALS

When explosive materials arrive at a project site, the site SUXOS accomplishes the following:

- Immediately checks the lot number or manufacture's marks and nomenclature/ description of each explosive item against the explosive delivery manifest/invoice;
- Records this information on the MERA;
- If placed in magazines, records this information on the Daily Summary of Magazine Transactions (DSMT) (see Attachment 4);
- Maintains on site a copy of the original delivery invoice/manifest receipt document;
- Maintains the completed DSMT record in the magazine with the explosive materials;
- Annotates and updates the DSMT upon each issue, receipt, and weekly/yearly inventory;
- Keeps a duplicate DSMT record in the project files;
- Submits DMST records to the MMRP Operations Manager upon project completion and/or when explosive magazines are emptied and taken out of service; and

The MMRP Operations Manager retains DSMT records for no less than 5 years from the transaction date.

4.5.1 Explosive Materials Accountability

The SUXOS properly documents and verifies all explosive material receipts, issues, turn-ins, and inventories through physical count. The UXOQCS confirms the count on the DSMT and the Explosive Material Disposition Record (see Attachment 5).

4.5.2 Request for Explosives

To ensure that all issued explosive materials are accounted for while in the possession of individual users, follow the procedure outlined below:

- The SUXOS reviews all requests for explosives from the individual operating sites and issues only the required amount of explosives for the day's operations.
- The SUXOS records explosive issues using the Explosive Material Disposition Record, deducts issues from the DSMT record, and annotates explosives usage in the Daily Production Report. The explosive materials end user signs the Explosive Material Disposition Record to certify that the explosives were expended for their intended purpose.
- When withdrawing or turning in explosive materials, the Demolition Supervisor and SUXOS verify through physical count the entries made on the Explosive Material Disposition Record and the DSMT record.

The UXOQCS or the UXO Safety Officer (UXOSO) verifies the accuracy of all explosive transactions.

4.5.3 Reconcile Receipt Records

When necessary, the SUXOS reconciles the delivery shipping documentation with the requested amounts ordered and amounts received, and immediately reports shortages or overages to the Project Manager and the MMRP Operations Manager. The Project Manager then contacts the explosives dealer to reconcile differences.

At the end of each explosive demolition operation, the Demolition Supervisor and either the UXOQCS or the UXOSO reconciles the entries on the Explosive Material Disposition Record with the DSMT record and gives the records to the SUXOS for final verification and acceptance.

4.6 STORAGE

4.6.1 Establish Explosive Storage Magazines

Establish explosive storage magazines at HGL project sites IAW ATFP 5400.7 (27 CFR § 555, Subpart K - Storage), DESR 6055.09, and the applicable DDESB-approved ESS/ESP/CSS/CSP.

- When not in use, properly store and secure all explosive materials in a Type 2 portable outdoor magazine that meets the design specifications of ATFP 5400.7, (27 CFR § 555.203(b)) and ATFP 5400.17. Placard the magazine with the appropriate DOT hazard class/division and fire symbols, and post emergency notification information clearly.

- When storing explosive materials on DoD facilities, comply with the local DoD components explosive safety, security, and siting requirements.
- When site security conditions necessitate additional safeguarding of explosive materials, fence the explosive storage area using a minimum 6-foot-high fence with a lockable gate or a suitable intrusive detection system.
- Install lightning protective systems (grounding) IAW DESR 6055.09. Inspect the lightning protective system annually. Test the lightning protective system every 2 years.
    - Fences located within 6.5 feet of a magazine shall be bonded to the magazine's lightning protective system.
    - When more than one magazine is used, separate them by a minimum of 6.5 feet and ground them separately. If the 6.5-foot distance is not feasible, bond the magazines to a common grounding system.
- When siting explosives storage magazines, including locating, installing, and maintaining the magazines:
    - Comply with all ATF, federal, DoD, state, and local storage and compatibility criteria and procedures.
    - Comply with magazine criteria and quantity distance requirements established in ATFP 5400.7 (27 CFR, § 555, Subpart K - Storage) and DESR 6055.09.

4.6.2 Physical Security of Explosive Materials

Maintain strict physical security and safeguard explosive materials when these materials are being used and stored on HGL project sites. The SUXOS and UXOQCS enforce access, control, transportation, and security of all explosives materials on site. Place explosive storage magazines in the most secure locations practicable IAW the following:

- ATFP 5400.7 (27 CFR §§ 555.207 and 555.208),
- ATFP 5400.15, *Volunteer Security Checklist*,
- DESR 6055.09,
- HGL SOP 503.01, *Explosives Storage Inspections and Security*.

4.6.3 Physical Security of MEC

On known munitions response (MR) sites where intentional physical contact with MEC or chemical warfare materiel is planned or anticipated, comply with the DDESB-approved ESP/CSP or ESS/CSS concerning the physical security of all MEC discoveries.

On project sites where intentional physical contact is not planned or anticipated but MEC is discovered, the site supervisor immediately notifies the project manager, who then immediately notifies the client to obtain safeguarding instructions.

Record all instances of discovered MEC items using the MEC Demilitarization/Disposal by Detonation Accountability Record (see Attachment 6).

4.6.4 Required Notifications

The SUXOS coordinates with the MMRP Operations Manager to notify the local ATF office in writing 5 days before an explosives storage magazine is added to the project location IAW ATFP 5400.7 (27 CFR § 555.63). Include the following information in the written notification to the local ATF:

- HGL Huntsville office telephone number and address,
- HGL explosives license number,
- Explosives storage magazine address/location (latitude/longitude coordinates),
- Magazine identification number, and
- Emergency contact name, address, and telephone number.

The SUXOS notifies local fire authorities orally before the end of the day that storage of the explosive materials begins, and again in writing within 48 hours from the time such storage begins IAW ATFP 5400.7 (27 CFR § 555.21). Include the following information in both oral and written notifications to the local fire authorities:

- Type(s) of explosive materials,
- Magazine capacity (NEW amount), and
- Location of each storage site where explosive materials are stored.

The SUXOS confirms to the HGL MMRP Operations Manager when all notifications to fire authorities are completed.

4.6.5 Access and Control

The SUXOS and the UXOQCS establish a key-control system for access to and control of explosives through the following:

- Only personnel authorized by the MMRP Operations Manager are issued keys to explosive storage magazines and trucks loaded with explosives.
- Keys not currently in use are secured in an unmarked area located separately from other keys on the premises.

- Procedures for magazine key control, access restriction, and accountability as explained in HGL SOP 503.01, *Explosives Storage Inspections and Security*, are followed.
- Only those HGL employees listed as "*cleared*" on the current FELC Notice of Clearance and on the HGL Authorized Agent list may purchase and receive explosive materials.

4.7 TRANSPORTATION

Comply with all DOT (49 CFR §§ 171 through 173, 383 and 397), state, and local regulations regarding transportation of explosive materials. Permits are not required when transporting explosive materials within the project site and off public transportation routes (PTRs). Always select and use the most expeditious route when transporting explosive materials on or off a PTR.

Comply with DOT regulations (49 CFR §§ 172, 173, 387, and 397) when transporting 1,000 pounds or less of Compatibility Groups 1.4B and 1.4S explosives. Comply with DOT regulations (49 CFR §§ 172, 173, 387, and 397) when transporting 99 pounds or less of detonating cord Compatibility Group 1.4D if the explosive content does not exceed 100 grains per linear foot. Under these circumstances a commercial driver's license, vehicle placarding, and written travel route are not required.

4.7.1 Procedures for Transporting Explosive Materials from Storage to Disposal Location

When explosive materials must be transported on public highways and PTRs, the SUXOS and UXOSO coordinate to provide the driver with a safe transportation route plan with the least public exposure. This transportation route plan is not required when only Compatibility Group 1.4 explosives are being transported as described in Section 4.7.

Comply with the following when transporting demolition explosive materials:

- Keep initiating explosives, such as blasting caps, separated from other explosives at all times.
    - Blasting caps may be transported in the same vehicle if they are in a separate Type 3 magazine (day box) conforming to Institute of Makers of Explosives (IME) requirements and secured away from other explosive items.
    - Place high explosives in a Type 3 magazine (day box) meeting the design specification of ATFP 5400.7 (27 CFR § 555.203(c)).
    - Place ATF Type 3 day boxes in the bed of a vehicle; block and brace the boxes separately using ratchet tie-down straps, bolts, or other suitable means to keep the containers from shifting. When placed in a vehicle, secure the ATF Type 3 day box using a locking system that contains a chain or cable and a padlock.

- If the explosive load being transported is in an open vehicle, place explosives in Type 3 magazines.
- Do not ride in the cargo compartment of a vehicle transporting explosives.
- Always observe compatibility requirements.
- The receiving party signs the receipt documents.
- Comply with posted speed limits but do not exceed a safe and reasonable speed for road/field conditions, which may mean traveling at speeds slower than those posted. Do not exceed 25 miles per hour in vehicles transporting explosives off road.
- Properly record all explosive materials being transported using a Bill of Lading (see Attachment 5).

4.7.2 Explosives Transportation Personnel Requirements

Requirements for HGL employees assigned to operate motor vehicles transporting explosive material are as follows:

- Qualified IAW DOT regulations (49 CFR §§ 387 and 391),
- Listed on the FELC Notification of Clearance,
- UXO-qualified to have direct access to explosive materials,
- Possesses a valid state driver's license, and
- Possesses a commercial Class C driver's license with a hazardous material (HAZMAT) endorsement when transport vehicle is classified as a commercial motor vehicle.

4.7.3 Explosives Transportation Vehicle Requirements

Transport explosives in closed vehicles whenever possible. Adhere to the minimum requirements for vehicles transporting explosives as follows:

- Inspect the vehicle using the Motor Vehicle Inspection-Hazardous Material form (see Attachment 7).
- Properly placard the vehicle on all sides and at each end IAW DOT regulations (49 CFR).
- Equip vehicle with a first aid kit, two 10–B:C fire extinguishers, and a means of communication with the UXOSO.
- Shut off the engine when loading or unloading explosive materials.
- Chock the wheels during loading and unloading to prevent movement.

- Do not allow bare explosive to contact spark-producing metal. Ensure vehicle cargo beds have wooden or plastic liners, dunnage, or sand bags to prevent the explosive materials from coming into contact with the metal bed and fittings.
- Properly segregate all explosive materials being transported IAW their hazard/class division compatibility requirements.

4.8 RECEIPT PROCEDURES AND AUTHORIZED ACCESS

The SUXOS is strictly accountable for control of all explosive materials from the time of initial receipt until expenditure, return of explosives to an authorized explosive dealer, or relieved of accountability by an authorized agent.

If a discrepancy exists between inventoried and on-hand quantities of explosive materials, the SUXOS and UXOQCS review the DSMT record and the Explosive Material Disposition Record to verify the accuracy of the inventory records.

If the records review does not reconcile the discrepancy, the following actions are taken:

- The SUXOS immediately reports the discrepancy to the Project Manager and the MMRP Operations Manager.
- The SUXOS or UXOQCS notifies the appropriate U.S. Government representative when the project is under U.S. Government contract. For example, on a U.S. Army Corps of Engineers (USACE) project, notify the Ordnance and Explosive Safety Specialist or the Contracting Officer.
- The Project Manager immediately initiates an investigation to determine the cause of the discrepancy.
- The SUXOS reports discrepancies that cannot be reconciled within a 24-hour period IAW ATFP 5400.7 (27 CFR § 555.30).

4.9 INVENTORY

4.9.1 Special Inventories

The SUXOS and the UXOQCS conduct a true and accurate physical inventory of all explosive materials on hand at HGL project sites. The UXOSO conducts the inventory when the SUXOS or UXOQCS is not available. Special inventories are required under the following conditions:

- On initial physical receipt of explosive materials at a project site,
- When permanently changing location of the premises to another project site,
- When project field operations are temporarily suspended,
- When project field operations resume after suspension,

- Annually, and
- When required by the ATF or an HGL RP.

Annotate the purpose of these inventories on the DSMT record. For example, annotate the annual inventory as "Annual Inventory" and annotate a project field season completion as "Field Season Suspended."

Prepare each special inventory in duplicate. Submit the original to the MMRP Operations Manager, who will then forward the inventory to the ATF regional office. Keep a copy in the project files.

4.9.2 Physical Inventory and Inspections

The SUXOS and the UXOQCS (or UXOQCS designee) conduct a true and accurate physical inventory of all explosive materials stored at HGL project sites **once every 30 days.** The inventory will adhere to the following procedures:

- Record the results of the physical inventory on the DSMT form.
- Write "Monthly Inventory" through both the "Quantity Received" blocks.
- Conduct complete inventories after any issues/turn-ins of demolition material.

Begin weekly **(not to exceed 7 days)** inspections of the explosive magazines immediately after explosive materials arrive on the project site. The weekly inspection (not to exceed 7 days) is necessary to determine if unauthorized entry into the magazine(s) or unauthorized removal of the magazine contents has been attempted. Refer to HGL SOP 503.01, *Explosives Storage Inspections and Security*, Section 5.1.3, for additional guidance on 7-day explosive magazine inspections.

4.10 REPORTING LOSS OR THEFT OF EXPLOSIVE MATERIALS

Upon discovery of any theft or loss of explosive materials, the SUXOS immediately notifies the following points of contact in the order listed below:

1. HGL MMRP Operations Manager[1,2]	256-970-2103	7:30 a.m.– 4:30 p.m. CDT
	256-714-5808	After hours
2. ATF[1]	800-461-8841	8:00 a.m.– 5:00 p.m. EST
	800-800-3855	After hours
3. Local Law Enforcement Office[1,2]		24 hours
4. Project Client Representative[1]		8:00 a.m.– 5:00 p.m. local
5. ATF U.S. Bomb Data Center (USBDC)	866-927-4570 (fax) USBDC@atf.gov	5:00 p.m.– 8:00 a.m. EST

Notes:
1. Phone in the notification.
2. Fax or email the completed ATF Form 5400.5, Report of Theft or Loss-Explosive Materials, within 24 hours from the time of the incident (see Attachment 8).

– N O T E –

1. *Failure to report the theft or loss of any explosive materials missing from stock* ***within 24 hours*** *of discovery to the appropriate federal and local authorities is a felony offense.*
2. *For munitions response projects under contract to USACE, the Project Manager notifies the USACE Contracting Officer immediately by telephone and in writing within 24 hours of the discovery.*
3. *Submit the completed Report of Loss or Theft-Explosive Materials form to the USBDC* ***within 24 hours*** *of discovery of any theft or loss of explosive materials. Coordinate report submission with the UXO Safety Manager.*

Additional reporting procedures are provided in ATFP 5400.15, *Safety and Security Information for Federal Explosive Licensees and Permittees*.

For unused explosives, the Demolition Team Leader conducts the following:

- Returns explosive materials issued for use but not expended to the storage magazine, and records the transaction on the Explosive Disposition/Usage Record and DSMT, and
- Classifies returned explosives as "turn-ins."

4.11 DISPOSAL OF REMAINING EXPLOSIVES

ATF requires an accurate accounting of all explosive materials purchased and used. When work is completed or temporarily suspended at a project site, all unused explosives are either

- Disposed of by detonation;
- Returned to the ATF-licensed explosives dealer (original acquisition source) where the explosive materials were originally purchased; or

- Properly stored IAW ATFP 5400.7 (27 CFR § 555), the work plan, and the ESS/CSS or ESP/CSP.

4.12 DISASTER PREPAREDNESS

Many natural disasters such as floods, forest fires, hurricanes, or tornados occur with little or no warning; therefore, it is critical to anticipate and prepare for response actions.

When a natural disaster threatens an HGL project site, the SUXOS takes preliminary measures to secure explosive materials from potential loss, including the following:

1. Develops a contingency plan for immediately relocating explosive materials to a compliant explosives magazine in an area less susceptible to weather-related damage, if possible.
2. Notifies the nearest ATF field office and supplies the following information:
    - HGL project location,
    - Telephone number and address for the licensed premise (HGL Huntsville office),
    - Explosive license number,
    - Explosive storage magazine address/location (latitude/longitude coordinates),
    - Magazine identification number, and
    - Emergency contact name, address, and telephone number.
3. Under the verbal authorization of the ATF field supervisor, immediately moves stored explosives to compliant storage magazine in an alternate location.
4. Verifies that backup copies of critical records are collected and maintained off site.
5. <u>If explosives are missing or stolen, completes the required notifications immediately IAW Section 4.10</u>. If the missing or stolen explosives are found or recovered and returned, notifies the USBDC and any investigating agency personnel of all recovered explosives. USBDC is responsible for tracking all stolen, lost, and recovered explosives. Prompt reporting of the recovery of explosives previously reported as missing or stolen saves valuable investigative time and resources.
6. If damaged explosive materials are an immediate threat to public safety, contacts local law enforcement authorities and the ATF 24-hour hotline. ATF hotline personnel notify the appropriate ATF Field Division personnel who then coordinate the ATF field response.
7. If the damaged explosive materials are not an immediate threat to public safety, contacts the manufacturer for instructions on the appropriate means of destruction. Contacts the local ATF office for any additional guidance.

8. If ATF required records have been damaged, lost or destroyed:
   - Immediately inventories explosive materials and attempts to reconstruct any records destroyed, lost, or rendered illegible.
   - Contacts the acquisition source/explosive dealer to obtain copies of recent sales and acquisition records.
   - Contacts the local ATF office for assistance or further information.

5.0 QUALITY CONTROL

Proper and careful accountability and management of explosives is critical to the success and safety of all explosive operations involving HGL employees, the public, and properties. The assigned SUXOS for each project site assumes primary responsibility and accountability for the use of the explosives.

HGL could be engaged in multiple MR projects at any given time. This section describes the lines of authority and responsibility of employees who have direct administrative and operational management responsibility on HGL projects involving the security, storage, transportation, and use of explosive materials. RP or EP positions are so designated IAW ATFP 5400.7 (27 CFR § 841(s)).

5.1 CHIEF OPERATING OFFICER

RP position that oversees the accountability and management of HGL's explosive materials program and policy. The RP verifies that explosive operations are conducted in compliance with all federal, state, and local regulations under HGL's ATF license.

5.2 MMRP DIRECTOR

RP position that directs and enforces the accountability and management of HGL's explosive materials program to ensure that all explosive material purchase, use, storage, and transportation operations are conducted IAW applicable federal, state, and local regulations.

5.3 MMRP OPERATIONS MANAGER

RP position that implements the accountability and management of HGL's explosive materials program and provides direct administrative, operational, quality control, safety, and security oversight on all munitions projects and explosive operations.

- Ensuring that all explosive operations procedures comply with this SOP and applicable regulations;

- Coordinating with the Project Manager to stop any explosive operation deemed unsafe, and preventing operations from resuming until the unsafe condition is corrected; and
- Periodically auditing quality assurance, safety, and security at HGL MR project sites where explosive materials are used and stored.

5.4 SUXOS

RP or EP position directly responsible for safe and secure execution of all field activities involving explosive operations.

- Supervises and verifies that all explosive operations are carried out in compliance with this SOP, the work plan, and the applicable DDESB-approved ESP/ESS/CSP/CSS (when applicable);
- Acts as the single point of contact for receipt and release of explosive materials to an authorized ATF-licensed explosives dealer or agents, including the safeguarding and security of explosive material purchased and stored on the project site; and
- Coordinates all explosive materials logistical support through the HGL MMRP Operations Manager.

5.5 UXOSO

EP position with direct oversight of explosive safety and security on the MR project site to which they are assigned.

- Communicates directly with the MMRP Operations Manager on all matters concerning explosive safety and security;
- Ensures that all explosive safety procedures are performed IAW this directive, associated site SOPs, the work plan, and the approved ESP/ESS/CSP/CSS; and
- Is authorized to stop any explosive operation deemed unsafe and to delay resumption of operations until the unsafe condition is corrected.

5.6 UXOQCS

EP position that maintains explosive management quality control on the MR project assigned.

- Liaises directly with the Site Managers and SUXOS concerning proper administration of the explosive management program; and
- Oversees quality control of all site explosive operations procedures, inventories, and stock cards and ensures compliance with this directive, SOPs, the work plan, approved ESP/ESS/CSP/CSS, and all federal, DoD, state, and local regulations.

5.7 DEMOLITION SUPERVISOR

EP position that plans, directs, and executes the project site explosive demolition operation for the destruction or demilitarization of MEC/material documented as an explosive hazard. This person ensures positive control and security of the explosive material, and the safe conduct of explosive operations. The SUXOS may delegate the Demolition Supervisor responsibilities to a qualified UXO Technician III.

5.8 EXPLOSIVES DRIVER

EP position for HGL employees who transport explosive materials (explosives driver). This person must

- Possess a current state driver's license, a valid DOT commercial Class C driver's license with a hazardous materials endorsement IAW 49 CFR §§ 383 and 397.
- Comply with all federal, state, local, and HGL requirements when operating explosive-laden vehicles.

5.9 DEMOLITION TEAM MEMBERS

Demolition team members work under the direct supervision of an ATF RP or EP, the SUXOS, or the Demolition Supervisor. They are allowed to handle explosive materials without an ATF clearance when directly supervised by an ATF RP or EP.

6.0 SECURITY

Before establishing explosives storage or conducting explosives operations on an HGL project site, the SUXOS and UXOQCS jointly conduct an explosive security survey IAW HGL SOP 503.01, *Explosives Storage Inspections and Security*, as follows:

- Document the inspection and any discrepancies and their disposition in the SUXOS daily log and the UXOQCS quality control daily report.
- Notify the local law enforcement or security agency closest to the project site when explosive materials are stored in the on-site magazines.
- Notify the local law enforcement or security agency about the project site business hours as an added security measure.

7.0 DATA AND RECORDS MANAGEMENT

7.1 PERMANENT RECORDS

As an explosives licensee, HGL is required to keep permanent records of explosive materials for 5 years from the date of transactions including importation, production, shipment, receipt, sale, or other disposition, whether temporary or permanent, of explosive materials as regulated by ATFP 5400.7 (27 CFR § 555.121). ATF officers may examine or inspect these records at any time. These records are maintained on site while the site is active and in the HGL Huntsville office after demobilization.

7.2 RECORD MAINTENANCE AND CORRECTING ERRORS

Maintaining accurate records of explosives is essential in preventing errors. The SUXOS manages all explosives-related records for accuracy and completeness, and verifies that information is properly documented on all applicable record forms.

If an error is made, the individual who made the error performs the following:

1. Draws a single line through the error,
2. Writes in the correct information in the space closest to the error,
3. Initials and dates the correction, and
4. Verifies that an individual witnessed the correction by having them write their initials and the date next to the corrected error.

7.3 SPECIAL INVENTORY

When a special inventory is required as specified by ATFP 5400.7 (27 CFR § 555.123(a)), the MMRP Operations Manager prepares a record of the inventory in duplicate and submits the original to the ATF regional director's office as specified by ATFP 5400.7 (27 CFR § 555.123(a)(4)).

A true and accurate physical inventory is taken at the following:

- When the location of a business changes to another ATF region,
- When the business is discontinuing operations, and
- At any time when the ATF regional director requests that one be taken.

7.4 RECORDKEEPING

The SUXOS maintains records of all explosive material acquisitions, purchases, issuances, usages, and inventories records on site and makes them available for inspection by authorized agencies. Recordkeeping includes the following:

- Tracking explosive items by their respective lot number or manufacturer's marks of identification until the items are expended, transferred to another ATF licensee, or returned to the original explosive acquisition source, and
- Recording and maintaining all documentation and records generated as a result of all explosive material transactions using the forms listed below. (Attachment 9 provides additional instructions for using and maintaining explosives records.)

7.4.1 Manufacturer of Explosives Record of Acquisition

The SUXOS completes the MERA upon receipt of any explosive materials by HGL IAW ATFP 5400.7 (27 CFR § 555.123) and submits an electronic copy of the MERA within 48 hours of the acquisition to the MMRP Operations Manager.

7.4.2 Daily Summary of Magazine Transactions

Properly record all issues, returns, and inventories using the DSMT and IAW ATFP 5400.7 (27 CFR §§ 555.123 and 555.127). Keep this record with each explosive item stored at each magazine as follow:

- Maintain and update duplicate DSMT records at the same time as the original record; keep these records separate from the project files.
- Update DSMT records no later than the close of the next business day with the manufacturer's name or brand name, the total quantity received in and removed from each magazine during the day of transaction, and the total remaining on hand at the end of the day.
- Submit an electronic copy of the DSMT within 48 hours of any transaction to the MMRP Operations Manager.

7.4.3 Explosive Material Disposition Record – Bill of Lading

The Explosive Material Disposition Record - Bill of Lading serves two purposes:

1. For recording all explosive material
   - Issued for demilitarization/demolition operations;
   - Expended by detonation; or
   - Returned to the magazine for storage; and
2. As a bill of lading whenever explosive materials are being transported by vehicle on HGL project sites.

7.4.4 Munitions and Explosives of Concern/Unexploded Ordnance Accountability Record

The SUXOS uses the MEC Demilitarization/Disposal by Detonation Accountability Record to record the demilitarization/disposal of all MEC items discovered on HGL project sites.

7.4.5 Motor Vehicle Inspection-Hazardous Materials

The explosive driver uses the Motor Vehicle Inspection - Hazardous Materials form (Attachment 7) when hazardous materials are transported by vehicle on HGL project sites. Follow the procedures shown in Section 4.7.

7.5 RECORDS DISTRIBUTION

The SUXOS, upon completion of project field operations, distributes all MEC and explosive material records as indicated below:

– N O T I C E –

As required by the ATF, send an electronic copy of the most recent explosive record transaction to the HGL Huntsville office (premise location) within 24 hours from the time of the transaction occurred.

1. Send original records to the HGL Huntsville, Attention MMRP Operations Manager; maintain records for a period of 5 years from the time of the latest transaction IAW ATFP 5400.7 (27 CFR § 555.121(a)(2)).
2. Archive records older than 5 years throughout the life of HGL's Manufacturer of Explosives License.
3. Distribute records as shown below.

Record	Huntsville Office	Project Manager
Manufacture of Explosives Record of Acquisition Form	Original	
DSMT Form	Original	
Explosive Material Disposition Record Form	Original	
Bill of Lading Form	Original	
MEC Demilitarization/Disposal Accountability Record Form	Original	Copy
Report of Theft or Loss of Explosive Material	Original	Copy

8.0 REFERENCES

ATF, Publication 5400.18, Daily Summary of Magazine Transactions.

ATF, Publication 5400.19, Recordkeeping Requirements for Explosive Material Manufacturers.

ATF, Publication 5400.7, Federal Explosives Laws and Regulations (27 CFR § 555).

Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), Publication 5400.15, ATF Safety and Security Information for Federal Explosives Licensees and Permittees.

DoD Explosive Safety Board, Technical Paper 18, Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities.

HydroGeoLogic, Inc. (HGL), HGL Standard Operating Procedure 503.01, Explosives Storage Inspections and Security.

U.S. Army Corps of Engineers (USACE), Engineer Manual 385-1-97, Explosives Safety and Health Requirements Manual.

U.S. Department of Defense (DoD), Defense Explosives Safety Regulation 6055.09, Edition 1.

U.S. Department of Transportation (DOT), 49 CFR §§ 100 through 199.

ATTACHMENTS

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ATTACHMENT 1

SOP ACKNOWLEDGEMENT SHEET

SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the activities described in this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure that all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker's statement for this purpose. I will ensure that the SOP contains current procedures. If a 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.

_____ _____

Senior UXO Supervisor Date

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 IAW the SOP, I will stop the process and notify my immediate supervisor.

Worker's Name	Date	Supervisor's Name

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ATTACHMENT 2

U.S. Department of Justice
Bureau of Alcohol, Tobacco, Firearms and Explosives

Federal Explosives License/Permit
(18 U.S.C. Chapter 40)

In accordance with the provisions of Title XI, Organized Crime Control Act of 1970, and the regulations issued thereunder (27 CFR Part 555), you may engage in the activity specified in this license or permit within the limitations of Chapter 40, Title 18, United States Code and the regulations issued thereunder, until the expiration date shown. **THIS LICENSE IS NOT TRANSFERABLE UNDER 27 CFR 555.53.** See "WARNINGS" and "NOTICES" on reverse.

Direct ATF Correspondence To	ATF - Chief, FELC 244 Needy Road Martinsburg, WV 25405-9431	License/Permit Number	1-AL-089-20-0F-00632
Chief, Federal Explosives Licensing Center (FELC)	Christopher R. Reeves	Expiration Date	June 1, 2020

Name
HYDROGEOLOGIC, INC MUNITIONS RESPONSE TEAM

Premises Address (Changes? Notify the FELC at least 10 days before the move.)
4835 UNIVERSITY SQUARE, STE 15
HUNTSVILLE, AL 35816-

Type of License or Permit
20-MANUFACTURER OF EXPLOSIVES

Purchasing Certification Statement
The licensee or permittee named above shall use a copy of this license or permit to assist a transferor of explosives to verify the identity and the licensed status of the licensee or permittee as provided by 27 CFR Part 555. The signature on such copy must be an original signature. A faxed, scanned or e-mailed copy of the license or permit with a signature intended to be an original signature is acceptable. The signature must be that of the Federal Explosives Licensee (FEL) or a responsible person of the FEL. I certify that this is a true copy of a license or permit issued to the licensee or permittee named above to engage in the business or operations specified above under "Type of License or Permit."

Licensee/Permittee Responsible Person Signature — Position/Title: UXO MANAGER
Printed Name: NEIL WADE FEIST — Date: 7/13/17

Mailing Address (Changes? Notify the FELC of any changes.)
HYDROGEOLOGIC, INC
HYDROGEOLOGIC, INC MUNITIONS RESPONSE TEAM
4835 UNIVERSITY SQUARE, STE 15
HUNTSVILLE, AL 35816-

ATF Form 5400.14/5400.15 Part I
Revised October 2011

Previous Edition is Obsolete

Federal Explosives License (FEL) Customer Service Information

Federal Explosives Licensing Center (FELC)
244 Needy Road
Martinsburg, WV 25405-9431

Toll-free Telephone Number: (877) 283-3352
Fax Number: (304) 616-4401
E-mail: FELC@atf.gov

ATF Homepage: www.atf.gov

Change of Address *(27 CFR 555.54(a)(1))*. Licensees or permittees may during the term of their current license or permit remove their business or operations to a new location at which they intend regularly to carry on such business or operations. The licensee or permittee is required to give notification of the new location of the business or operations not less than 10 days prior to such removal with the Chief, Federal Explosives Licensing Center. The license or permit will be valid for the remainder of the term of the original license or permit. **(The Chief, FELC, shall, if the licensee or permittee is not qualified, refer the request for amended license or permit to the Director of Industry Operations for denial in accordance with § 555.54.)**

Right of Succession *(27 CFR 555.59)*. (a) Certain persons other than the licensee or permittee may secure the right to carry on the same explosive materials business or operations at the same address shown on, and for the remainder of the term of, a current license or permit. Such persons are: (1) The surviving spouse or child, or executor, administrator, or other legal representative of a deceased licensee or permittee; and (2) A receiver or trustee in bankruptcy, or an assignee for benefit of creditors. (b) In order to secure the right provided by this section, the person or persons continuing the business or operations shall furnish the license or permit for for that business or operations for endorsement of such succession to the Chief, FELC, within 30 days from the date on which the successor begins to carry on the business or operations.

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ATTACHMENT 3

Site Name/Location:	HGL License Number: 1-AL-089-20-0F-00632
Project Site Activity: MMRP Project	Supervisor's Name/Position:

Date of Manufacture or Other Acquisition	Lot Number or Manufacturer's Marks of Identification	Brand Name, Nomenclature or Description and Size-(when mixing binary materials)	Quantity Acquired	Name, Address, and License or Permit Number of Distributor

HGL MR Form 15.02 (Revised August 2017)

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ATTACHMENT 4

Nomenclature/Brand Name of Manufacturer:	Lot Number/Manufacturer Mark:	Hazard Class/Division:
Site Location/Name:	GPS Coordinate:	HGL License Number: **1-AL-089-20-0F-00632**

Date	Quantity In	Quantity Out	Current Balance	Action/Purpose (Receipt/Issue/Inventory)	Printed Name

HGL MR Form 15.03 (Revised August 2017)

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ATTACHMENT 5

Date:	Site Name/Location:	Grid #/Area or GPS coordinate:	Distributee Explosive License #: 1-AL-089-20-0F-00632

This form will be used as a Bill of Lading anytime explosives are transported in an HGL vehicle under DOT regulations and kept with the explosives driver in the vehicle until the explosives are issued, expended, or returned to storage.

SECTION I. Explosive Material Issued for Demilitarization/Demolition Operations:

Lot Number/Manufacturer's Marks of Identification	Brand Name, Nomenclature, or Description	Quantity	Hazard/ Class	Receipt Initials

Print Explosive Driver Name:	Explosive Driver Signature:
N/A	N/A

SECTION II. Explosive Material Expended by Detonation:

Lot Number/Manufacturer's Marks of Identification	Brand Name, Nomenclature, or Description	Quantity	Hazard/ Class	Receipt Initials

SECTION III. Explosive Material Returned to Storage:

Lot Number/Manufacturer's Marks of Identification	Brand Name, Nomenclature, or Description	Quantity	Hazard/ Class	Receipt Initials

Demolition Supervisor Signature:	SUXOS Signature:

HGL MR Form 15.05 (Revised August 2017)

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ATTACHMENT 6

Site Location:						
Contract Number:				Delivery/Task Order Number:		

Grid Coordinates	Anomaly No.	Identification	Date Located	Date Disposed	Method of Disposal	Comments

Reviewed and Accepted (print name)	Senior UXO Supervisor Signature	Date

HGL MR Form 15.04 (Nov 2010)

Page _____ of _____

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ATTACHMENT 7

Section 1 – Documentation and Instructions

1. This form applies to all vehicles which must be marked and placarded in accordance with DOT Title 49 CFR and will be retained in the cab of the vehicle with the driver operator.
2. This form will be completed in conjunction with the Vehicle Inspection Checklist and Bill of Lading forms.
3. Upon completion of explosive transportation operations this form will be retained in the project files and will be submitted to the HGL Huntsville office, attention MMRP Operations Manager at the completion of field activities.

Company:	
Date of inspection:	
Time of inspection:	
Location of inspection:	
Operator's name:	
Operator's license number:	
Medical examination current: ☐ Yes ☐ No	
Valid CDL with Hazardous Materials endorsement: ☐ Yes ☐ No	
Route plan and map: ☐ Yes ☐ No	
Hazardous Materials Compliance Handbook in vehicle: ☐ Yes ☐ No	
Vehicle Safety Inspection Checklist (HGL MR Form 15.23) completed and kept in vehicle: ☐ Yes ☐ No	
Bill of Lading (HGL MR Form 15.05) completed and kept in vehicle: ☐ Yes ☐ No	

Section 2 – Mechanical Inspection *(place "**X**" in the applicable box, if rejected, explain in block 3*:

	Satisfactory	Unsatisfactory		Satisfactory	Unsatisfactory
Horn operative	☐	☐	Tires, wheels, and rims	☐	☐
Steering system	☐	☐	Wheel chocks set	☐	☐
Windshield/wipers	☐	☐	Tailgate and doors	☐	☐
Mirrors	☐	☐	Cargo space clear	☐	☐
Warning signals	☐	☐	Non-sparking bed liner	☐	☐
Spare fuses	☐	☐	Tarpaulin and straps	☐	☐
Electrical wiring	☐	☐	Two 10-lb fire extinguishers	☐	☐
Lights and reflectors	☐	☐	Properly placarded on all sides	☐	☐
Fuel system	☐	☐	Detonator box	☐	☐
Exhaust system	☐	☐	Type 3 day box (IME 122)	☐	☐
Brake system	☐	☐	Explosives properly segregated	☐	☐
Suspension	☐	☐	Other (Explain in Block A.)	☐	☐
Inspection result *(If rejected provide reason in Block A.)*:			**ACCEPTED** ☐	**REJECTED** ☐	

ATTACHMENT 7 (continued)

A. Remarks:	
B. Inspector signature (origin):	**C.** Driver signature (origin):
D. Inspector signature (destination):	**E.** Driver signature (destination):

HGL MR Form 15.06 (Revised August 2017)

ATTACHMENT 8

OMB No. 1140-0026 (07/31/2014)

U.S. Department of Justice
Bureau of Alcohol, Tobacco, Firearms and Explosives

Report of Theft or Loss-Explosive Materials

For ATF Use Only

Date Received	Date Faxed to JSOC & Field Division	Unique Identifier
		Case Number

To Be Completed By Person Making Report

Upon discovery of any theft or loss of any of your explosive materials:
- First, contact ATF toll free at 1-800-461-8841 between 8:00 a.m. - 5:00 p.m. EST or after hours and weekends contact ATF at 1-800-800-3855 to report the theft or loss;
- Second, contact your local law enforcement office to report the theft or loss to obtain a police report; and
- Third, complete this form and attach any additional reports, sheets or invoices necessary to provide the required information, and fax the form with additional material(s) to the ATF U.S. Bomb Data Center (USBDC) at 866-927-4570 or email to USBDC@atf.gov.

1. Date

2. Type of Report *(Check one)*: ☐ Theft ☐ Loss ☐ Attempted Theft/Suspicious Activity ☐ Supplement

3. Full Name of Person Making the Report *(Last, First, Middle)*

4a. Licensee or Permittee Name

4b. Federal Explosives License or Permit Number

5a. Office Address *(Street Address, City, State, and Zip Code)*

5b. Telephone Number

5c. E-mail Address

6. Actual Location of Theft or Loss *(If different from item 5a)*

7. Theft or Loss	Date	Time
a. Discovered		
b. When Was the Magazine Last Checked		
c. Occurred *(Show approximate if exact not known)*		
d. Reported to ATF by Telephone		
e. Reported to Local Authorities		

8. Name of Local Law Enforcement Officer to Whom Reported

9. Name and Address of Local Authority to Whom Reported

10. Telephone Number

11. Police Report Number

12. Explosive Materials Lost or Stolen *(Attach invoices or additional sheets, if necessary)*

a. Manufacturer and/or Importer	**b. Brand Name**	**c. Date Shift Code**	**d. Size** *(Length & Diameter)*	**e. Quantity** *(Pounds of Explosives, Number of Dets)*	**f. Type and Description** *(Dynamite, Blasting Agents, Detonators, etc. Include for each type, size, MS delay or length of legwire, as applicable)*

ATF Form 5400.5
Revised July 2012

13. Theft or Loss Occurred from *(Check applicable box on each row)*

a. Magazine Type:

☐ 1 ☐ 2 ☐ 2 Det. Box ☐ 3 Day Box ☐ 4 ☐ 5

☐ Outdoor ☐ Indoor

☐ Permanent ☐ Portable ☐ Mobile Truck ☐ Mobile Trailer

☐ Overnight Storage ☐ Day Storage

b. Types of Locks *(Check all that apply)*:

☐ Padlock ☐ Mortise ☐ 3-Point ☐ Puck Lock ☐ Other *(Explain)* _____

c. Location Description/Type:

☐ Licensed/Permitted Premises ☐ Remote Storage ☐ Work Site ☐ In Transit ☐ During Operations

14. Method of Entry:

☐ Door Was a Key Used? ☐ Yes ☐ No Suspected Employee-Involved Theft? ☐ Yes ☐ No

☐ Wall(s) ☐ Roof ☐ Floor/Bottom

Lock(s) Defeated? *(If yes, check additional appropriate boxes)* ☐ Yes ☐ No

☐ Lock Shackle Cut *(How?)* _____ ☐ Lock Pried, Twisted or Levered

☐ Lock Left Unlocked ☐ Lock Picked or Shimmed

☐ Keyway Drilled Out ☐ Lock Body Drilled Out or Cut

☐ Other *(Explain)* _____

Manufacturer and Model of Lock:	Location of Magazine Keys: ☐ Office ☐ Employee ☐ Other *(Address)* _____	Are All Keys Accounted For? ☐ Yes ☐ No

15. Hood Defeated? *(If yes, check all applicable)* ☐ Yes ☐ No

☐ Hood Cut ☐ Hood Removed

☐ Other *(Explain)* _____ ☐ Hood Broken

Hood Width *(Inches)* _____ Hood Length (Inches) _____

Hood Depth *(Inches)* _____ Hood Thickness (Inches) _____

16. Other Information Pertinent to the Theft, Loss or Suspicious Activity *(Any details you can provide)*

16a. Was Theft or Loss Disclosed During an ATF Inspection or Being Reported as a Result of Inspection? ☐ Yes ☐ No

16b. Additional Security Measures in Place?

☐ Alarm ☐ Security System/Service ☐ Fencing ☐ Lighting ☐ Other *(Explain)* _____

17. Signature and Title of Person Making Report	18. Date

ATF Form 5400.5
Revised July 2012

ATTACHMENT 9

EXPLOSIVE RECORD MAINTENANCE AND USE INSTRUCTIONS

RECORD	USE	ELECTRONIC RECORD	ORIGINAL RECORD
Explosive Material Delivery Invoice	Verify actual invoice receipt for accuracy and legibility.		
Manufacturer of Explosives Record of Acquisition – Form 15.02	1. Record all on-call delivery acquisitions. 2. Record all to on-site storage delivery acquisitions. 3. Verify each item recorded on this form matches each item listed on the delivery invoice.	All explosive acquisitions or transactions occurring during a workweek will be submitted on the last workday of the week via email to the MMRP Operations Manager, email: nfeist@hgl.com and nmcmillan@hgl.com	1. Retain original record on file during field activities. 2. On completion of field activities submit to Huntsville office.
Daily Summary of Magazine Transactions (Magazine Data Card) – Form 15.03	1. Record all explosive material acquisitions, receipts, issues, and turn-ins on the day of occurrence. 2. Record all explosive material inventory activities.		
Explosive Material Disposition Record/ Bill of Lading – Form 15.05	Record upon occurrence all explosive materials: 1. Issued for demil/demolition operations. 2. Expended by detonation. 3. Turned-in for return to storage.		
MEC/UXO Accountability Record – Form 15.04		Not required	Upon completion of field activities submit to Huntsville office.

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HGL HydroGeoLogic, Inc Exceeding Expectations	**STANDARD OPERATING PROCEDURE**

Explosive Demolition Operations	**SOP No.: 502.01.1** **SOP Category: MMRP and Geophysics** **Revision No.: 1**
	Revision Date: January 2016 **Review Date: January 2017**

Approved By:

Jan Kool Digitally signed by Jan Kool Date: 2016.01.14 20:37:09 -05'00'

1/14/2016

Jan Kool, Ph.D.
Corporate QA Manager

Date

Digitally signed by Neil Feist
DN: cn=Neil Feist, o, ou=HGL, email=nfeist@hgl.com, c=US
Date: 2016.01.14 20:35:03 -06'00'

Neil Feist
MMRP Operations Manager

Date

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1.0 PURPOSE AND APPLICABILITY

This standard operating procedure (SOP) establishes the overall safe practices and procedures for conducting explosive demolition operations on HydroGeoLogic, Inc. (HGL) Military Munitions Response Program (MMRP) projects sites.

2.0 SUMMARY OF METHOD

This SOP applies to all HGL employees assigned to perform explosive demolition operations on HGL project sites. All employees tasked with performing munitions and explosives of concern (MEC)-related activities will be qualified in accordance with (IAW) Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 18 and the requirements specified by HGL SOP 501.01.1, *Explosive Materials Accountability and Management*, Section 5.0.

This SOP also applies to all instances where public safety may be affected by site conditions. Use this SOP in conjunction with approved project plans and the HGL SOPs cited in Section 8.0 of this SOP.

3.0 GENERAL REQUIREMENTS

Perform all work in a manner 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.

- Conduct all explosive activities in conformance with the Work Plan, Explosives Safety Submission (ESS)/Explosives Site Plan (ESP), Site Safety and Health Plan (SSHP) and HGL SOP 501.01.1.
- Procedures for packaging and disposing of all material potentially presenting an explosive hazard (MPPEH) generated during field activities will be described in the project-specific work plan and processed IAW HGL SOP 504.01.1, *MPPEH Inspection and Management*.

Personnel who use this procedure must complete the SOP acknowledgement form (see Attachment 1) and submit it to the Site Manager/Senior Unexploded Ordnance (UXO) Supervisor (SUXOS) and the Unexploded Ordnance Quality Control Specialist (UXOQCS) as evidence that they have read and understand this procedure. Site management will retain the SOP acknowledgement form in the project file.

Justify any deviations from the procedures specified in this SOP to the HGL Senior UXO Operations Manager and UXO Safety Manager for approval and inclusion in the project work plan before implementing. Do not compromise federal law in deviations. Thoroughly describe both deviations from requirements and the newly modified process in the justification documentation.

4.0 DEFINITIONS

APP	Accident Prevention Plan
BIP	blow-in-place
CCBC	counter-charge bottom centerline
CPR	cardiopulmonary resuscitation
DDESB	Department of Defense Explosive Safety Board
DoD	U.S. Department of Defense
DS	Demolition Supervisor
ESP	Explosives Site Plan
ESS	Explosives Safety Submission
EZ	exclusion zone
HE	high explosives
HFD-H	hazardous fragment distance-horizontal
HGL	HydroGeoLogic, Inc.
MDAS	material documented as safe
MDEH	material documented as an explosive hazard
MEC	munitions and explosives of concern
MMRP	Military Munitions Response Program
MPPEH	material potentially presenting an explosive hazard
MR	munitions response
MSD	minimum safe distance
PPE	personal protective equipment
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SUXOS	Senior Unexploded Ordnance Supervisor
TP	technical paper
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	UXO Safety Officer

5.0 PROCEDURES

This section describes the administration, training, and logistics necessary for conducting explosives demolition operations on HGL MMRP project sites.

5.1 DEMOLITION TEAM PERSONNEL

All employees are required to meet the minimum requirements listed in this procedure, but may request a variance if these procedures are unsafe or not compatible with contract or site-specific requirements. Obtain permission to vary from this procedure from the Project Manager and the HGL UXO Safety Manager. All employees are encouraged to submit comments and recommendations to improve this procedure.

All personnel engaged in demolition operations must be thoroughly trained in explosive safety and demolition procedures, and must be capable of recognizing hazardous situations and taking prompt corrective action. All UXO demolition team personnel must meet the minimum requirements specified by DDESB TP 18 and HGL SOP 501.01.1, Section 4.3, to perform tasks covered by this SOP.

Do not conduct demolition operations without client authorization, approved plans/SOPs, qualified and trained UXO technicians, and proper demolition and safety equipment.

5.2 DEMOLITION TEAM ASSIGNMENTS AND RESPONSIBILITIES

HGL demolition operations require specific organizational roles and personnel assignments as follows:

- **Senior Unexploded Ordnance Supervisor (SUXOS) (Demolition Supervisor)**
  - Serves as the Demolition Supervisor (DS), but may delegate this responsibility to a UXO Technician III level qualified individual;
  - Plans, directs, and executes all demolition operations;
  - When employing the services of a “certified blaster” from a licensed explosive dealer, allows only UXO technicians to place donor charges next to MEC/UXO;
  - Maintains explosive accountability for and security of all explosive materials issued for use during execution of demolition operations;
  - Maintains positive communications at all times with the Demolition Team and the UXO Safety Officer (UXOSO); and
  - Inspects the detonation site after each explosive detonation or any misfire and allows no one within the minimum safe distance (MSD) from the detonation site until the area is declared safe, but may delegate this responsibility to a qualified UXO Technician III.

- **UXOSO**
  - Ensures that all demolition operations are performed safely and IAW the approved site-specific plans and this SOP;
  - Establishes reliable primary and secondary communications before demolition operations begin;
  - Collaborates with the SUXOS before initiating any explosive charges to secure all roadways and access points to the MSD area and evacuate all personnel;
  - Verifies that the detonation site is inspected after each explosive detonation or misfire; and
  - Allows no one within the MSD until the area is declared safe.
- **Demolition Team** consisting of a minimum of three personnel or as required by the approved work plan. The minimum qualifications for demolition team members includes the following:
  - UXO Technician III or above performing the duties of DS,
  - A UXO Technician II or above to assist the DS during demolition operations, and
  - A UXO Technician I or above.

5.3 REFERENCE DOCUMENTS

Before beginning demolition operations, the SUXOS and UXOSO read and acquire a good working knowledge of the following approved documents and publications, and make them available on site during all demolition operations:

- U.S. Army Technical Manual 60A-1-1-31, *General Information on Explosive Ordnance Disposal Procedure*
- DDESB-approved ESP or ESS (if applicable)
- Work Plan or Technical Management Plan
- Accident Prevention Plan (APP)/SSHP

5.4 COORDINATION AND NOTIFICATIONS

The SUXOS conducts a coordination meeting to establish roles and responsibilities before demolition operations begin, and to address specific elements of planning and organizational responsibilities including but not limited to the following:

- Individual(s) assigned with ultimate responsibility for demolition operations,
- Demolition team assignments and responsibilities,
- Primary and secondary communications,
- Verification of reliable communications on remote sites,

- Explosive handling, storage, and transportation,
- Required support services, fire, medical, security, etc.,
- Emergency procedures,
- Notification process,
- Maintenance and control of exclusion zones (EZ):
  - Safety guard positions
  - Road barricades
  - EZ clearance prior initiation of demolition shot
  - Demolition team rally point
  - Posting of operation "all clear" procedures
- Community impact.

5.4.1 Public Meeting

In coordination with the client, HGL's Project Manager, Site Manager, or SUXOS may be required to hold a public meeting before beginning demolition operations when demolition operations potentially impact the local civilian community. Topics could include the following:

- Daily hours of operation,
- Requirements for evacuation of occupied residences and road closures,
- EZs/MSD boundaries, and
- Community impact.

5.4.2 Notifications

The SUXOS notifies emergency response agencies as far in advance as possible that disposal activities will take place. The notifications include information on scheduling, evacuations, road closures, EZs, and any other required support. The following agencies are typically notified, as applicable:

- Public utility companies (electric, gas and water),
- Paramedic/emergency medical technician squad,
- Local fire department,
- Local law enforcement/police department,
- Security agency, and
- Local airport (Federal Aviation Administration, etc.).

5.4.3 Public Utility Services

The SUXOS notifies the appropriate utility company officials when demolition operations could potentially impact public utilities. When situations mandate the demolition of a MEC hazard near public utilities, take precautions to prevent damaging or disrupting these services, with either protective measures (engineering controls) or with relocation of the MEC hazard to a safe

distance when the SUXOS and UXOSO have jointly determined that the MEC hazard is acceptable to move.

5.5 EXCLUSION ZONES, EVACUATIONS, AND ROAD CLOSURES

Base the EZ for all demolition operations on the munition with the greatest fragmentation distance as identified in the project work plan and/or ESP/ESS. Before initiating explosive demolition operations to demilitarize, destroy, or dispose of MEC hazards, evacuate all personnel to a safe location beyond the MSD as determined by DDESB TP 16 calculation methodologies.

When conducting explosive demolition of MEC items, observe the greater of the following: hazardous fragment distance-horizontal (HFD-H), unless reduced by DDESB-approved engineering controls, or the calculated K328 distance using the formula $D=328W^{1/3}$. The following procedures should also be implemented:

- Post the necessary warnings and safety controls before beginning explosive operations. Posters or flyers may be suitable in some cases. Identify the location of operations, the times operations begin and end, and the contact person for verifying safe passage through an area.
- Maintain positive site control at all times during any explosive operation.
- Establish the highest degree of public safety by placing barricades at access points on residential streets and roads and by posting an appropriate number of safety guards at key locations to prevent access to the EZ before conducting explosive operations.

Once demolition operations are in progress, do not allow the public and other nonessential personnel into the EZ under any circumstances. Grant re-entry into the EZ only under the following conditions:

- The SUXOS has granted essential personnel an “all-clear.”
- The UXOSO has completed a post-detonation assessment of the EZ and determined the area safe to access.

5.6 TWO-PERSON RULE

The two-person rule is a safety concept that requires two knowledgeable individuals to perform potentially hazardous operations. These individuals must be trained and be capable of recognizing safety hazards and improper procedures. The two-person rule applies whenever explosives are handled or transported during demolition operations. No one should handle or assemble explosives alone.

5.7 DEMOLITION OPERATIONS BRIEF

Before beginning any explosive operations, hold a demolition operation briefing for all personnel assigned to or working with disposal teams to review MEC explosive demolition and emergency response procedures. Use applicable SOP attachments to cover topics including, but not limited to, the following:

- APP/SSHP,
- This SOP,
- Demolition firing systems and components,
- Disposal charge placement,
- Explosives transportation,
- Site munitions brief,
- Type and condition of MEC,
- Emergency response equipment,
- Emergency procedures,
- Two-person rule, and
- Team assignments.

5.8 EQUIPMENT, MATERIAL, AND VEHICLE REQUIREMENTS

The DS ensures that all required equipment and materials are available. Use the checklists in the attachments to this procedure to verify and document equipment and material availability. At minimum, verify the following are available before beginning each disposal operation:

- Demolition equipment (Attachment 3),
- Safety Equipment (Attachment 4),
- Explosive vehicles (HGL SOP 503.01.1),
- Safety vehicle(s), and
- Designated personnel accountability and assembly location/rally point.

5.9 COMMUNICATIONS

Use field handheld portable radios for primary communications. Post contact information for emergency services, including telephone numbers for the project personnel, in the APP/SSHP.

Use cellular telephones for secondary communication. Post telephone numbers for the HGL key personnel in the APP.

– W A R N I N G –

Maintain radio communication between the demolition team and SUXOS at all times.

5.10 EXPLOSIVE VEHICLE TRANSPORTATION

Use vehicles that comply with the regulations specified by the Department of Transportation, 49 Code of Federal Regulations §§ 171, 173, and 177, and HGL SOP 501.01.1, Section 4.7, to transport explosive materials.

5.11 WEATHER AND ENVIRONMENTAL CONSIDERATIONS

The UXOSO will obtain a local weather report before beginning demolition operations. Do not conduct demolition operations when electrical storms are within 10 miles of site operations, when visibility restricts positive control of the EZ, or when weather conditions impact safety.

5.12 EMERGENCY MEDICAL SUPPORT

Ensure that the telephone number of the responding medical facility is posted in the APP/SSHP or is otherwise available to site personnel. If required, notify emergency medical personnel of the location and duration of demolition operations each day. At least two on-site UXO personnel will be first aid and cardiopulmonary resuscitation (CPR) qualified.

5.13 FIRE PREVENTION PLAN

Ensure that the telephone number of the responding fire department is posted in the APP/SSHP or is otherwise available to site personnel. If required, notify the fire department of the location and duration of demolition operations each day. Keep fire extinguishers and shovels on site to fight small fires. Evacuate personnel from the area if the fire approaches munitions or explosives. Do not fight grass fires in areas where there may be munitions or kickouts.

5.14 PERSONAL PROTECTIVE EQUIPMENT

Conduct demolition operations in Level D personal protective equipment (PPE) consisting of cotton, GORE-TEX®, or other nonstatic producing clothing and foul weather gear; gloves; safety glasses; and composite or steel-toed boots. The UXOSO verifies that the proper PPE is procured, issued, and used by project personnel and that daily checks are performed to ensure continued PPE availability and use.

5.15 EXPLOSIVE OPERATIONS PROCEDURES

Allow only HGL UXO-qualified personnel to conduct demolition operations on HGL munitions response project sites. Follow these general safety guidelines at all times during all demolition operations:

- Blow-in-place (BIP) MEC items found requiring demolition that the SUXOS and UXOSO consider unacceptable to move.
- The SUXOS and UXOSO jointly declare when MEC items are acceptable to move.

- Move MEC items deemed acceptable to move by the SUXOS and UXOSO to a single item location within the munitions response site for destruction when approved in project plans.
- Vent MPPEH or material documented as an explosive hazard (MDEH) items to facilitate 100 percent inspection of all surfaces.
- Do not conduct demolition operations without proper authorization.
- When required, use engineering controls (for example, sandbag mitigation) to reduce blast and fragment hazards.

5.15.1 Engineering Controls

Employ engineering controls IAW the project plans and DDESB guidance.

5.15.2 Initiation Sequence

The SUXOS or DS ensures that the following steps are taken before initiating any demolition shot:

1. All required notifications have been completed.
2. The EZ has been established and guards have been posted at access points.
3. The EZ and surrounding area have been visually inspected for unauthorized personnel.
4. The following demolition warnings announcements have been issued on the handheld/mobile radio before the demolition shot(s):
    a. **Five-minute warning:** The DS announces a warning 5 minutes before the shot(s).
    b. **One-minute warning:** The DS announces a warning 1 minute before the shot(s).

After these steps have been completed, the SUXOS/DS shouts three loud “Fire in the Hole!” warnings and then gives the “fire” command on the radio.

After the demolition shot has been cleared, the SUXOS/DS announces over the radio an “all clear.” The SUXOS/DS then announces on the radio that demolition operations have ceased.

5.15.3 Initiation Systems

The following applies to the initiation systems used in explosives operations:

- The primary firing system: remote firing device with Nonel®.
- The alternate primary firing system: remote firing device with electric blasting caps.

- The secondary system: blasting machines or initiators capable of electric or Nonel® initiation.
- In areas of high electromagnetic radiation, or a high fire index, use a Nonel® system.

5.15.4 Blow-in-Place Operations

Verify the following before a MEC item is BIP:

- An appropriate EZ for the MEC encountered has been established and evacuation of the area has been confirmed.
- When applicable, the appropriate engineering controls are in place for the reduction of the fragmentation hazard.
- The following emergency support services have been notified and are standing by in position:
  - Emergency services (when required)'
  - Fire department, and
  - Law enforcement.
- Make every effort to establish the firing point in a location where the SUXOS and the UXOSO can visually observe the entire EZ.

Fire all BIP operations by positive control methods. Use Nonel® or direct command remote control firing device initiation to maintain positive control up to the point of detonation.

5.15.5 Phosphorus-Filled Munitions

When munitions containing plasticized white phosphorus, red phosphorus, or white phosphorus fillers are encountered, adhere to the following procedures:

- Wear protective clothing, including helmets with full-face shields, a welder's apron, and gloves when handling suspected phosphorus-filled munitions.
- Instruct medical support personnel that they are supporting phosphorus-filled munitions demolition operations and have first aid treatment materials on hand.
- If an accident occurs in the field, irrigate phosphorus wounds with water, and apply a saline-soaked dressing. Keep the dressing wet until medical personnel arrive.
- Keep an ample supply of water and sand readily available when handling suspected phosphorus-filled munitions.
- If safe to do so, counter-charge bottom centerline (CCBC) phosphorus-filled munitions to disperse the phosphorus in the air for complete combustion.

- Verify that all phosphorus has been consumed when returning to the disposal site after detonation of phosphorus-filled munitions.
- Do not approach the area until all smoke has cleared and the SUXOS has declared the area safe.

5.15.6 MPPEH

Consider all potential munitions-related items to be MPPEH until they have undergone a 100 percent inspection by a UXO Technician II and a 100 percent re-inspection by a UXO Technician III. Designate MPPEH items that cannot be 100 percent visually inspected as MDEH IAW U.S. Department of Defense (DoD) Instruction 4140.62.

Treat MDEH as Hazards Class/Division 1.1 material until it has undergone the proper treatment process specified by the work plan and/or the DDESB-approved ESP/ESS. **Do not** co-mingle MDEH with any other material until it has (1) undergone the required treatment process, (2) undergone a second 100 percent inspection by a UXO Technician II, (3) undergone a 100 percent re-inspection by a UXO Technician III, and (4) met the designation requirement of material documented as safe (MDAS).

Upon completion of the venting and/or demolition shot, UXO technicians conduct a thorough inspection of the surrounding area. The resulting MPPEH will be inspected before final disposition to determine its designation as either MDEH or MDAS IAW project plans and HGL SOP 504.01.1.

6.0 SAFETY

The SUXOS and UXOSO ensure that all demolition operations on HGL munitions response (MR) project sites are conducted in the safest possible manner for protection of project personnel, the public, and project equipment assets. The SUXOS and the UXOSO brief all demolition team members on and verify that they understand Attachments 2, 4, and 5 of this SOP before the execution of any explosive operation.

7.0 DATA AND RECORDS MANAGEMENT

The SUXOS, DS, and UXOQCS use the forms and checklists identified by this SOP and HGL SOP 501.01.1, *Explosive Materials Accountability and Management*, for all HGL demolition operations. The following checklists are used to verify that all demolition operations personnel assignments and functions, and explosive expenditures are properly documented and recorded:

- Disposal Operations Checklist (Attachment 2)
- Post-Demolition Operations Checklist (Attachment 8)
- Three Phase Quality Control Checklist (Attachment 9)

The following documents must be on site during disposal operations in conjunction with this SOP:

- Approved work plan,
- Approved SSHP,
- Approved ESP or ESS (when applicable),
- Range certification (when applicable),
- HGL SOP 501.01.1, *Explosive Materials Accountability and Management*,
- HGL SOP 503.01.1, *Explosives Storage Inspection and Security*, and
- HGL SOP 504.01.1, *Material Potentially Presenting and Explosive Hazard Inspection and Management*.

8.0 REFERENCES

Bureau of Alcohol, Tobacco, Firearms and Explosives, 2012. Publication 5400.7, Federal Explosives Laws and Regulations (27 CFR § 555). April.

Code of Federal Regulations, Title 49, Parts 171, 173 and 177 (U.S. Department of Transportation and Other Regulations Relating to Transportation).

HydroGeoLogic, Inc. (HGL), 2015. Standard Operating Procedure (SOP) 501.01.1, Explosive Materials Accountability and Management. December.

HGL, 2015. SOP 503.01.1, Explosives Storage Inspection and Security. December.

HGL, 2015. SOP 504.01.1, Material Potentially Presenting an Explosive Hazard Inspection and Management. December.

U.S. Army, 2008. Technical Manual 60A-1-1-31, General Information on Explosive Ordnance Disposal Procedure. October.

U.S. Army Corps of Engineers, 2008. Engineer Manual 385-1-97, Explosives Safety and Health Requirements Manual. September.

U.S. Department of Defense (DoD), 2008. Explosive Safety Board Technical Paper 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, December.

DoD, 2010. Manual 6055.9-M, DoD Ammunition and Explosives Safety Standards. February.

DoD, 2008. Instruction 4140.62, DoD Ammunition and Explosives Safety Standards. November.

ATTACHMENTS

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ATTACHMENT 1

SOP ACKNOWLEDGEMENT SHEET

SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the activities described in this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure that all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker's statement for this purpose. I will ensure that the SOP contains current procedures. If a 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.

_____ _____

Senior UXO Supervisor Date

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 IAW the SOP, I will stop the process and notify my immediate supervisor.

Worker's Name	Date	Supervisor's Name

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ATTACHMENT 2

	ATTACHMENT 2 DEMOLITION OPERATIONS CHECKLIST		
	FUNCTION CHECK	**DATE/TIME**	**INITIALS**
1.0 SENIOR UXO SUPERVISOR:			
1. Assign Demolition Team: a. SUXOS: _____ b. Demolition Supervisor: _____ c. Demo Team Assistant: _____ d. Demo Team Member: _____ e. Demo Team Member: _____ f. UXOSO: _____ 1) Safety Position #1: _____ 2) Safety Position #2: _____ 3) Safety Position #3: _____ 4) Safety Position #4: _____ g. Other: _____			
2. Communications: a. Radio call signs / cellular numbers: 1) SUXOS: _____ /_____ 2) DS: _____ /_____ 3) UXOSO: _____ /_____ 4) Safety Position-1: _____ /_____ 5) Safety Position-2: _____ /_____ 6) Safety Position-3: _____ /_____ 7) Safety Position-4: _____ /_____			
3. Brief Demolition Team: a. Review emergency procedures. b. Discuss MEC/MC/UXO to be disposed. c. Describe Disposal procedures.			

	ATTACHMENT 2 DEMOLITION OPERATIONS CHECKLIST	
FUNCTION CHECK	**DATE/TIME**	**INITIALS**
4. Inspect Range/Exclusion zone upon completion of operations.		
2.0 DEMOLITION SUPERVISOR		
1. Verify roads are closed.		
2. Verify exclusion zone boundaries in place.		
3. Complete health and safety and equipment checklists.		
4. Ensure command center has completed the verification checklist: a. Responsible activity. b. Medical Facility. c. Fire Department. d. Security/Police Department.		
5. Disposal Supervisor tailgate safety brief: a. Designate emergency vehicles. b. Designate emergency evacuation route. c. Review emergency response procedures.		
6. Verify daily equipment inspection.		
7. Verify detonators are separated from explosives.		
8. Verify area has been evacuated.		
9. Notify command center operations are commencing.		
10. Start disposal activities.		
11. UXOSO ensures detonation site inspected after designated wait time.		
12. Collect all metal fragments for later disposal.		
13. QC check performed.		
14. Stop disposal activities.		

	ATTACHMENT 2 DEMOLITION OPERATIONS CHECKLIST		
	FUNCTION CHECK	**DATE/TIME**	**INITIALS**
	15. QA check (if required). 16. HGL notification upon completion of demolition operations: a. Notify Client: _____ b. Responsible Activity: _____ c. Medical Facility: _____ d. Fire Department: _____ e. Local Police/Security: _____ f. Public Utility Company: _____ 17. Complete HGL Form MEC/UXO Accountability Log. 18. Complete Post Demolition Operation Checklist, Attachment 8.		
	Demolition Supervisor Signature:	**Date:**	

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ATTACHMENT 3

DEMOLITION EQUIPMENT CHECKLIST

Equipment	Quantity	Comments
Explosive Vehicle(s)		
Personnel Vehicle(s)		
Handheld Radios		
Camera		
Day Boxes		
Wheel Chocks		
Placards		
Fire Extinguishers, 1A 10BC		
Sand Bags		
Tie Downs		
Locks		
Demolition Kit		
Cutter, NONEL		
Knife		
Duct tape		
Electrical tape		
Galvanometer		
Firing Device / Blast Machine		
Shovel		
Firing Wire		
Measuring tape, 50- or 100-meter		
Toolbox, general hand tools		
Magnetometer / Detector		

Checklist Verification

Disposal Supervisor Signature:	**Date:**

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ATTACHMENT 4

SAFETY EQUIPMENT CHECKLIST

1.0 EQUIPMENT	QUANTITY	COMMENTS
Burn Blanket		
Emergency Eye Wash		
Fire Blanket		
Fire Extinguishers, 1A 10BC		
First Aid Kit		
Leather gloves		
Goggles		
Face Shield(s)		
Welder's Gloves		
Welder's Apron(s)		
Safety Vest(s)		
Stretcher		
Water, 5-gal		
Water, drinking		
Other:		
Other:		

2.0 CHECKLIST VERIFICATION

Disposal Supervisor Signature:	Date:

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ATTACHMENT 5

GENERAL SAFETY PRECAUTIONS

1. Carry blasting caps in approved containers and keep them out of direct sun. Keep the caps located at least 25 feet from other explosives until they are needed for priming.

2. Do not work with electric blasting caps or other electro-explosive devices while wearing clothing prone to producing static electricity such as nylon, silk, synthetic hair, etc.

3. Do not use explosives or accessory equipment that is obviously deteriorated or damaged. They may cause premature detonation or fail completely.

4. Always point the explosive end of blasting caps, detonators, and explosive devices away from the body during handling.

5. Use only standard blasting caps of at least the equivalent of a commercial No. 8 blasting cap.

6. Use electric blasting caps of the same manufacturer for each demolition shot involving more than one cap.

7. Do not use improvised methods for initiating blasting caps.

8. Do not bury blasting caps. Use detonating cord to transmit the explosive wave from the blasting caps, on the surface, to a buried/tamped explosive charge. Buried blasting caps are subject to unobserved pressures and movement, which could lead to premature firing or misfires.

9. Test electric-blasting caps for continuity at least 50 feet from any other explosives prior to connecting them to the firing circuit. Upon completion of testing, the lead wires will be shunted by twisting the bare ends of the wires together. The wires will remain shunted until ready to be connected to the firing circuit.

10. In the event of a misfire when disposing of explosives by detonation, do not approach the disposal site for at least 60 minutes after the expected detonation time, when firing electrically. When conducting non-electric procedures, the wait time will be at least one hour from the expected time of detonation.

11. Items with lugs, strong backs, tail-booms, base plates, etc., should be oriented away from personnel locations.

12. Consideration should be given to tamping the UXO to control fragments, if the situation warrants. Fragments will be minimized not only to protect personnel but also property, such as buildings, trees, etc.

13. Avoid inhaling the smoke, dust, or fumes of burning pyrotechnic or incendiary materials. The smoke, dust and fumes from many of these materials are irritating and/or toxic if inhaled.

14. Do not use water on incendiary fires. Water may induce a violent reaction or be completely ineffective, depending on the mixture.

15. Anticipate a high order detonation when burning pyrotechnic or incendiary-loaded MEC. Safety

measures for personnel and property must be based upon this possibility.

16. Inert munitions will not be disposed of, or sold for scrap, until the internal fillers have been exposed and unconfined. Heat generated during a reclamation operation can cause the inert filler, moisture, or air to expand and burst the sealed casings. Venting or exposure may be accomplished in any way necessary to preclude rupture due to pressure from being confined. All requirements of the UXO Procedure for the Management and Disposition of Material Potentially Presenting an Explosive Hazard (MPPEH) will be met prior to releasing any inert munitions material.

17. Maintain minimum safe distances between electromagnetic-radiating sources and electro-explosive devices (IAW EODB/TM-TO 60A-1-1-12).

18. Do not conduct blasting or Demolition operations during an electrical, dust, sand, or snowstorm severe enough to produce atmospheric static electrical charges, or when such a storm is nearby (within 10 miles). Under such conditions, all operations will be suspended or terminated, cap and lead wires shunted, and personnel removed from the demolition area. Demolition operations will also be terminated if visibility becomes less than 600 feet.

19. Loose initiating explosives: lead azide, mercury fulminate, lead styphnate, and tetracene. These explosives manifest extreme sensitivity to friction, heat, and impact. Extra precautions are required when handling these types of explosives. Keep initiating explosives in a water-wet condition at all times until ready for final preparation for detonation. Sensitivity of these explosives is greatly increased when dry.

20. Exercise extreme care when handling and preparing high explosives for detonation. They are subject to detonation by heat, shock, or friction.

21. Do not pack bomb fuze wells with explosives unless it can be positively confirmed that the fuze well does not contain any fuze components.

22. Photo flash bombs must be handled with the same care as black powder-filled munitions.

23. MEC containing phosphorus will not be detonated into the ground. Phosphorus-filled munitions will be counter-charged on the bottom centerline (CCBC) when possible.

24. A search of the detonation site, after the demolition operation, will be conducted to assure complete disposal was accomplished.

25. Do not abandon any explosives.

26. Do not leave explosives, empty cartridges, boxes, liners or other materials used in the packing of explosives lying around where children, unauthorized persons or livestock can get at them.

27. Do not allow any wood, paper or other materials used in packing explosives to be burned in a stove, fireplace, or other confined space, or be re-used for any other purpose. Such materials will be destroyed by burning at an isolated location out of doors, with no one allowed within 100 feet of the burning operation.

28. Do not fight fires involving explosive material. Evacuate all personnel to a safe location and secure the area.

29. Know and observe federal, state, and local laws/regulations that apply to the transportation, storage,

and use of explosives.

30. Do not permit metal, except approved metal truck bodies, to contact explosive containers.

31. Do not transport metal, flammable, or corrosive substances with explosives.

32. Do not allow smoking, or the presence of unauthorized personnel, in vehicles transporting explosives.

33. Carefully load and unload explosives from vehicles. Never throw or drop explosives from the vehicle.

34. Assure the load is blocked and braced to prevent it from movement and displacement.

35. Do not drive vehicles containing explosives over public highways until all permits and certifications have been obtained from the state enforcement agencies.

36. All routes must be approved in writing prior to transporting explosive materials over public highways.

37. Licensed commercial carriers will conduct the shipment of explosive materials over public highways unless HGL UXO personnel have been specifically licensed and certified to make the shipment.

38. Never leave a vehicle that is loaded with explosives unattended.

39. Do not store blasting caps, detonators, or other items containing initiating explosives in the same box, container, or magazine with other explosives.

40. Store explosive materials in military or BATF-approved magazines only. Ensure the magazines used for the storage comply with quantity distance requirements, for the class of explosive material they contain. Reference documents include: Explosives Law and Regulation, BATF P 5400.7, and 49 CFR.

41. Do not store spark-producing metal/tools in an explosive magazine.

42. Do not permit smoking, matches, or any source of fire or flame within 100 feet of an explosive magazine.

43. Do not allow leaves, grass, brush, or debris to accumulate within 50 feet of an explosive magazine.

44. Do not permit the discharge of firearms within 300 feet of an explosive magazine.

45. Do not use any alkaline material such as lye, washing soda, or soap to remove TNT exudate. Alkaline materials will react with TNT to render it more sensitive.

46. Do not permit smoking, matches, or other sources of fire or flame within 100 feet of an area in which explosives are being handled.

47. Do not expose explosives or devices containing explosive to prolonged exposure to direct sun light. Such exposure can increase sensitivity and deterioration.

48. Ensure all unused explosives are returned to their proper containers and the container closed after use.

49. Do not carry explosives or explosive components in pockets or on the body.

50. Do not insert anything but time fuse or detonating cord into the open end of a blasting cap.

51. Do not strike, tamper with, or attempt to remove or investigate the contents of an electric/non-electric blasting cap, detonator, or other explosive initiating device. A detonation may occur.

52. Do not pull on the electrical lead wires of electric blasting caps, detonators, or their electro-explosive devices. A detonation may occur.

53. Do not attempt to remove an unfired or misfired primer or blasting cap from a base coupling. There is a high risk of an explosion.

54. Do not allow unauthorized or unnecessary personnel to be present when explosives are being handled.

55. Always point the explosive end of blasting caps, detonators, and other explosive devices away from the body.

56. Do not use pull rings or safety pins to lift or handle explosive devices.

ATTACHMENT 6

EXPLOSIVE SYSTEMS CONFIGURATION

1.0 REMOTE FIRING DEVICE

1. The following guidance refers to the Rothenbuhler remote firing device. If alternative firing devices are used, follow the applicable manufacturer's guidance.
2. Perform system pre-operational test and set up using the Rothenbuhler Operator's Manual. Remove key from controller unit until ready to fire.
3. Place the remote near the detonation site with the antenna in the vertical position. If using electric caps the remote should be within 100 feet of the shot. Use the unit blast shield, sandbags, or natural cover to protect the remote.
4. Ensure the remote indicates a READY condition for the selected initiation method (green READY LED on steady, red ARMED LED off).
5. If using Nonel®/shocktube, connect the shock tube to the igniter tip. The tube should be wrapped around through holes in the tip's molded casing to keep it from falling out. Prime the shot and return to the safe area.
6. If using electric caps, cut off a length of firing wire that will reach between the remote and the charges (100 feet or less).
7. Conduct a continuity check of the firing wire with a galvanometer. Shunt the free ends of the wire to prevent an electric charge from building up in the firing wire.
8. Test each electric blasting cap 50 feet downwind of other explosives with a galvanometer.
9. Place blasting caps in a hole, behind a barricade, or under a sandbag before removing the shunt and testing for continuity.
10. Fully extend the leg wires and ensure the cap is pointing away from the person conducting the continuity test.
11. Secure the leg wires to prevent the cap from moving during the test.
12. Use only a special silver-chloride dry cell battery in the testing galvanometer. Other type batteries may provide sufficient voltage to fire the blasting cap.
13. Upon completion of testing, re-shunt the leg wires. The wires will remain shunted until ready to connect to the firing circuit.
14. For dual priming connect blasting caps in a parallel circuit to the extension wires.
15. Test the circuit with the galvanometer, and then connect extension wires to the remote.
16. Retrieve caps from barricade, prime shot, and return to safe area.

17. Retrieve caps from barricade, prime shot, and return to safe area.

2.0 FIRING THE REMOTE FIRING DEVICE

1. The SUXOS will verify that the exclusion zone is clear and barricades are in place.
2. The SUXOS will give a "five-minute warning" over the radio.
3. The SUXOS will give a "one-minute warning" over the radio.
4. Install the key and engage the "POWER" switch on the controller to the right until the BATTERY LED illuminates.
5. Momentarily depress the controller STATUS button. The yellow TRANSMIT LED will flash for approximately one second. At the end of this time a green READY LED will come on steady, indicating that the remote is on and in the standby mode. The steady green LED also indicates the remote is within range of the controller.
6. Push the ARM/DISARM switch to the left and hold for one second. The red ARMED LED will flash for approximately 18 seconds and then come on steady. The remote is now armed.
7. UXO Demolition Supervisor gives three loud "Fire-in-the-Hole" warnings.
8. SUXOS gives fire command on the radio.
9. SUXOS gives permission to fire the shot.
10. Lift the safety cover on the FIRE switch and push the FIRE switch forward.

3.0 PREPARATION OF THE SCORPION ELECTRONIC BLASTING MACHINE

1. The following guidance refers to the Scorpion Electronic Blasting Machine. If alternative blasting machines are used, follow the applicable manufacturer's guidance.
2. Perform pre-operational check as per instructions on blasting machine.
3. Lay out firing wire or Nonel®/shocktube.
4. Conduct a continuity check of the firing wire with a galvanometer. Shunt the free ends of the wire to prevent an electric charge from building up in the firing wire.
5. Test each blasting cap with a galvanometer 50 feet away from other explosives.
6. Place blasting caps in a hole, behind a barricade, or under a sandbag before removing the shunt and testing for continuity.
7. Fully extend the leg wires and ensure the cap is pointing away from the person conducting the continuity test.
8. Secure the leg wires to prevent the cap from moving during the test.
9. Use only a special silver-chloride dry cell battery in the testing galvanometer. Other type

batteries may provide sufficient voltage to fire the blasting cap.

10. Upon completion of testing, re-shunt the leg wires. The wires will remain shunted until ready to connect to the firing circuit.

11. For dual priming, connect blasting caps in a parallel circuit to the firing wire.

12. Retrieve caps from barricade, prime shot, and return to safe area.

4.0 FIRING THE SCORPION ELECTRONIC BLASTING MACHINE

1. The SUXOS will verify that the exclusion zone is clear and barricades are in place.

2. The SUXOS will give a "five-minute warning" over the radio.

3. The SUXOS will give a "one-minute warning" over the radio.

4. If firing electric check firing wire with a galvanometer.

5. Connect the firing leads to the terminal posts of the blasting machine.

6. For Nonel®/shocktube, plug in the shock tube adapter and attach Nonel®/shocktube.

7. UXO Demolition Supervisor gives three loud "Fire-in-the-Hole!" warnings.

8. SUXOS gives fire command on the radio.

9. SUXOS gives permission to fire the shot.

10. Degrees and hold CHARGE button (keep depressed throughout sequence).

11. Press DETONATE button when green ready light comes on. For non-electric shots, hold DETONATE button down for one second and release.

5.0 MISFIRE PROCEDURES FOR THE REMOTE FIRING DEVICE

1. Make three successive attempts to fire.

2. Turn off the controller and remove the key.

3. Wait 60 minutes from the last initiation attempt.

4. After the wait time has elapsed, the Demolition Supervisor and a safety observer will proceed down range to inspect the firing system.

5. If Nonel®/shocktube was used, do not remove the caps from the charge. Disconnect Nonel®/shocktube from the igniter tip on the remote. Place a new, primed explosive charge next to the misfired charge.

6. If electric caps were used, remove the old blasting caps from charge and disconnect from extension wires. Shunt cap leg wires.

7. If detonating cord was used, cut detonating cord between cap and charge, and disconnect cap

from extension wires. Shunt cap leg wires.

8. Set up new firing system.

6.0 MISFIRE PROCEDURES FOR THE SCORPION ELECTRONIC BLASTING MACHINE

1. Make three successive attempts to fire.
2. If using firing wire and still unsuccessful, disconnect wires and check continuity.
3. If continuity is good, reconnect to blasting machine and make three more attempts to fire.
4. If still unsuccessful, check connections of firing wires to terminals and make three more attempts to fire.
5. Change blasting machine after third unsuccessful attempt.
6. If unsuccessful with new blasting machine, disconnect and shunt firing leads.
7. If using Nonel®/shocktube, disconnect from blasting machine.
8. Wait 60 minutes from the last initiation attempt.
9. After the wait time has elapsed, the Demolition Supervisor and a safety observer will proceed down range to inspect the firing system.
10. If electric caps were used, remove old blasting caps from charge and disconnect from firing wire. Shunt cap leg wires.
11. If detonating cord was used, cut detonating cord between cap and charge and disconnect cap from fire wire. Shunt cap leg wires.
12. If Nonel®/shocktube was used, do not remove the caps from the charge. Place a new, primed explosive charge next to the misfired charge (FM-5-250).
13. Set up new firing system.

7.0 SHOCK TUBE FIRING SYSTEMS

Shock tube is a thin plastic tube of extruded polymer with a layer of special explosive dust deposited on its interior surface. The special explosive dust propagates a detonation wave, which is normally contained within the plastic tubing. Shock tube offers the instantaneous action of electric initiation without the risk of accidental initiation of the blasting cap by radio transmitters in the area or by static electricity discharge. The shock tube medium is extremely reliable.

The high reliability of shock tube blasting is due to the fact that all of the components are sealed and, unlike standard non-electric priming components, cannot be easily degraded by moisture. Cutting the shock tube makes the open end vulnerable to moisture. Care should be taken to keep moisture from the cut end of the shock tube. Use the following procedures to cut and splice shock tube.

1. Use a sharp knife or razor blade to squarely cut (90-degree angle) approximately 18 inches from a new roll or the cut-off end of a partial roll.

2. Loosely tie the two shock tube ends to be spliced together in a SQUARE KNOT. Leave at least 2 inches free at the end of each shock tube beyond the knot.

3. Pull the shock tube lightly to tighten the knot, but not so tight as to significantly deform the shock tube in the knot.

4. Use only the splicing tubes provided to make splices. Taping the two cut ends of shock tube together does not make a reliable splice.

5. Push one of the free shock tubes, to be spliced, firmly into one of the pre-cut splicing tubes at last 1/4 inch.

6. Push the other shock tube end firmly into the other end of the splicing tube at least 1/4 inch. Attempt to push the two ends up against each other or get as close as possible.

7. Secure splice with electrician's tape.

8. Each additional splice in shock tube reduces the reliability of the priming system. Minimize the number of splices in a shock tube line to as few as possible.

9. Spool out the desired length of shock tube and cut off squarely with a sharp knife or razor blade.

10. Secure the shock tube remaining on the spool by tying a tight overhand knot in the loose end.

11. Protect the open end of the shock tube by sealing it with the end caps provided or with electrician's tape.

12. Attach an initiator to the free end of the shock tube that is spliced into the blasting cap. If a separate blasting cap or detonating cord is used to actuate the shock tube, tie a tight overhand knot in this end

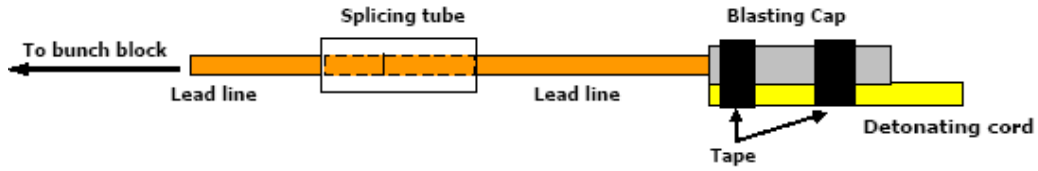
8.0 SHOCK TUBE SET-UP

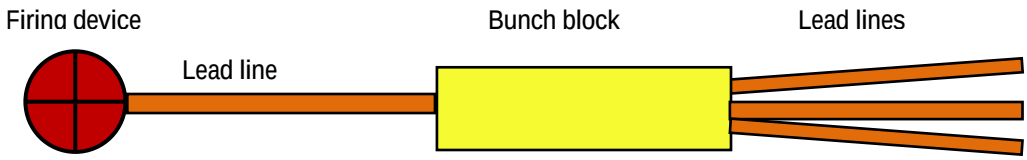
1. Lay out required length of shock tube (trunk line) from demo area back to the firing point.

2. Attach an EZTL 30 bunch block (or equivalent) using the supplied splicing tube to the lead line at demo site. Secure the bunch block or immobilize with sandbags. Run additional lead line(s) from bunch block to OE (See Figure 1).

3. Attach only a maximum of six additional leads per bunch block. Use additional bunch blocks, if necessary.

FIGURE 1 – SHOCK TUBE SETUPS





9.0 DONOR EXPLOSIVES

The primary donor explosives used for MEC disposal will be the boosters, plastic explosives, jet perforators, or binary explosives.

9.1 BOOSTER

1. Insert appropriate grain detonating cord into the detonator well. Insert all the way through and back through other hole and tie an overhand knot to secure it.

2. When using more than one booster, insert detonating cord through each of the boosters' detonator wells and secure to keep them from sliding along the detonating cord.

9.2 Plastic Explosives

Set up with blasting cap(s) or detonating cord lead(s) as per EODB 60A-1-1-31.

9.3 Jet Perforator

1. Use the detonating cord clip provided or tape to secure detonating cord to the Jet Perforator.
2. If safe, place the Jet Perforator on the MEC item using tape or other suitable methods to prevent it from moving.
3. For tamped shots, use a box or other suitable material to provide soil from getting between the perforator and MEC item.

9.4 Binary Explosives

Binary explosives are two-part explosives that are not classified as an explosive until mixed. These can be procured in various configurations to include plastic tube containers and pliable packs in varying sizes depending on the required application. The binary should not be mixed until ready for use. After mixing it can be primed as a cap sensitive explosive using Nonel®/shocktube, detonating cord, or electric or non-electric blasting caps. Use as any high explosive with a velocity of detonation around 20,000 feet per second.

9.5 Post-Demolition Procedures

1. Wait the designated wait times specified by the SOP. A minimum 5 minutes after single

shots or after a series of shot that can be counted. A minimum of 60 minutes after multiple shots that could not be counted.

2. The Demolition Supervisor and one other UXO technician will return to the detonation site and check the results of the shot. If the procedure was successful, the Demolition Supervisor will call in additional personnel to clean up the site. UXO personnel will conduct a visual sweep of the detonation site and the immediate area to gather fragments and explosive residue, if present.

3. Explosive residue will be collected and detonated.

4. MPPEH will be examined to ensure complete consumption of explosive material.

5. Intact MEC items that failed to detonate will be disposed of.

6. After area is swept and cleared the Demolition Supervisor will notify the SUXOS and the "all clear' will be given.

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ATTACHMENT 7

ROTHENBUHLER ENGINEERING 1670
REMOTE FIRING DEVICE (RFD)
PROCEDURES

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SAFETY WARNINGS

1) Always follow your local safety regulations. This manual and its procedures are secondary to governmental regulations, local regulations or company safety regulations and procedures. The operation procedures in this manual are only suggestions and should be checked against the above safety regulations and procedures. Company training should include the proper use of this machine and only trained personnel should use it.

2) Never rely on this equipment or any equipment totally for your safety. All mechanical and electronic equipment can fail. Always have a safety procedure that will protect you and minimize hazards of such failure.

3) High power radio transmissions can cause electric blasting caps to detonate. Keep the high powered Controller 25 or more feet (8 meters) from electric detonators.

4) The Shock Tube Initiator on the Remote Unit can develop up to 3,000 Volts. Do not touch this tip or tip jacks while arming or firing the unit.

5) Do not connect electric detonator wires or shock tube to the Remote Unit unless the green READY light is on, the red ARMED light is off, and the battery light is on steady.

6) Do not use the system if any of the units show damage to the point that failure is suspected. Thoroughly test the system prior to use.

7) Never approach the Remote Unit if it is attached to live explosives unless you have a confirmed READY status back to the Controller AND you have waited at least 2 minutes for the automatic disarm AND you have followed proper safety wait times.

8) It is MANDATORY that the Protective Cover is installed on the Charge Connector of the Remote unit at all times unless charging. There is the potential presence of voltage on some of the pins of the Charge Connector. For models produced after March 2009 (Serial Numbers 371+), the maximum current available from any pin is limited to 14.3 milliamperes.

3. PREOPERATIONAL PROCEDURES

3.1. PHYSICAL INSPECTION

3.1.1. Inspect all components for physical damage.

3.1.2. Remove the antenna dust caps and ensure the antenna jacks on the Controller Unit and Remote Unit are not damaged. Ensure they are clean and dry. Replace the antenna dust caps.

3.1.3. Ensure that the Remote and Controller Unit antennas are clean and free of damage. Ensure the electrical contacts are clean and dry.

3.1.4. Examine the shock tube igniter jacks on the left sides of the Remote Units. The jacks should be clean and dry.

3.1.5. Examine the Remote Unit's shock tube igniter tips. They should be clean and dry. If more than 200 shots have accumulated on either tip, replacement is recommended to ensure reliable shot initiation.

3.1.6. Press the two electric detonator binding posts located on the left sides of the Remote Units. Ensure they compress and return to their normal position (Dual Output Model only).

3.1.7. Ensure the key receptacles on the Controller Unit and Remote Units are clean and dry. Ensure they operate smoothly and show no signs of physical damage.

3.2. CHARGING THE BATTERIES

3.2.1. Ensure all units are turned off (The Remote Unit will not charge unless deactivated).

3.2.2. Ensure the ambient air temperature is between 32 and 86 °F (0 to 30 °C). When the ambient temperature is above 80 °F (27 °C), best results are obtained when the Remote lids are opened and air is allowed to circulate over the Remote display panels.

3.2.3. Remove the protective covers on the charge connectors. Line the key on the charger adapter plugs with the slot on the top of charge connectors mounted on each unit. Insert the plugs and turn clockwise until locked in place.

WARNING It is MANDATORY that the Protective Cover is installed on the Charge Connector of the Remote unit at all times unless charging. There is the potential presence of voltage on some of the pins of the Charge Connector. For models produced after March 2009 (Serial Numbers 371+), the maximum current available from any pin is limited to 14.3 milliamperes.

3.2.4. Insert the supplied charger adapters into suitable power outlets (100-240 VAC, 50/60 Hz).

3.2.5. As the units begin charging, the green SLOW lights will come on briefly, then the red FAST lights will blink for about 5 seconds and come on steady. The red FAST lights indicate the units are fast charging. Table 3-1 shows the charge indicator modes.

3.2.6. When charging is complete, the FAST lights will turn off, and the green SLOW lights will come on steady. Typical recharge time is 3-4 hours. For maximum battery life, avoid leaving the charger connected for more than 24 hours when possible.

Light	Blink Mode	Indicates
FAST	On steady	Fast Charging
FAST	Blinks at startup	Pre-testing
FAST	Blinks continuous	Battery Error
SLOW	On steady	Charge Complete
SLOW	Blinks continuous	Pack Temperature Range Exceeded

Table 3-1 RFD Charge Indicator Modes

3.2.7. When charging is complete, disconnect the charge adapters and reinstall the covers on the charge connectors.

WARNING It is MANDATORY that the Protective Cover is installed on the Charge Connector of the Remote unit at all times unless charging. There is the potential presence of voltage on some of the pins of the Charge Connector. For models produced after March 2009 (Serial Numbers 371+), the maximum current available from any pin is limited to 14.3 milliamperes.

3.3. BATTERY USAGE AND TESTING

3.3.1. To check the Controller's battery level, activate the unit by pressing the ON switch. The battery level will be shown as a percentage of full charge.

Figure 3-1 Controller Battery Level

Figure 3-2 Remote Battery Voltage

3.3.2. To test the Remote's battery voltage, turn the unit on and the hold the PRESS TO TEST switch for 10 seconds. A fully charged battery will stabilize with a reading of 13.5 V or more. The Remote Unit should be charged when the battery is less than 12.0 V. At 11.7 V, the yellow POWER light will flash to show the battery is too low.

3.3.3. When freshly charged, the Remote Units will run for up to 16 hours at an ambient temperature of 68 °F or 20 °C. Allow for reduced run times for hot or cold temperatures, or when the Safety Poll® mode of operation is used (Safety Poll® mode is explained in Section 5.1). Each unit can be fired approximately 100 times before recharging is required. Allow 15 minutes less run time, for each firing event.

3.3.4. When freshly charged, the Controller Unit will run in standby for up to 12 hours at an ambient temperature of 68 °F or 20°C. Allow for reduced run times for hot or cold temperatures, or when the Safety Poll® mode of operation is used (Safety Poll® mode is explained in Section 5.1).

3.3.5. The batteries will self-discharge at a rate of approximately 1% per day. This rate will increase as the temperature increases.

3.3.6. The RFD battery cells are reasonably resistant to developing a memory. For best results, allow the RFD to become mostly discharged before recharging, and allow the unit to fully charge without interruption.

3.3.7. The RFD's internal battery packs can be recharged up to 500 times before replacement is required. A decrease in run time may be noticed at the end of the battery pack's life cycle.

Return the RFD to an authorized service shop for replacement when required, or change your packs during the recommended 2-year servicing. Do not attempt field replacement.

3.3.8. Always turn the units off when not in use to conserve the battery charge.

3.3.9. The battery meter test switch can be pushed to check the battery level even if the power switch is in the off position. If the accessories bag in the lid gets excessively stuffed with tips or other items the possibility exists that the battery test button could be held down and consequently drain the battery.

3.4. TESTING THE RFD

3.4.1. This test procedure must be conducted in an area that is at least 100 feet from the nearest electric detonators or wires connected to electric detonators.

3.4.2. All RFD system components are described in detail in Section 2.

3.4.3. Ensure all units are sufficiently charged according to procedures 3.2 and 3.3.

3.4.4. Position the Controller and Remote Units at least 5 feet (1.5 meters) apart, in a position where all units can be observed while testing.

3.4.5. Install the antennas on the Remote and Controller Units.

3.4.6. On the Remotes, insert the enable keys and turn the POWER switches to the ON positions. Observe that the READY, ARMED, and POWER lights blink briefly on power up. The yellow light next to the ENABLE KEY should blink continuously to show the key is installed. The POWER light should remain on steady.

3.4.7. On the Remote Units, place the SELECT switch to the SHOCK TUBE position (Dual Output Model only). Observe the green SHOCK TUBE READY lights are on, and the red ARMED lights are out. Install a shock tube tip into the jacks located on the side of each Remote Unit.

3.4.8. On the Controller Unit, insert the Controller's key and press the ON switch. Observe the yellow POWER and KEY lights are on steady.

3.4.9. On the Controller, press the STATUS switch. After a short time the green READY lights for the Remote Units that were previously prepared for use, will come on steady to show they are disarmed and communicating two-way. The select lights will automatically be turned on for Remote Units that answered back to the Status request if the Auto Select option is enabled.

3.4.10. If Auto Select option is not enabled, on the Controller, press the SELECT switches to select the Remote Units to be tested. The yellow SELECT lights for the selected units will turn on.

3.4.11. On the Controller, press the ARM switch. The ARMED lights for the selected Remote Units will blink for up to 15 seconds and come on steady.

3.4.12. On the Remote Units, the red ARMED lights will come on steady. The system is armed.

3.4.13. On the Controller, before 2 minutes have elapsed, press the DISARM switch. All Remotes will disarm within 3 seconds.

3.4.14. Re-arm the Controller Unit and wait 2 minutes. After the 2 minutes, all Remotes will return to the disarmed state. The red ARMED lights will go out, and the green READY lights will come on steady.

3.4.15. Re-arm the Controller Unit, and before the two minutes have expired, press both FIRE switches together and hold for ½ second. You should notice that all Remote Units developed sparks at the shock tube tip electrodes. All units subsequently return to the disarmed state.

Note: 3.4.16 through 3.4.19 applies to the Dual Output Model only.

3.4.16. On the Remote Units, place the SELECT switches to the ELECTRIC DETONATOR position and observe the green ELECTRIC DETONATOR READY lights are on, and the ARMED lights are out.

3.4.17. On the Remotes, depress the two spring loaded binding posts and insert the leads of the test lamps.

3.4.18. Repeat procedures 3.4.11 through 3.4.14. The test lamps should remain extinguished through out this portion of the procedure.

3.4.19. Re-arm the Controller Unit, and before the two minutes have expired, press both FIRE switches together and hold for ½ second. You should notice that all test lamps light briefly. All units subsequently return to the disarmed state.

3.4.20. If any units did not work as described in this section, return to a service shop for repair. Never use a unit that is damaged or suspected of being damaged.

3.4.21. Turn off all units. Restore antennas, tips, and test lamps as required. The system is now operationally ready for use.

4. RFD OPERATIONAL PROCEDURES

4.1. SETTING UP THE RFD

WARNING It is MANDATORY that the Protective Cover is installed on the Charge Connector of the Remote unit at all times unless charging. There is the potential presence of voltage on some of the pins of the Charge Connector. For models produced after March 2009 (Serial Numbers 371+), the maximum current available from any pin is limited to 14.3 milliamperes."

4.1.1. Select the number of Remotes required for the operation. Ensure all units are sufficiently charged and tested according to Chapter 3.

Figure 4-1 Installing the Controller Antenna

4.1.2. Ensure the Controller Unit key is removed. Position the Controller Unit at the intended firing position and install the antenna.

4.1.3. To place the RFD in Safety Poll® mode, press and hold the STATUS switch while also pressing the ON switch (Details of Safety Poll® mode in Section 5.1).

4.1.4. Select a position for the first Remote Unit close to the blast area, but far enough to ensure the Remote is safe from direct air blasts and falling rocks.

Figure 4-2 Remote Antenna Installation

4.1.5. Install the antenna on the Remote Unit. Ensure the antenna is free of obstruction.

Figure 4-3 Activating the Remote Unit

4.1.6. Turn the POWER switch to the ON position. Observe the yellow POWER light is on and not flashing. Ensure the battery voltage is above 12.0V.

4.1.7. For underground operation, ensure the green RECEIVE light is on steady to indicate the Remote is in receiving range of the leaky feeder radio signal.

4.1.8. For surface operation, the green RECEIVE light suggests there may be an interfering

radio signal or noise present. The RECEIVE light is similar to breaking squelch on a handheld radio and does not necessarily indicate operation is degraded.

Figure 4-4 Select the Initiator

4.1.9. Place the SELECT switch to the desired initiation method (Dual Output Model only). Verify the green READY light is on, while the red ARMED light remains off.

4.1.10. If using non-electric shock tube, install the tube into the RFD Tip, and install the tip into the jacks on the left side of the Remote as described in Section 2.8.

4.1.11. If using electric detonators, install the two-wire firing cable into the spring loaded binding posts located on the left side of the Remote Unit (Dual Output Model only).

4.1.12. Install the enable key into the Remote Unit and observe the yellow light next to the ENABLE KEY begins flashing. If the Controller is in Safety Poll® mode, this light will turn on steady within 15 seconds to show that full 2-way communications are working.

4.1.13. Close the lid on the Remote for protection. Repeat Sections 4.1.4 to 4.1.13 for the remaining Remote Units to be used in the operation.

4.2. FIRING THE RFD

Figure 4-5 Activating the Controller Unit

4.2.1. Activate the Controller Unit on pressing the ON switch. Observe the yellow POWER light is on. The Controller should be recharged when the BATTERY indicator reads 20% or less.

Figure 4-6 Inserting the Controller KEY

4.2.2. When the area is clear and all shots are prepared, insert the key into the Controller Unit as shown in Figure 4-6. The yellow KEY light will turn on.

Figure 4-7 Select the Remote Units

4.2.3. Press the SELECT switches to select the Remote Units to be fired. The yellow SELECT lights will illuminate as the corresponding Remotes are selected.

Figure 4-8 Perform a STATUS check

4.2.4. Press the STATUS switch and observe the green READY lights will light for each selected Remote Unit that is operational and within range.

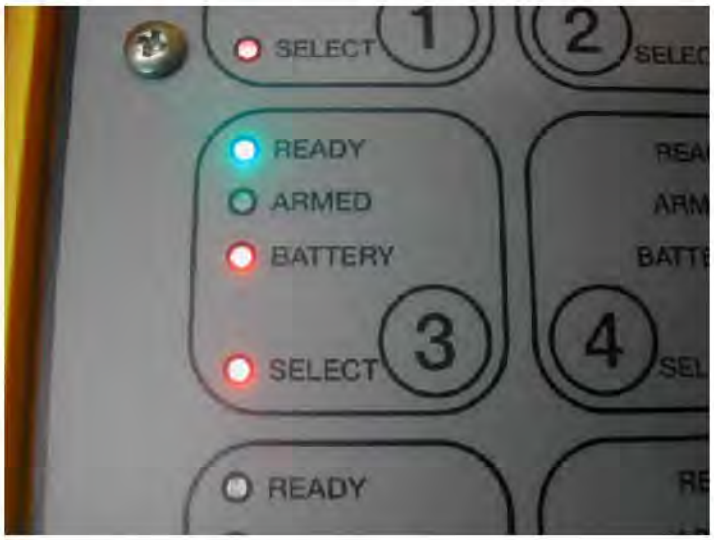

Figure 4-9 Observing the STATUS check results

4.2.5. Shown in Figure 4-9 are the results of our STATUS check for Unit #3. The steady green READY light indicates Unit #3 is disarmed. The steady yellow BATTERY light indicates Unit #3's battery is not low.

Figure 4-10 Arm the SELECTED Remote Units

4.2.6. Wait for the appropriate warning sirens. About 30 seconds from firing, press and hold the ARM switch for ½ second. The red ARMED lights will blink for up to 15 seconds and come on steady.

4.2.7. For systems configured in 1-way mode: If any of the ARMED lights continue to blink, those units are not within 2-way range and confirmation cannot be received. The Remote(s) may or may not fire depending on range, local interference, and the Controller radio's power setting.

4.2.8. For systems configured for 2-way only mode, units that are not within 2-way range will not be armed.

Figure 4-11 Firing the ARMED and SELECTED Remote Units

4.2.9. When ready to fire, press the two FIRE switches together at the same time and hold for ½ Second as shown in Figure 4-11. Shot initiation should be detected.

Figure 4-12 Verify the green READY Lights are on steady

4.2.10. After a short time, the green READY lights should be on steady to show that each Remote Unit has fired and is now disarmed as shown in Figure 4-12. Any lights that continue to blink indicate the Controller did not receive a confirming message and a manual STATUS check is required to ensure all units are disarmed.

Figure 4-13 Manually checking STATUS

4.2.11. To manually check status, press the STATUS switch at any time. The updated status of the SELECTED Remotes will be reported on the faceplate enunciator panel. You may alternately press DISARM and STATUS until all Remotes have reported they are confirmed READY.

Figure 4-14 Turn the Controller Unit OFF

4.2.12. With all deployed Remote Units having reported steady READY status, deactivate the Controller by pressing the OFF switch.

Figure 4-15 Remove the Controller's Key

4.2.13. Remove the Controller Unit's key.

4.2.14. Wait an additional 2 minutes, and following standard safety procedures, you may approach and retrieve the Remote Units.

4.2.15. Turn OFF the Remote Units. Remove and store the enable keys, antennas, and shock tube tips.

4.2.16. Inspect all units for physical damage. Close the lids and restore dust caps.

ATTACHMENT 8

POST-DEMOLITON OPERATIONS CHECKLIST

I. Project Information

Site Name: _____ Date: _____

Site Location: _____ Grid Number: _____

Demolition Team Leader: _____

II. Explosive and MEC/UXO Accountability (Donor explosives)	Yes	No
(a) All unused explosive materials returned to magazine and properly stored?		
(b) Explosive Usage Record (HGL Form 15.05) completed and submitted to SUXOS?		
(c) All destroyed/demiled MPPEH, MEC and UXO accounted for and verified by SUXOS?		
(d) MEC/UXO Accountability Record (HGL Form 15.04) completed and filed?		
(e) Magazine Data Card–Daily Summary of Magazine Transaction (HGL Form 15.02) completed?		
(f) Magazine locked and secured (two-locks)?		
(g) Detonator box locked and secured (two-locks)?		
(h) Magazine fence gate locked and secured?		
(i) Magazine keys returned and properly secured?		

III. Remarks

IV. Approval (signature)

Demolition Supervisor:	Senior UXO Supervisor:

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ATTACHMENT 9
Three-Phase Quality Control Checklist
Explosive Demolition Operations

Team:	**Location:**	**Date:**
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P);* *INITIAL (I);* *FOLLOW-UP (F)*		

CHECKLIST

Item	Reference	Inspection Point	Yes	No	N/A	Comments
1.	DDESB TP 18	All demolition team members meet the UXO-qualified personnel requirements				*(P)*
2.	Work Plans, ESP or ESS	Have all demolition team members reviewed the current work plan, ESP or ESS? *Check Dates/Record of training.*				*(P)*
3.	SOP 502.01.1	Do the provisions of SOP 502.01.1 meet procedural and safety requirements for performing demolition operations for all personnel selected to participate in the procedures meet the requirements specified?				*(P), (I), (F)*
4.	SOP 502.01.1	Was the **Safety Briefing** held prior to commencing Demolition operations?				*(P)*
5.	SOP 502.01.1	Was a **Public Meeting** held prior to commencing Demolition operations? (if applicable)				*(P)*
6.	SOP 502.01.1	Has the SUXOS completed the mandatory notifications in advance of the conduct of Demolition operations (i.e. *Medical, Fire, Security)*				*(P),(I),(F)*
7.	SOP 502.01.1	Has the Explosive Safety Quantity Distance arc for the largest munition that will be detonated been used to calculate the EZ prior to the conduct of Demolition operations?				*(P),(I),(F)*
8.	SOP 502.01.1	Are proper visitor access and control procedures known and followed?				*(P),(I),(F)*
9.	SOP 502.01.1	Does the integrity of the EZ remain intact until Demolition operations are complete?				*(P), (I), (F)*
10.	SOP 502.01.1	Are appropriate personnel requirements met/achieved for the proper conduct of Demolition operations?				*(P), (I), (F)*
11.	SOP 502.01.1	Is the two-man rule concept religiously followed whenever explosives are transported or handled during explosive operations?				*(P), (I), (F)*
12.	SOP 502.01.1	Does a demolition procedures review occur prior to the conduct of Demolition operations in accordance with the requirements of SOP 502.01.1?				*(P), (I), (F)*
13.	SOP 502.01.1	Have sufficient communications been established to enable team/field personnel to communicate with the Site Field Office and emergency response agencies prior to the conduct of operations?				*(P), (I), (F)*
14.	SOP 502.01.1	Are there sufficient range vehicles available, with appropriate safety devices installed, to transport and support Explosive Demolition Operation Personnel?				*(P), (I), (F)*
15.	SOP 502.01.1	Are all vehicle safety requirements of SOP 502.01.1 known and strictly observed?				*(P), (I), (F)*
16.	SOP 502.01.1	Does the SUXOS obtain a weather report prior to the conduct of Demolition operations?				*(P), (I), (F)*

17.	SOP 502.01.1	Are Demolition operations denied or cancelled when electrical storms are within 5 miles of the disposal site or when other severe weather conditions exist that would have a negative impact on safety?				*(P), (I), (F)*
18.	SOP 502.01.1	Are emergency medical support administrative, notification, training, and equipment requirements observed for Demolition operations in accordance with SOP 502.01.1?				*(P), (I), (F)*
19.	SOP 502.01.1	Are fire support administrative, notification, training, and equipment requirements observed for Demolition operations in accordance with SOP 502.01.1?				*(P), (I), (F)*
20.	SOP 502.01.1	Are the PPE items required for Demolition operations present and serviceable in accordance with SOP 502.01.1?				*(P), (I), (F)*
21.	SOP 502.01.1	Are engineering control specifications available and employed when it becomes necessary to reduce detonation effects? (if applicable)				*(P), (I), (F)*
22.	SOP 502.01.1	Does the SUXOS or Demolition Supervisor take the appropriate actions as specified in SOP 502.01.1 prior to initiating a demolition shot?				*(I), (F)*
23.	SOP 502.01.1	Are explosive initiation systems chosen in accordance with SOP 502.01.1 provisions?				*(I), (F)*
24.	SOPs 501.01.1 and 502.01.1	Are Disposal Operations Checklists and Explosive Disposal Logs prepared and completed in accordance with this SOP 501.01.1 and SOP 502.01.1?				*(I), (F)*

PUNCH LIST ITEMS

No.	

Conducted by: _____ Acknowledged by: _____

HGL HydroGeoLogic, Inc Exceeding Expectations	**STANDARD OPERATING PROCEDURE**

Explosives Storage Inspections and Security	**SOP No.: 503.01** **SOP Category: MMRP and Geophysics** **Revision No.: 2** **Revision Date: September 5, 2017** **Review Date: September 2019**

Approved By:

Jan Kool

Jan Kool, Ph.D.
Corporate QA Manager

9/5/2017
Date

NW B

Neil Feist
MMRP Operations Manager

9/11/2017
Date

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Attachment 3 Explosive Storage Magazine Inspection Checklist
Attachment 4 Key Control Register and Inventory Log

1.0 PURPOSE AND APPLICABILITY

This standard operating procedure (SOP) describes the basic guidelines and procedures for performing explosive storage inspections and for providing security for magazines sited during Military Munitions Response Program (MMRP) projects. HydroGeoLogic, Inc. (HGL) employees should use this SOP in conjunction with HGL SOP 501.01, *Explosive Materials Accountability and Management*.

2.0 SCOPE AND APPLICATION

This procedure applies to all HGL employees who have been granted "Responsible Person" and "Employee Possessor" status by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) under HGL's Type 20 - Manufacturer of Explosives license and are tasked with performing explosive storage inspections and operations and with providing security for magazines located on HGL project sites. These procedures apply to the inspection and security of all HGL explosive storage magazines during mobilization and demobilization, active site operations, and periods when site operations are inactive but explosives are still stored on the premises.

3.0 GENERAL REQUIREMENTS

Perform all work in a manner consistent with Occupational Safety and Health Administration standards and requirements. Refer to the site- or project-specific health and safety plan for relevant health and safety requirements. Conduct all activities in conformance with the approved Explosives Safety Submission (ESS), Explosives Site Plan (ESP), Chemical Safety Submission (CSS), or the Chemical Site Plan (CSP); and Site Safety and Health Plan (SSHP). Describe procedures for packaging and disposing of waste generated during field activities in the project-specific work plan.

Personnel who use this procedure must complete the SOP Acknowledgement Form (see Attachment 1) and submit it to the Senior Unexploded Ordnance Supervisor (SUXOS) and Unexploded Ordnance Quality Control Specialist (UXOQCS) as evidence that they have read and understand this procedure. Project leaders retain this documentation in the project file.

Justify deviations from specified requirements to the Project Manager and/or the relevant Program Manager for approval, authorization, and inclusion in the approved project plans. Do not compromise federal law in deviations. Thoroughly describe both the deviations and the newly modified process in the justification documentation.

4.0 DEFINITIONS

4.1 DEFINITIONS

Employee Possessor: Any employee under HGL's explosive license who has or will have actual physical possession (direct access) of explosive materials or who has or will have constructive possession of explosive materials. This includes HGL employees assigned to unexploded ordnance (UXO) positions who directly handle explosive materials as part of the production process, employees who handle explosive materials to ship or transport them, and employees who use explosive materials, such as blasters and their helpers.

Responsible Person: An employee under HGL's explosive license who has the authority to direct the management of and policies pertaining to explosive materials.

4.2 ABBREVIATIONS/ACRONYMS

AR	Army Regulation
ATF	Bureau of Alcohol, Tobacco, Firearms and Explosives
ATFP	ATF Publication
CERCLA	Comprehensive Environmental Response, Cleanup, and Liability Act
CDL	commercial driver's license
CFR	Code of Federal Regulations
CMV	commercial motor vehicle
CSP	Chemical Site Plan
CSS	Chemical Safety Submission
DDESB	DoD Explosive Safety Board
DOT	U.S. Department of Transportation
DoD	U.S. Department of Defense
ESP	Explosives Site Plan
ESS	Explosives Safety Submission
HGL	HydroGeoLogic, Inc.
IAW	in accordance with
MMRP	Military Munitions Response Program
MRS	Munitions Response Site

NEW net explosive weight
NFPA National Fire Protection Association

OE ordnance and explosives

PES potential explosive site

SOP standard operating procedure
SSHP Site Safety and Health Plan
SUXOS Senior Unexploded Ordnance Supervisor

USACE U.S. Army Corps of Engineering
UXO unexploded ordnance
UXOQCS Unexploded Ordnance Quality Control Specialist
UXOSO Unexploded Ordnance Safety Officer

5.0 PROCEDURAL STEPS

Only HGL employees who are cleared by the ATF as either a Responsible Person or an Employee Possessor and are listed on the HGL Explosives License - Notice of Clearance are authorized to have access to explosive materials and storage magazines.

- The SUXOS and the UXOQCS are responsible for inspecting and securing explosive storage magazines.
- If a UXOQCS is not assigned or available, the UXO Safety Officer (UXOSO) may serve as the responsible party.

5.1 INSPECTIONS AND TESTING

5.1.1 Project Startup Inspections

Before establishing an explosive storage magazine and receiving explosive materials at a project site, the SUXOS and the UXOQCS conduct a joint explosive security survey inspection using the checklist provided as Attachment 2. The SUXOS documents the result of this survey using Attachment 2 and submits the results in the daily report.

5.1.2 Grounding Inspection and Testing

Identify a qualified electrician during pre-operational planning. Contract with a qualified electrician to install the grounding installation system in accordance with (IAW) the National Fire Protection Association (NFPA) 780. When more than one magazine is used, separate them

by a minimum of 6.5 feet and ground them separately. If the 6.5-foot distance is not feasible, bind the magazines to a common grounding system.

5.1.2.1 Electrical Test/Grounding

The contracted electrician will perform electrical grounding and bonding (resistance) tests in accordance with U.S. Department of Defense (DoD) Manual 6055.09-M, V2.E4.3.2. The electrical test will be conducted before placing explosive magazines in service and every 2 years.

5.1.2.2 Visual Inspection

Visually inspect the explosive storage magazines, including their grounding, every 12 months in accordance with DoD Manual 6055.09-M, V2.E4.3.1.

5.1.3 Weekly Inspections of Storage Areas

Begin weekly (not to exceed 7 days) inspections of the explosive magazines immediately after explosive materials arrive on the project site.

The weekly inspection (not to exceed 7 days) is necessary to determine if unauthorized entry into the magazine(s) or unauthorized removal of the magazine contents has been attempted. Use the Explosive Storage Magazine Inspection Checklist in Attachment 3 to document inspections of regular explosive storage.

The individual conducting the inspection signs the checklist after the inspection has been completed. The SUXOS reviews and signs the inspection checklist and maintains this report with the project site files.

The weekly inspection includes, but is not limited to, the following:

- Explosive storage magazine(s) grounding systems,
- Placards and signage,
- Fire hazards,
- Posting of fire/chemical hazards and safety information,
- Explosive compatibility,
- Net explosive weight limits,
- Explosive material container labeling and packing,
- Housekeeping,
- Explosive storage magazine integrity,
- Fencing security,
- Evidence of forced entry, sabotage, tampering, or vandalism,
- Vegetation,

- Magazine lock and key accountability,
- Abnormal odors and temperatures, and
- Emergency point of contact information displayed.

5.1.4 Explosive Materials Inventories

The SUXOS and UXOQCS will ensure that magazines containing explosive materials are inventoried every 30 days. Document the inspection in accordance with HGL SOP 501.01, *Explosive Materials Accountability and Management*.

Conduct the inventory as follows:

- Confirm that the project field office is maintaining current manufacture of explosives record of acquisition forms.
- Confirm that the "Magazine Data Card - Daily Summary of Transactions" is being maintained with the explosive materials and that the project field office is maintaining a duplicate copy.
- Ensure that inventory, issue, and receipt transactions are accurately annotated and reflect the most recent transactions.
- Account for explosives received and stored in the magazine from the date of receipt to the date of destruction or to the date of transfer.

5.2 EXPLOSIVE STORAGE MAGAZINES

Store and secure explosive magazines in appropriate numbers and locations as required by all applicable DoD Explosive Safety Board (DDESB); ATF; and other federal, state, and local laws and regulations.

- Store all high-explosive materials appropriately IAW the following:
  - DoD Manual 6055.09-M, *DoD Ammunition and Explosives Safety Standards*, Volumes 2 and 3;
  - ATF Publication (ATFP) 5400.7, *ATF Federal Explosives Law and Regulations*; and,
  - U.S. Army Corps of Engineers (USACE) Engineer Manual 385-1-97.
- Properly secure all high-explosive materials in approved ATF Type 2 outdoor portable explosive storage magazines.
- Comply with the explosive quantity distances per the site-specific DDESB-approved ESS/CSS or ESP/CSP.

5.3 SECURITY LOCKS

Use high-security padlocks to secure explosive materials in accordance with Code of Federal Regulations (CFR) § 555.208. The SUXOS and UXOQCS must maintain control of all magazine keys. Use the HGL Key Control Register and Inventory Log (Attachment 4) to record persons accountable for explosive magazine storage keys.

5.4 PLACARDS AND SIGNAGE

Place placards and signs on the doors of the magazines that indicate the U.S. Department of Transportation (DOT) hazardous materials class and division for the explosive materials stored in each magazine.

- Place an "*EMPTY"* sign on the magazine when it contains no explosive materials and is not in use.
- Prominently display a sign in an accessible location at the explosive storage area showing contact information for the HGL emergency point of contact.

5.5 NOTIFICATIONS

Immediately after explosive storage magazines on HGL project sites are established, notify appropriate parties as required by HGL SOP 501.01, *Explosive Materials Accountability*.

5.6 FENCING PROTECTION

Install appropriate fencing (physical security) on all sites IAW ATFP 5400.7 and Army Regulation (AR) 190-11, paragraph 5-3:

- Use a chain link fence made of galvanized, aluminized, or plastic coated woven steel with a 2-inch-square mesh and 9-gauge-diameter wire, including coating.
- Locate posts, bracing, and other structure members on the inside of the fence. Use galvanized steel or aluminized wire-ties equal in gauge to the fencing to secure the fence to the posts or other structural members.
- Use a fence with minimum height of 6 feet without an outrigger.
- Extend the bottom of the fence to within 2 inches of firm ground.
    - Stabilize surfaces in areas where loose sand, shifting soils, or surface waters may cause erosion and thereby assist an intruder in penetrating the fenced area.
    - Install concrete curbs, sills, or other suitable-type anchoring devices, extending them below ground level where surface stability is not possible or practicable.

- Install the fewest number of vehicular and pedestrian gates in the barrier required for operations.
  - Use gates that are structurally comparable to the adjacent fence.
  - Install approved lock and hinge pins on gates; weld or otherwise modify hardware to prevent easy removal.

Fences installed around magazines must be at least 6.5 feet from the magazine. If the 6.5-foot distance is not feasible, bind the fencing into the grounding system.

6.0 TRANSPORTATION REQUIREMENTS

Comply with all federal, state, and local regulations when transporting ordnance and explosives (OE).

For on-site OE transportation: Permits are not required under the Comprehensive Environmental Response, Cleanup, and Liability Act (CERCLA) for on-site transportation within the MRS.

For off-site OE transportation:

- Do not transport OE off site without first coordinating with and receiving approval from the appropriate Government authority overseeing the contract.
- Use commercial carriers approved to transport ammunition and explosives to ship OE off site.
- Package OE in accordance with 49 CFR Parts 172 and 173, if possible. If not possible, package and transport the OE so that it does not move or touch other OE items.
- Provide drivers with emergency response information.
- Inspect vehicles using the Explosives Vehicle Inspection Form; properly placard the vehicles if applicable.
- Observe compatibility requirements.
- Brace the load well; cover with a fire-resistant tarpaulin except when in an enclosed vehicle or day box.

6.1 GENERAL HIGHWAY TRANSPORTATION

In most instances, the data in the following sections meets the requirements for explosive transport.

6.1.1 Commercial Motor Vehicle Requirements (49 CFR Part 383.5)

Commercial motor vehicle (CMV) means a motor vehicle, or a combination of motor vehicles (towed units, etc.), used in commerce to transport passengers or property, if the motor vehicle

- Has a gross combination weight rating of 11,794 or more kilograms (26,001 pounds or more), inclusive with a towed unit with a gross vehicle weight rating of more than 4,536 kilograms (10,000 pounds); or
- Has a gross combination weight rating of 11,794 or more kilograms (26,001 pounds or more), inclusive with a towed unit with a gross vehicle weight rating of more than 4,536 kilograms (10,000 pounds); or
- Has a gross vehicle weight rating of 11,794 or more kilograms (266,001 pounds or more); or
- Has a gross vehicle weight rating of 11,794 or more kilograms (266,001 pounds or more); or is designed to transport 16 or more passengers, including the driver; or
- Is designed to transport 16 or more passengers, including the driver; or
- Is of any size and is used in the transportation of materials found to be hazardous for the purposes of the Hazardous Materials Transportation Act, and which require the motor vehicle to be placarded under the *Hazardous Materials Regulations* (49 CFR Part 172, subpart E).

6.1.2 CDL Requirements

If a commercial driver's license (CDL) is required, the Project Manager or UXOSO ensures that vehicle operators obtain the necessary license/permits. The operator of the vehicle need not have a CDL if site personnel are not performing the following:

- Transporting explosives on DOT public roadways (for example, within an MRS and off a public road), or
- Transporting any materials that must be placarded under the DOT Hazardous Materials Regulations (for example, they are only transporting 1.4 explosives in quantities less than 1,000 pounds).

Comply with DOT 49 CFR Parts 172, 173, 387, and 397 when transporting 1,000 pounds or less of Compatibility Group 1.4B and 1.4S. Comply with DOT 49 CFR Parts 172, 173, 387, and 397 when transporting 99 pounds or less of detonating cord Compatibility Group 1.4D, if the explosive content does not exceed 100 grains per linear foot. Under these circumstances a CDL, vehicle placarding, and written travel route are not required.

6.1.3 Federal Installations/On-Site

Comply with the following requirements during transportation of explosives and OE on-site and on federal installations:

- Inspect and properly placard vehicles.
- Transport explosives in closed vehicles whenever possible.
- When loading or unloading explosives, turn off the vehicle engine and set wheel chocks and brakes.
- Equip vehicle beds with a plastic bed liner, dunnage, or sandbags to protect the explosives from contact with the metal bed and fittings.
- Equip vehicles transporting explosives with a first aid kit, two 10-B:C fire extinguishers, and communications capabilities.
- Separate initiating explosives, such as detonators, from other high explosives during loading, unloading, and while on vehicles.
- Observe compatibility requirements.
- Verify that operators transporting explosives have a valid driver's license.
- Instruct drivers concerning speed limits. Ensure that they know to do the following:
    - Comply with posted speed limits, but not exceed a safe and reasonable speed for conditions regardless of posted limits; and
    - Not exceed 25 mph in when transporting explosives off-road.

6.2 OFF-SITE TRANSPORTATION OF EXPLOSIVES OVER PUBLIC HIGHWAY

DOT certificates of registration for individuals involved in the transportation of demolition materials are not required if only 1.4 explosives, or less than 55 net explosive weight (NEW) of 1.1, 1.2, or 1.3 explosives are being transported.

Explosives of compatibility Group S may be packed with explosives of all other explosive compatibility groups except A and L. To determine the compatibility of the material typically transported by site personnel, refer to the appropriate Safety Data Sheets.

6.2.1 General Placarding Requirements

Sites that require placards must adhere to requirements in 49 CFR 172.504. The placard requirements listed below apply to explosives transportation, if applicable:

"(a) Except as otherwise provided, each bulk packaging, freight container, unit load device, transport vehicle or rail car containing any quantity of a hazardous material must be placarded on each side and each end with the type of placards specified in Tables 4 and 5, in accordance with other requirements and exceptions."

A CDL, vehicle placarding, and written travel route are not required for the following:

- When transporting 1,000 pounds or less of Compatibility Group 1.4B and 1.4S, and
- When transporting 99 pounds or less of detonating cord Compatibility Group 1.4D, if the explosive content does not exceed 100 grains per linear foot.

6.2.2 Documentation

When explosives are being transported, place completed copies of forms described below in the vehicle. Coordinate deviations from the planned route with the UXOSO.

Instructions for Motor Vehicle owners (Emergency Response Information):

- Enter into the form only the items being transported. Complete columns for applicable quantity unit and weight.
- It is imperative that the NEW limitation of 55 lbs. not be exceeded.
- Enter all required data on the front of the form; check Guide 50 block on the back of the form.

Explosives Purchase/Receipt/Authorization List (required as part of the transport paperwork):

- Verify that pertinent data for transporting explosives is included.
- Use only the route shown unless an emergency arises or the designated route is blocked.

Explosives Vehicle Inspection Form:

- Complete before placing explosives in the vehicle.
- Include the form with each shipment.

ATF Permit/License: Make a copy of the current ATF license readily available in the vehicle.

7.0 QUALITY CONTROL

- The HGL MMRP Operations Manager maintains, manages, and annually reviews this SOP for procedural, quality control and safety issues.
- The MMRP Operations Manager receives all questions, comments, and recommendations regarding this SOP.
- Project managers and supervisors ensure that site personnel read, understand, and follow this SOP.
- Discrepancies found with procedural steps or safety issues pertaining to this SOP should be referred to the responsible supervisor for corrective action.

The SUXOS or their designee trains all personnel responsible for explosive storage magazine and security on the requirements of this SOP, and documents the training with the HGL Training Attendance Log and in the SUXOS daily report.

8.0 SAFETY

Notify the SUXOS, the UXOSO, and the project manager immediately if an explosive safety situation is encountered during any phase of work. Follow these explosive safety precautions and protocols:

- Never open a metal container inside or within 50 feet of the explosive storage magazine or explosives.
- Open all containers of explosives with non-sparking tools, except metal slitters, which may be used on fiberboard containers.
- Do not permit matches, lighters or any other spark-producing devices inside or in the proximity of an explosive storage area, explosive storage magazine or potential explosive site (PES).
- Do not smoke within 50 feet of the explosive storage area or a PES.
- Keep magazines clean, dry and free of trash at all times. Sweep magazine floors regularly; use only non-sparking cleaning gear to maintain cleanliness.
- Clean floors stained with leakage from explosive materials according to the explosive manufactures instructions.
- Keep the area within 25 feet in all directions surrounding the explosive storage magazines clear of rubbish, brush, high grass and trees. Live trees greater than 10 feet tall need not be moved.
- Do not allow flammable and volatile materials within 50 feet from the explosive storage area.

- Observe the two-person rule at all times during inventory, issue, turn-in and transportation of explosives.

9.0 RECORDS

9.1 GROUNDING INSPECTIONS

The contracted electrician who installed the explosive magazine grounding system will submit documentation of the certification to the HGL Site Manager/SUXOS upon completion of the test.

- Include a statement that the explosive storage magazine(s) complies with the requirements of DoD-M 6055.09-M before storing explosive materials in the magazine(s).
- The SUXOS maintains the original inspection report in the project files.
- The UXOQCS sends an electronic copy to the HGL MMRP office, Huntsville, Alabama, MMRP Operations Manager.

9.2 SECURITY INSPECTIONS

The SUXOS maintains original copies of all inspection records on site, and makes them available for inspection by authorized HGL designees and agencies. The UXOQCS submits an electronic copy of this inspection to the MMRP Operations Manager.

Upon completion of project field operations, send all original inspection and explosive transaction records to the HGL MMRP office in Huntsville, Alabama, to the attention of the MMRP Operations Manager, for archiving throughout the life of HGL's explosive license.

9.3 DOCUMENTATION

Collect and maintain documentation generated as a result of this procedure using the following forms attached to this SOP:

- Attachment 1: SOP Acknowledgement Form
- Attachment 2: Explosive Storage and Security Survey Checklist
- Attachment 3: Explosive Storage Magazine Inspection Checklist
- Attachment 4: Key Control Register and Inventory Log

If a nonconformance is identified during an inspection, provide a detailed description of the nonconformance with recommendations for addressing the nonconformance. Record all inspections using the Explosive Storage Area Inspection Checklist, Attachment 3.

10.0 REFERENCES

Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), Publication 5400.15, ATF Safety and Security Information for Federal Explosives Licensees and Permittees.

ATF, Publication 5400.18, Daily Summary of Magazine Transactions.

ATF, Publication 5400.19, Recordkeeping Requirements for Explosive Material Manufacturers.

ATF, Publication 5400.7, Federal Explosives Laws and Regulations (27 CFR § 555).

National Fire Protection Association (NFPA) 780, Standards for the Installation of Lightning Protective Systems.

U.S. Army, Army Regulation (AR) 190-11, Physical Security of Arms, Ammunition, and Explosives,

U.S. Army Corps of Engineers (USACE), Engineer Manual 385-1-97, Explosives Safety and Health Requirements Manual.

U.S. Department of Defense (DoD) Manual 6055.9-M, DoD Ammunition and Explosives Safety Standards,

U.S. Department of Transportation (DOT), 49 CFR Parts 100-199, 383.

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ATTACHMENTS

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ATTACHMENT 1

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT

I have read, understand and agree to abide by the provisions as detailed in this standard operating procedure (SOP) prepared by HGL. By signing below, I certify that I have had the opportunity to read and ask questions about this SOP, and that I understand the procedures, equipment and restrictions, and agree to abide by them. Failure to comply with this SOP may lead to disciplinary action and/or my dismissal from the work site and termination of employment.

Prior to the commencement of any work task associated with this SOP, the SUXSO or UXOQCS assigned to the project will discuss additional procedures to be implemented, or any other site-specific conditions that may arise. All on-site personnel of HydroGeoLogic, Inc., must sign this Acknowledgment Form before performing the task covered by these SOPs.

Print Name	Signature	Date

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ATTACHMENT 2

Explosive Storage and Security Survey Checklist

Project Site (name, city and state):		
Inspection conducted by/position:	Signature	Date
UXOQCS or UXOSO:	Signature	Date
Reviewed by SUXOS:	Signature	Date

1. Publications	YES	NO	NA	COMMENTS
a. ATF Federal Explosive Law & Regulations, ATF P 5400.7,	☐	☐	☐	
b. HGL SOP 15.00 Explosive Accountability & Management	☐	☐	☐	
c. HGL SOP 15.02 Explosive Storage, Inspection & Security	☐	☐	☐	

2. Explosive Storage	YES	NO	NA	COMMENTS
a. Proper explosive storage magazines, Type 2 conforming to BATF standard	☐	☐	☐	
b. Placards. Each magazine properly placarded with DOT Haz Class/Division symbol	☐	☐	☐	
c. Explosive compatibility groups. Separated into the appropriate Haz Class/Division	☐	☐	☐	
d. Physical Security survey conducted and documented	☐	☐	☐	
e. Locks met BATF standards	☐	☐	☐	
f. Key control system established and functional	☐	☐	☐	
g. Lightening Protection.	☐	☐	☐	
1) Magazine constructed of minimum 3/16 inch metal	☐	☐	☐	
2) Magazine grounded	☐	☐	☐	
3) Magazine located 6 feet from nearest fence	☐	☐	☐	
4) Installation/Client/Property Owner standards met	☐	☐	☐	
h. Fire Protection. Minimum size/type fire extinguisher located within 30 feet of storage magazine	☐	☐	☐	
1) Proper fire division symbol at entrance to storage site	☐	☐	☐	
5) Fire fighting control plan established in APP/SSHP	☐	☐	☐	
6) Area surrounding magazine free of rubbish, brush, dry grass, trees for a minimum of 25 foot.	☐	☐	☐	
i. Magazine location site meets IBD/PTR distances	☐	☐	☐	
j. Commercial explosives being stored in DoD facilities require DoD HC/SCG approval	☐	☐	☐	
k. Adequate earth cover used to meet IBD & PTR distances	☐	☐	☐	

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Explosive Storage and Security Survey Checklist

3. Explosive Accountability & Management	YES	NO	NA	COMMENTS
a. Explosive accountability and management responsibilities and organization established	☐	☐	☐	
b. Explosive material purchase/receipt signature authority on-hand	☐	☐	☐	
c. Accountability records & tracking established	☐	☐	☐	
d. MEC final disposition accountability tracking records established	☐	☐	☐	
e. Lost, missing and stolen procedures in place	☐	☐	☐	
f. Disaster preparedness plan in place	☐	☐	☐	
g. Receipt procedures accounting for each item of explosives properly documented on-site	☐	☐	☐	
h. Individuals authorized to receive issue and transport Identified and granted explosive access by the BATF FELC.	☐	☐	☐	
4. Explosive Transportation	**YES**	**NO**	**NA**	**COMMENTS**
a. Hazardous waste manifest on-hand and maintained	☐	☐	☐	
b. Explosive Transport Vehicle	☐	☐	☐	
1) Vehicle inspection checklist on hand	☐	☐	☐	
2) Proper DOT placards, lettering, and/numbering on hand	☐	☐	☐	
3) Operators licensed (CDL/HazMat endorsement)	☐	☐	☐	
4) First aid kit on board vehicle	☐	☐	☐	
5) Communication protocols established	☐	☐	☐	
6) Day boxes on hand	☐	☐	☐	

MR Form 15.31 (June 2011)

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ATTACHMENT 3

Explosive Storage Magazine Inspection Checklist

Project Site (name, city and state):		
Inspection by:	Signature:	Date:
Reviewed by Senior UXO Supervisor:	Signature:	Date:

A. EXTERIOR OF MAGAZINE	YES	NO
1. Are explosive storage magazines grounding systems in place, and properly grounded and bonded?	☐	☐
2. Are the proper hazard class/division and fire symbols placards posted and in good condition?	☐	☐
3. Are any fire hazards (flammable/volatile materials) visible within 50 feet of the magazine?	☐	☐
4. Is the area around the magazine cleared of vegetation not less than 25 feet in all directions?	☐	☐
5. Are all no-smoking signs posted?	☐	☐
6. Are magazines and fence gates in good repair, locked and secured?	☐	☐
7. Are there any indications of vandalism/tampering with the magazines, fence or locks?	☐	☐
8. Is the emergency point of contact information prominently displayed in an accessible location?	☐	☐
9. Are fire extinguishers required and present?	☐	☐
B. INTERIOR OF MAGAZINE	**YES**	**NO**
1. Are there any unusual odors or stain present?	☐	☐
2. Are detonators segregated from high explosives and stored properly?	☐	☐
3. Are ventilation ports clear?	☐	☐
4. Are all magazines floors clean, dry and good housekeeping being maintained?	☐	☐
5. Are explosive material containers properly packed, stacked, marked and stowed?	☐	☐
6. Are the any damaged or leaking containers?	☐	☐
7. Are containers properly stowed away from the magazine walls?	☐	☐
C. MAGAZINE OPERATIONS	**YES**	**NO**
1. Are Net Explosive Weigh limits exceeded?	☐	☐
2. Are personnel training on security, fire protection and emergency procedures?	☐	☐
3. Are magazines locks and keys accounted for and properly logged in and out?	☐	☐
4. Upon completion of this inspection send an electronic copy of this report to the HGL Huntsville Office.	☐	☐

D. REMARKS

Note any departures from authorized procedures and list any discrepancies noted below.

HGL MR Form 15.09 (Sep 2012)

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ATTACHMENT 4

Key Control Register and Inventory Log

SITE NAME/LOCATION:	PERIOD COVERED: FROM: TO:

KEY CONTROL NUMBER(S)
(Enter serial number or other identifying number from key)

1.	13.	25.	37.
2.	14.	26.	38.
3.	15.	27.	39.
4.	16.	28.	40.
5.	17.	29.	41.
6.	18.	30.	42.
7.	19.	31.	43.
8.	20.	32.	44.
9.	21.	33.	45.
10.	22.	34.	46.
11.	23.	35.	47.
12.	24.	36.	48.

KEY ISSUE AND TURN IN

KEY NUMBER	ISSUED (Date/Time)	ISSUE BY (Printed Name/Signature)	ISSUED TO (Printed Name/Signature)	TURNED IN (Date/Time)	RECEIVED BY (Printed Name/Signature)

HGL MR Form 15.26 (Sep 10)

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HGL HydroGeoLogic, Inc Exceeding Expectations	STANDARD OPERATING PROCEDURE
MPPEH Inspection and Management	SOP No.: 504.01.1
	SOP Category: MMRP and Geophysics
	Revision No.: 1
	Revision Date: January 2016
	Review Date: January 2017

Approved by:

Jan Kool Digitally signed by Jan Kool Date: 2016.01.14 20:40:15 -05'00'

1/14/2016

Jan Kool, Ph.D.
Corporate QA Manager

Date

Digitally signed by Neil Feist
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Date: 2016.01.14 20:36:15 -06'00'

Neil Feist
MMRP Operations Manager

Date

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LIST OF ATTACHMENTS

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Attachment 3 DD Form 1348-1A Issue Release/Receipt Document (MD and RRD release or transfer) and DD Form 1348-1A Issue Release/Receipt Document (MD release only)
Attachment 4 Sample Certificate of Destruction and Blanket Certificate of Destruction Letters
Attachment 5 Chain of Custody Form

1.0 PURPOSE

This standard operating procedure (SOP) describes procedures for handling material potentially presenting an explosive hazard (MPPEH), including inspection, management, safety, security, and chain of custody (CoC) certification during munitions response activities.

2.0 SCOPE AND APPLICATION

This SOP applies to all HydroGeoLogic, Inc. (HGL) employees involved in inspection and management processes for certifying MPPEH as either material documented as safe (MDAS) or as material documented as an explosive hazard (MDEH) before transfer within or release from U.S. Department of Defense (DoD) control. HGL employees tasked with performing these procedures must be qualified in accordance with DoD Safety Board (DDESB) Technical Paper 18 and DoD Instruction (DoDI) 4140.62.

3.0 GENERAL REQUIREMENTS

All work must be performed in a manner 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. Conduct all activities in conformance with the Explosive Safety Submission/Explosives Site Plan and the Site Safety and Health Plan (SSHP). Describe procedures for the packaging and disposal of all waste generated during field activities in the project-specific work plan.

Personnel who use this procedure must complete the SOP Acknowledgment Form (see Attachment 1) and submit the form to the Senior Unexploded Ordnance (UXO) Supervisor and Unexploded Ordnance Quality Control Specialist (UXOQCS) as evidence that they have read and understand this procedure. The UXOQCS retains this document in the project file.

Justify deviations from specified requirements to the project manager (PM) and/or the relevant program manager for authorization and discussion in the approved project plans. Do not compromise federal law in deviations. Fully describe both deviations from requirements and the newly modified process in the justification documentation.

4.0 DEFINITIONS AND ABBREVIATIONS/ACRONYMS

4.1 DEFINITIONS

Exclusion Zone (EZ): A safety zone established around a work area that contains or potentially contains munitions and explosives of concern (MEC). Only project personnel and authorized escorted visitors are allowed within the EZ. Examples of EZs include safety zones around MEC intrusive activities and safety zones where MEC is intentionally detonated.

Fuze: Devices that initiate the detonation sequence in munitions, such as (1) a device with explosive components designed to initiate a train of fire or detonation in a munition, and (2) a nonexplosive device designed to initiate an explosion in a munition.

Fuzes are typically associated with munitions (for example, mortars, and bombs), but are occasionally found separately. They may contain a charge large enough to cause injury or death.

Material Documented as an Explosive Hazard (MDEH) (formerly referred to as MDAH, material documented as hazardous): 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 CoC has been established and maintained. This material is no longer considered to be MPPEH. The MDEH characterization only addresses the explosives safety status of the material.

Material Documented as Safe (MDAS): MPPEH that has been assessed and documented as not presenting an explosive hazard and for which the CoC has been established and maintained. This material is no longer considered MPPEH.

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, 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.

Military Munitions: All ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of DoD, the Coast Guard, Department of Energy, and National Guard.

Military Munitions includes confined gaseous, liquid, and solid propellants; explosives; pyrotechnics; chemical and riot control agents; smokes; and incendiaries, including bulk explosives and chemical warfare 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, and devices and components thereof. The term also includes non-nuclear components of nuclear

devices 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. 2710(e)(3)(A)).

Military Munitions does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components, except as noted above.

Military Munitions Response Program (MMRP): A relatively new (2002) element of the Secretary of Defense's Defense Environmental Restoration Program that addresses the following:

- Potential explosives safety, health, and environmental issues caused by past DoD munitions related activities; and
- Potential explosives safety hazards presented by MEC, which includes UXO, discarded military munitions (DMM), and munitions constituent concentrations high enough to pose an explosive hazard and potential environmental contamination.

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 explosives safety risks, including the following:

- UXO, as defined in 10 U.S.C. 101(e)(5)(A) through (C);
- DMM, as defined in 10 U.S.C. 2710(e)(2); or
- Munitions constituents (such as TNT and RDX), as defined in 10 U.S.C. 2710(e)(3), present in high enough concentrations to pose an explosive hazard.

Munitions Debris (MD): Remnants of munitions (such as fragments, penetrators, projectiles, shell casings, links, and fins) remaining after munitions use, demilitarization, or disposal. Inert munitions-related material recovered during an MEC removal.

Range-Related Debris (RRD): Debris, other than munitions debris, collected from operational ranges or from former ranges (for example, targets such as tanks, vehicles or other man-made structures).

Transferred Within or Released from DoD Control: A situation where a receiver has taken physical custody of MDEH or MDAS from DoD and has received signed documentation that acknowledges the MDEH or MDAS material (DD Form 1348–1A, Issue Release/Receipt Document, or an equivalent document).

Unexploded Ordnance (UXO): Military munitions that meet one of the following criteria:

- Have been primed, fuzed, armed, or otherwise prepared for action;
- Have been fired, dropped, launched, or projected;
- Have been placed in such a manner as to constitute a hazard to operations, installation, personnel, or material; and
- Remain unexploded whether by malfunction, design, or any other cause.

A more detailed description of the term UXO is provided in Public Law (P.L.) 106-65, section 3031 (c)(5)(A).

UXO-Qualified Personnel: Individuals who meet the training requirements for UXO Technician and Personnel and have performed successfully in military Explosive Ordnance Disposal (EOD) positions or are qualified to perform in the following service contractor positions: UXO Technician II, UXO Technician III, and UXO Safety Officer (UXOSO), UXO Quality Control Specialist (UXOQCS), and Senior UXO Supervisor (SUXOS).

4.2 ABBREVIATIONS/ACRONYMS

CoC	chain of custody
DDESB	DoD Explosive Safety Board
DMM	discarded military munitions
DoD	U.S. Department of Defense
DoDI	U.S. Department of Defense Instruction
DQCR	Daily Quality Control Report
EM	Engineer Manual
EOD	Explosives Ordnance Disposal
EZ	exclusion zone
HGL	HydroGeoLogic, Inc.
HTRW	hazardous, toxic, or radiological waste
MD	munitions debris
MDAS	material documented as safe
MDEH	material documented as an explosive hazard
MEC	munitions and explosives of concern
MMRP	Military Munitions Response Program
MPPEH	material potentially presenting an explosive hazard
MSD	minimum separation distance

OESS Ordnance and Explosive Safety Specialist

P.L. Public Law
PM Project Manager

QC quality control

RRD range-related debris

SOP standard operating procedure
SSHP site safety and health plan
SUXOS Senior Unexploded Ordnance Supervisor

USACE U.S. Army Corps of Engineering
UXO unexploded ordnance
UXOQCS Unexploded Ordnance Quality Control Specialist
UXOSO Unexploded Ordnance Safety Officer
UXOSP Unexploded Ordnance Sweep Personnel

5.0 RESPONSIBILITIES

5.1 MANAGERS AND SUPERVISORS

The PMs and field supervisors ensure that all site personnel read, understand, and follow this SOP. Immediately refer any discrepancies with procedural steps or safety issues pertaining to this SOP to the responsible supervisor for corrective action.

The SUXOS or senior UXO-qualified individual assigned ensures that all MPPEH activities are conducted in accordance with the following:

- DoD 6055.09-M, Volume 7, DoD Ammunition and Explosives Safety Standards: Criteria for Unexploded Ordnance, Munitions Response, Waste Military Munitions, and Material Potentially Presenting an Explosive Hazard;
- DoDI 4140.62, Material Potentially Presenting and Explosive Hazard;
- EM 385-1-97, Explosives Safety and Health Requirements Manual; and
- All other references shown in Section 8.0 of this SOP.

HGL employees assigned by the field level UXO Technicians must comply with these procedures for processing MPPEH for final disposition. Only UXO-qualified personnel are authorized to perform MPPEH processing.

5.2 UXO TECHNICIANS

Follow these procedures to safely conduct inspections of the exterior and interior surfaces of all recovered MPPEH and to ensure these items do not present an explosive hazard.

1. Unexploded Ordnance Sweep Personnel (UXOSP):
    - Marks suspected items only; may not assess a suspect item to determine its status.
2. UXO Technician I:
    - Tentatively identifies a located item as MPPEH with confirmation by a UXO Technician II or III.
3. UXO Technician II:
    - Performs a 100 percent inspection of each item as it is recovered and determines the following:
        - Is the item a UXO, a DMM, munitions debris, or RRD?
        - Does the item contain explosives hazards or other dangerous fillers?
        - Does the item require detonation?
        - Does the item require demilitarization or venting to expose dangerous fillers?
        - Does the item require removal of batteries, mercury seals, or switches; draining of engine fluids; or removal of illuminating dials and other visible liquid HTRW materials?
    - Segregates material items requiring demilitarization or venting procedures from items ready for certification.
    - Processes any items found to contain explosive hazards or other dangerous fillers in accordance with applicable procedures.
4. UXO Technician III:
    - Performs a 100 percent reinspection of all recovered items to determine if it free of explosives hazards or other dangerous fillers and engine fluids, illuminating dials, and other visible liquid HTRW materials.
    - Supervises detonation of items containing explosive hazards or other dangerous fillers and venting/demil procedures.
    - Supervises the consolidation of MPPEH to be containerized and sealed, ensuring that MD and RRD are segregated.
5. UXOQCS:
    - Conducts daily audits of the procedures used by UXO teams and individuals for processing MPPEH.

- Performs and documents random sampling by pieces, volume, or area of all MPPEH collected from the various teams. Ensures that no sampled items with explosive hazards, engine fluids, illuminating dials, or other visible liquid HTRW materials are identified as MD or RRD as required for completion of DD Form 1348-1A, Issue Release/Receipt Document (see Attachment 3).

6. UXOSO:

- Ensures the specific procedures and responsibilities for processing MPPEH for certification as MD or RRD specified in the work plan are being followed.
- Ensures all procedures for processing MPPEH are being performed safely and consistent with applicable regulations.

7. SUXOS:

- Ensures that work and quality control (QC) plans specify the procedures and responsibilities for processing MPPEH for final disposition as MD or RRD.
- Completes a Requisition and Turn-in Document, DD Form 1348-1A, for all MD and RRD to be transferred for final disposition.
- Performs or witnesses the initial 100 percent inspection or DDESB-approved processing of the material to verify that the MD and RRD is free of explosive hazards necessary to complete the DD Form 1348-1A.
- Certifies all MD and RRD as free of explosive hazards, engine fluids, illuminating dials, and other visible liquid HTRW materials.
- Ensures that inspected debris is secured in a closed, labeled, and sealed container, and document as follows:
    - The container will be closed and clearly labeled on the outside with the following information: U.S. Army Corps of Engineering (USACE) or applicable DoD component/installation name/HGL/0001/seal's unique identification. Subsequent containers will be numbered 0002, 0003, and so on.
    - The container will be closed in such a manner that a seal must be broken in order to open the container. The container will be clearly marked with the seal's identification number.
    - A document describing each container will be created with the following information: container contents, weight of container, location where MD or RRD was obtained, HGL named as contractor, names of certifying and verifying individuals, unique container identification, and seal identification. Include these documents in a separate section of the final report.
- Establishes a secure location for collecting, processing, and storing MPPEH, MD and RRD until transferred off site.

- Uses the MPPEH, Munitions Debris and Range Debris Processing and Storage Area Inspection Checklist (see Attachment 2) to verify the following:
  - Exclusion zones are maintained during MPPEH inspection and processing activities.
  - Adequate warning signs and boundary markers are in place during MPPEH inspection and processing activities.
  - Storage containers, drums, pallets, and tarpaulins are in good repair.
  - Storage containers and drums are properly labeled and legible.
  - Uninspected material is properly segregated from inspected material to prevent co-mingling.
  - Storage containers or drums in active use are locked to prevent uninspected material from being co-mingled with inspected material until seals are installed.
  - Demilitarized items are secured.

5.3 MPPEH CERTIFICATION AND VERIFICATION PROCEDURES

Assess all MPPEH to determine and document its explosive safety status before transferring the material within DoD facilities or releasing it from DoD control. Authorized and technically qualified personnel must certify the MPPEH as MDAS before it can be released to the public. MPPEH procedures must comply with DoDI 4140.62 and Engineer Manual (EM) 385-1-97.

Adhere to the following certification and verification procedures for material suspected or determined to be MPPEH before transporting it within or out of DoD control:

1. Obtain certification and verification that a 100 percent inspection and an independent 100 percent reinspection has been completed and that the material has been determined to be free of explosives before certifying it as MDAS.
2. The SUXOS certifies that the debris is free of explosives hazards and can be classified as MDAS.
3. The USACE Ordnance and Explosive Safety Specialist (OESS) or similarly trained individual verifies that the debris is free of explosive hazards. When an OESS is not assigned, a similarly trained UXO-qualified person performs the verification.
4. Use DD Form 1348-1A, Issue Release/Receipt Document, as the certification/verification document. The DD Form 1348-1A must clearly show the names of the SUXOS and the OESS or similarly trained UXO-qualified individual and contain the following information (refer to example shown in Enclosure 3):
   - <u>Block 5</u>: Document date
   - <u>Block 17</u>: Basic material content (type of metal, such as steel or mixed)

- Block 20: Total weight
- Blocks 24, 25, 26, and 27:
  - SUXOS and OESS names, or UXOQCS name if OESS is not present;
  - Company name;
  - SUXOS and OESS signatures, or the UXOQCS signature if OESS is not present;
  - HGL Huntsville office addresses and telephone number;
  - HGL unique identification number for each container;
  - Container seal number; and
  - Site name, city, and state of where MD or RRD was obtained.

5. Enter the following certification/verification on each DD Form 1348-1A (refer to Attachment 3) for MD or RRD transferred within or released from DoD control. The SUXOS and the OESS, if present, must sign the form. If the OESS is not on site or one has not been assigned, a similarly trained UXO-qualified individual signs. Use this statement on any ranges where RRD is processed along with MD:

   "This certifies that the material listed has undergone a 100 percent inspection and an independent 100 percent reinspection, and to the best of our knowledge and belief, is free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials."

6. Enter the following certification/verification on each DD Form 1348-1A (refer to example, Attachment 3) for turnover of MD. The SUXOS and the OESS, if present, must sign the form if present. If the OESS is not on site or one has not been assigned, a similarly trained UXO-qualified individual signs. Use this statement on properties where only munitions debris is being processed:

   "This certifies and verifies that the material listed has undergone a 100 percent inspection and an independent 100 percent reinspection, and to the best of our knowledge and belief, is inert and/or free of explosives or related materials."

7. Upon receipt of the material identified on the DD Form 1348-1A, the PM and the SUXOS ensure that the following blocks are completed by the qualified recycler:

   - Block 10: Quantity of material received
   - Block 22: Signature
   - Block 23: Date

5.4 MAINTAINING CHAIN OF CUSTODY AND FINAL DISPOSITION

Coordinate with the USACE or the appropriate DoD agency to arrange for maintaining the CoC and for final disposition of the certified and verified materials. Release the certified and verified material only to an organization that will perform the following:

1. Provide certification on company letterhead stating the following:

   "Upon receiving the unopened labeled containers each with its unique identified and unbroken seal ensuring a continued chain of custody, and after reviewing and concurring with all the provided supporting documentation, sign for having received and agreed with the provided documentation that the sealed containers contained no explosive hazards when received. The contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content."

2. Send notification and supporting documentation to HGL documenting that the sealed containers have been smelted and are now only identifiable by their basic content.

The following steps should then be taken:

1. Incorporate this supporting documentation into the final report as supporting documentation for the final disposition of munitions debris and range-related debris.
2. If the CoC is broken, the affected MPPEH must undergo a second 100 percent inspection, then 100 percent reinspection, and be documented again to verify its explosives safety status (identified as either munitions debris or range-related debris). Refer to Section 7 of this SOP.
3. MDAS is no longer considered MPPEH as long as the CoC 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. Maintain this documentation as directed in Section 7.0 of this SOP.
4. Document MDAS being transferred within or released from DoD control on the CoC form, which is presented as Attachment 5.
5. The PM contacts the receiving agent/recycler to obtain MDAS final demilitarization certification documentation.

5.5 MDAS MANAGEMENT

Dispose of all MDAS with a recycler that smelts MDAS prior to resale or release in accordance with EM 385-1-97. If it is discovered during the material transfer and shipping process that a seal has been broken and the CoC of the material cannot be verified, the material in question will be subject to reinspection following the established MPPEH processes described in Sections 5.3 and 5.4 of this SOP.

The MDAS recycler subcontractor prepares the documentation verifying the demilitarization and final disposition of the material and provides copies of all MDAS certification and CoC documentation to HGL. Refer to examples in Attachments 3, 4 and 5.

5.6 MDEH MANAGEMENT

Complete the following procedures before releasing MDEH:

1. Ensure that MDEH is transferred or released only to a qualified receiver that meets the following requirements:
   - Has the licenses and permits required to receive, manage, or process the materials;
   - Has technical experts about the known or suspected explosive hazards associated with the MDEH;
   - Is qualified to receive, manage, and process MDEH in accordance with DoDI 4140.62; and
   - Has personnel who are
     - Experienced in managing and processing hazardous materials equivalent to the MDEH, and
     - Trained and experienced in the identifying and safe handling of used and unused military and/or any potential explosive hazards that may be associated with the specific MPPEH.
2. Advise the receiver of all of the potential hazards associated with the MPPEH. The receiver must agree to receive and process the material in accordance with DoD Instruction 4140.62.
3. Choose public transportation routes that comply with DoD hazardous material transportation regulations for all MPPEH shipments.
4. Maintain CoC and accountability records through final disposition of the MPPEH. A legible copy of inspection, reinspection, and other documentation as discussed in Sections 5.3 and 5.4 must accompany MPPEH through final disposition and be maintained for a period of 3 years thereafter and in accordance with Section 7.0 of this SOP.

5.7 INSPECTIONS

5.7.1 Project Startup Inspection

Before establishing the MPPEH processing and MD and RRD storage areas, the UXOQCS and UXOSO conduct a joint inspection of the storage areas and document the results of the inspection, identify any discrepancies, and note their disposition in the project Daily Quality Control Report (DQCR).

5.7.2 Routine Weekly Inspection

The UXOQCS inspects the MPPEH processing and MD/RRD storage area containers every week after they arrive and are collected at the site, using the MPPEH Processing and Munitions Debris and Range Debris Storage Area Inspection Checklist (Attachment 2) for conducting and documenting weekly storage area inspections.

The weekly inspection is necessary to determine if unauthorized entry into the containers has been attempted, or if unauthorized removal of the contents has occurred.

– N O T E –

It is paramount that these inspections enforce all safeguarding and security control measures required for preventing potential co-mingling of processed material and ensuring the integrity of this process is properly maintained.

The UXOQCS weekly inspection addresses the following questions:

1. Are exclusion zones properly maintained?
2. Are adequate hazard warning signs and boundary markers in place?
3. Are storage containers and drum pallet in fair condition?
4. Are containers properly labeled and labels intact?
5. Are containers sealed and locked?
6. Are uninspected items segregated from inspected items?
7. Are demilitarized items secured?
8. Are any materials missing, or is there evidence of tampering or unauthorized entry?

The UXOQCS signs the inspection checklist upon completion of this inspection; the SUXOS reviews and signs the inspection checklist. The checklist is maintained with the project site office files and is annotated in the weekly production report and the DQCR.

The SUXOS periodically spot-checks the MPPEH processing and MD/RRD storage area containers to ensure that security, integrity, and good housekeeping of the storage area is maintained.

6.0 QUALITY CONTROL

- The HGL Corporate QA Manager and MMRP Operations Manager ensure that this SOP is reviewed annually for completeness, accuracy, and safety.

- The HGL UXO Safety Manager maintains, manages, and annually reviews this SOP for procedural, QC, and safety issues. All questions, comments, or recommendations regarding this SOP should be directed to the UXO Safety Manager.
- PMs and supervisors ensure that all site personnel read, understand, and follow this SOP.
- Refer any discrepancies found with procedural steps or safety issues pertaining to this SOP to the responsible supervisor for corrective action.

All personnel involved in the MPPEH inspection process and management must carefully follow all safeguards and security control measures to prevent co-mingling of processed material. If suspicion arises that co-mingling has occurred, notify the SUXOS and the UXOQCS immediately. Reinspect and process the suspect material in accordance with this SOP.

Train all UXO-qualified personnel in the recognition and safe handling of used and unused military munitions and specific types of MPPEH in accordance with DoDI 4140.62, Material Potentially Presenting an Explosive Hazard; qualify all UXO-qualified personnel in accordance with DDESB Technical Paper 18.

7.0 RECORDS

All project personnel are responsible for documenting in detail all reports, logs, and certification and inspection forms based on their assigned level of technical responsibility. Use the forms listed below and found in the attachments to this SOP in the order shown for documenting the MPPEH inspection, certification, storage, and transfer and release of material process.

Before the transfer within DoD or release from DoD, document all verified and certified materials as follows:

1. The SUXOS prepares two original copies of the following:
    - DD Form 1348-1A, Issue Release/Receipt Document; refer to the two examples provided as Attachment 3.
    - CoC form.
    - Obtain signatures from the SUXOS, OESS (or UXOQCS), and MDAS recycler in all appropriate blocks on all documents as shown in Attachments 3, 4, and 5.
2. Distribute copies of the DD Form 1348-1A, Issue Release/Receipt Document, and CoC form as follows:
    - Copy 1:
        - Issued to the receiver (for example, transporter, demilitarization facility, or recycler).
    - Copy 2:

- Mail the original to the HGL Huntsville office repository, to the attention of the UXO Safety Manager, for retention.
- Scan Copy 2 as a PDF file and submit it electronically to the subcontracted recycler manager and the HGL UXO Safety Manager.

3. The PM and SUXOS coordinate the following:
   - Notifying the receiver agent/qualified recycler in advance of any pickups and shipments to its facility,
   - Forwarding advanced electronic copies of all completed CoC and DD Form 1348-1A documents to the receiving agent/recycler,
   - Following up with the receiving agent/recycler to obtain final (signed) destruction certification documents, and
   - Ensuring that either hard or electronic copies of the final demilitarization certification documents are forwarded to the HGL Huntsville office, to the attention of the UXO Safety Manager.

– N O T E –

It is the responsibility of the project manager to coordinate with the UXO Safety Manager to ensure final closeout of all material demilitarization/destruction certification records.

8.0 REFERENCES

U.S. Army Corps of Engineers (USACE), 2008. Engineer Manual 385-1-97 Explosives Safety and Health Requirements, September.

U.S. Code of Federal Regulations (CFR), Title 27, Part 55, Commerce in Explosives.

CFR, Title 29, Part 1910, Occupational Safety and Health Standards.

CFR, Title 29, Part 1926, Occupational Safety and Health Standards.

CFR, Title 40, Parts 260-299, Protection of the Environment.

CFR, Title 49, Parts 100-199, Transportation.

U.S. Department of Defense (DoD) 4145.26-M, 2008. Contractor's Safety Requirements for Ammunition and Explosives, March.

DoD Explosive Safety Board Technical Paper 18, 2004. Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, December.

DoD Manual 6055.09-M, Volume 7, 2010. DoD Ammunition and Explosives Safety Standards: Criteria for Unexploded Ordnance, Munitions Response, Waste Military Munitions, and Material Potentially Presenting an Explosive Hazard, August.

DoD Manual 4160.28-M-1, 2011 Defense Demilitarization Manual, June.

DoD Instruction (DoDI) 4140.62, 2008. Material Potentially Presenting an Explosive Hazard, November.

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ATTACHMENTS

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ATTACHMENT 1

STANDARD OPERATING PROCEDURE ACKNOWLEDGMENT

SUPERVISOR'S STATEMENT

I have read and understand this SOP. To the best of my knowledge, the activities described in this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure that all persons assigned to this process are qualified, have read and understand the requirements of this SOP, and have signed the worker's statement for this purpose. I will ensure that the SOP contains current procedures. If a change to the SOP is necessary, I will ensure that the process is stopped until the SOP is revised and approved. Changes will require the submission of a Field Change Request (FCR) or Design Change Notice (DCN) by the HGL project team and receipt of RPM approval before implementation. If unexpected safety, health, or environmental hazards are found, I will make sure the process is stopped until the hazards have been eliminated.

_____ _____

Senior UXO Supervisor Date

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.

Printed Name	Company	Signature	Date

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ATTACHMENT 2

Material Potentially Presenting an Explosive Hazard, Munitions and Range Debris Processing and Storage Area Inspection Checklist

Site (name, city and state):		
Inspection conducted by:	**Signature:**	**Date:**
Reviewed by Senior UXO Supervisor:	**Signature:**	**Date:**

I. INSPECTION ITEM

A. MPPEH and MD Storage Areas	**YES**	**NO**	**Explain Discrepancies**
1. Are exclusion zones maintained during processing?	☐	☐	
2. Are adequate warning signs and boundary markers in place?	☐	☐	
3. Are containers/drums in fair condition?	☐	☐	
4. Are drum pallets in fair condition?	☐	☐	
5. Are containers properly labeled and labels intact?	☐	☐	
6. Are un-inspected items segregated from inspected items to prevent comingling?	☐	☐	
7. Are containers sealed or locked?	☐	☐	
8. Are MDEH items properly segregated and secure?	☐	☐	
9. Are demilitarization items secure?	☐	☐	
10. Is the plastic tarpaulin intact?	☐	☐	

B. RD Storage Area	**YES**	**NO**	**Explain Discrepancies**
1. Are there any pieces or parts of targets missing?	☐	☐	
2. Is there evidence of any disturbance to the pile?	☐	☐	

HGL MR Form 15.28 (Dec 2010)

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ATTACHMENT 3

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3	4 5 6	7	23 24	25 26 27 28 29	45 46 47 48 49 50	51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70	71 72 73 74 75 76 77 78 79 80
DOC IDENT	RI FROM	MOS	UNIT	QUANTITY	SUPPLEMENTARY ADDRESS (SUPPR)	SIG / FUND / DISTRIBUTION / PROJECT / PRI / REQD / DDEALTE / ADV / RI / O/P / COND / MGT	

UNIT PRICE		DOLLARS	CTS
DOLLARS	CTS		

1. TOTAL PRICE

2. SHIP FROM

3. SHIP TO

4. MARK FOR

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS

10. QTY. REC'D	11.UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

Munitions Debris - Steel, Brass and Copper,

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE

22. RECEIVED BY	23. DATE RECEIVED

Sign and date here

24. DOCUMENT NUMBER & SUFFIX (30-44)

NOTICE: This form will used when Munitions Debris (MD) and range debris (RD) are processed together.

"This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials."

25. NATIONAL STOCK NO. & ADD (8-22)

DoD Contractor Title: Senior UXO Supervisor (SUXOS)

Print Name _____

Sign here

Signature: _____

Company: HydroGeoLogic, Inc., Munitions Response Team

Address: 8202 Louisiana Blvd NE, Albuquerque, NM 87113

Telephone #:(505) 341-2010

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

Container No. HGL-00_____

Seal No: _____

27. ADDITIONAL DATA

DoD Agency Representative or USACE Ordnance and Explosive Safety Specialist

Print Name: _____

Sign here

Signature: _____

Address: _____

Telephone: _____

Origin of the Material: (Site Name/City/State:

_____

_____

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

ATTACHMENT 3 (continued)

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1	2	3	4	5	6	7		23	24	25	26	27	28	29		45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
DOCUMENT			RI FROM			M&S		UNIT		ISS	QUANTITY				STR	SUPPLEMENTARY ADDRESS						SIG	FUND	DISTRIBUTION			PROJECT			PRI	REQD		DEAD	DATE	ADV	RI			O/P	COND	MGT									

1. TOTAL PRICE		2. SHIP FROM	3. SHIP TO
UNIT PRICE	DOLLARS	CTS	4. MARK FOR
DOLLARS	CTS		

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

Munitions Debris - Steel, Brass and Copper,

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE

22. RECEIVED BY	23. DATE RECEIVED

Sign and date here

24. DOCUMENT NUMBER & SUFFIX (30-44)

NOTICE: This form will be used for the release of munition debris (MD) ONLY.

"This material does not present an explosive hazard and is consequently safe for release. This certifies and verifies that the material listed has been 100 percent inspected and to the best of my knowledge and belief is inert and/or free of explosives related materials."

25. NATIONAL STOCK NO. & ADD (8-22)

DoD Contractor Position Title: Senior UXO Supervisor

Print Name: _____

Sign here

Signature: _____
Company: HydroGeoLogic, Inc., Munitions Response Team
Address: 8202 Louisiana Blvd NE, Albuquerque, NM 87113

Telephone #: (505) 341-2010

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

DoD Contractor Position Title: UXO Safety Officer

Print Name: _____

Sign here

Signature: _____
Company: HydroGeoLogic, Inc., Munitions Response Team
Address: 8202 Louisiana Blvd NE, Albuquerque, NM 87113

Telephone #: (505) 341-2010

27. ADDITIONAL DATA

Container No. HGL-00_____

Seal No: _____

Origin of the Material: (Site Name/City/State:

_____

_____

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

ATTACHMENT 4

SAMPLE

CERTIFICATE OF DESTRUCTION

To: Mr./Mrs. _____,
Project Manager,
HydroGeoLogic, Inc.
(Applicable HGL office address)

From: Mr./Mrs. Debris,
President/Owner
American EOD Services, Inc.
1206 East Park Avenue
Anaconda, MT 59711-0878

Re: Demilitarization and Recycling of Material Documented as Safe (MDAS) for the Remedial Investigation at Munitions Response Site ANAD-001-R-01, Recoiless Rifle Range, Anniston Army Depot, AL, U.S. Army Corp of Engineer Contract Number W912DY-10-D-0023, Delivery Order Number 002

Upon receiving the unopened labeled containers each with its unique identified and unbroken seal ensuring a continued chained of custody, and after reviewing and concurring with all the provided supporting documentation, sign for having received and agreeing with the provided documentation that the sealed containers contained no explosive hazards when received. The contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content.

I hereby certify that the material received/shipped from Anniston Army Depot, AL was demilitarized by means of shredding and smelting by the Bonetti Explosives, LLC, Columbus, TX and were only identifiable by their basic contents; furthermore, recycling was accomplished by smelting. The material was recycled by smelting into new steel products by at Lone Star Foundries, Inc., Austin, TX an are only identifiable by their basic content.

This certifcation is made in accordance with and subject to penalties of law under the United States Code, Title 18, Section 1001, Crimes and Criminal Procedures.

SIGN HERE

SIGNATURE: _____

NAME: _____

DATE: _____

TITLE: President/Owner

AGENCY: American EOD Services, Inc.

SAMPLE

BLANKET END USE CERTIFICATION

ANNISTON ARMY DEPOT, AL
REMEDIAL INVESTIGATION AT MUNITIONS RESPONSE SITE ANAD-001-R-01,
RECOILESS RIFLE RANGE,
U.S. ARMY CORP OF ENGINEER CONTRACT NUMBER W912DY-10-D-0023,
DELIVERY ORDER NUMBER 002

It is hereby certify that Bonetti Explosives, LLC, Columbus, TX will comply with all applicable federal, state and local ordinances, and regulations with respect to the care, handling, storage, shipment, resale, export, and other use of the material hereby purchased or received, and that he/she as a user in said materials is capable of complying with all appplicable federal, state and local laws. It is further certified that the material will be recycled into new steel and products by means of smelting within the continental United States of America and that the material will only be identifiable by its basic content. This certification is made in accordance with and subject to the penalties of the United States Code, Title 18, Section 1001, Crimes and Criminal Procedures.

SIGN HERE

SIGNATURE: _____

NAME: _____

DATE: _____

TITLE: _____

AGENCY: American EOD Services, Inc.

ATTACHMENT 5

Section I – Generator Release (continued on page 3)

Certification Chain of Custody (CoC) for Non-Hazardous Munitions and Range-related Debris (Inert, Demilitarization/Destruction)	**1a.** Project location and contract number:

1b. Generator name and mailing address:	Telephone number:
HydroGeoLogic, Inc. Munitions Response Team **5030 Bradford Drive, Bld 1 Suite 230, Huntsville, AL 35805**	**(256) 970-2103 or (256) 970-2106**
1c. Project site name and location:	Telephone number:

1d. Container Number:	**1e.** Unique Seal Identification Number:	**1f.** Gross weight (lbs):	**1g.** Net weight (lbs):	**1h.** Tare weight (lbs):

1i. Material description:	**1j.** Material type:	**1k.** Units (weight/volume):

1l. Inert certification:

"I certify and verify that the ammunition, explosives and other dangerous article (AEDA) residue, range residue and/or explosive contaminated property listed have been 100 percent inspected and to the best of my knowledge and belief is free of AEDA and other dangerous articles."

1m. Generator Inspector/Certifier—Unexploded Ordnance Quality Control Specialist:

Print or type name:	Signature:	Month/Day/Year:

1n. Generator Inspector/Certifier—Site Senior Unexploded Ordnance Supervisor:

Print or type name:	Signature:	Month/Day/Year:

1o. Generator Release—I am the Project Site Manager and acknowledge release of this material:

Print or type name:	Signature:	Month/Day/Year:

Section II –Transporter

2a. Transporter company name and mailing address:	Telephone Number:	Dispatcher Name:

2b. Transporter Receipt—I acknowledge receipt of this material and have verified that each container is sealed and intact:

Print or type name:	Signature:	Month/Day/Year:

2c. Transporter Release— I acknowledge release of this material:

Print or type name:	Signature:	Month/Day/Year:

HGL MR Form 15.07 (Revised Jun 2012)

Section III – Qualified Receiver

3b. Qualified Receiver Storage Manager Receipt Acknowledgement:

I acknowledge receipt of the unopened labeled container(s) listed herein each with its unique identified and unbroken seal ensuring a continued chained of custody, and after reviewing and agreeing with all the provided supporting documentation, I sign for having received the provided documentation that the sealed containers contained no explosive hazards when received.

Print or type name:	Signature:	Month/Day/Year:

3c. Demilitarization/Destruction Processor Acknowledgement:

I acknowledge receipt of this material and certify and verify that each item or items listed herein were demilitarized and/or destroyed so as to no longer resemble AEDA beyond the requirement listed in DoD 4160.21-M-1 and is only identifiable by its basic content.

Print or type name:	Signature:	Month/Day/Year:

3e. Qualified Receiver Manager Demilitarization/Destruction Certification:

I acknowledge this material has undergone demilitarization/destruction in accordance with DoD 4160.21-M-1and Engineer Manual 1110-1-4009 and that the contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content.

Print or type name:	Signature	Month/Day/Year:

4a. Special Instructions:

1. The SUXOS will produce the required number of the original CoC certification copies for distribution in accordance with HGL MMRP SOP 15.03.
2. The *Transporter* will be provided *1 original CoC certification copy* and complete Section II, blocks 2a. through 2.c.with signature.
3. The *Transporter* will turn over *this CoC certification copy* to the Qualified Recycler Manager upon delivery.
4. The *Qualified Recycler Manager* upon receipt of the material will verify and certify the CoC certification document information is complete and accurate by completing Section III. 3a.through 3e. with signatures.
5. The *Qualified Recycler Manager* after completing the demilitarization/destruction of the material listed on this CoC certification document will provide the Generator with a signed company letterhead stating:

   "Upon receiving the unopened labeled containers each with its unique identified and unbroken seal ensuring a continued chained of custody, and after reviewing and concurring with all the provided supporting documentation, sign for having received and agreeing with the provided documentation that the sealed containers contained no explosive hazards when received. The contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content".
6. The *Qualified Recycler Manager* will complete the attached DD FORM 1348–Issue Release/Transfer Document, blocks 22 and 23 and return this form along with this CoC certification document and Certificate of Destruction letter to the Generator address shown in block 1b.

4b. Discrepancies.

HGL MR Form 15.07 (Revised Jun 2012)

Page 2 of 3

ATTACHMENT 5 (continued)

Section I – Generator Release (Continued)	1.d. Container Numbers:	1.e. Unique Seal Identification No:	1.f. Gross weight (lbs):	1.g. Net weight (lbs):	1.h. Tare weight (lbs):
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
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24.					
25.					
26.					
27.					

HGL MR Form 15.07 (Revised Jun 2012)

Page 3 of 3

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HGL HydroGeoLogic, Inc Exceeding Expectations	STANDARD OPERATING PROCEDURE
Analog and Digital MEC Operations	**SOP No.: 506.01** **SOP Category: MMRP and Geophysics** **Revision No.: 0** **Revision Date: August 13, 2018** **Review Date: August 2020**

Approved By:

Jan Kool

Jan Kool, Ph.D.
Corporate QA Manager

Date

Digitally signed by Neil Feist
Date: 2018.08.14 09:10:14 -05'00'

Neil Feist
MMRP Operations Manager

Date

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1.0 PURPOSE

This standard operating procedure (SOP) establishes standard safe practices for performing munitions and explosives of concern (MEC) operations during munitions response projects conducted by HydroGeoLogic, Inc. (HGL) unexploded ordnance (UXO)-qualified personnel.

2.0 SUMMARY OF METHOD

All HGL employees tasked with performing MEC-related activities must be qualified in accordance with (IAW) Department of Defense Explosive Safety Board Technical Paper 18. They must perform all work in a manner consistent with Occupational Safety and Health Administration-established standards and requirements, and they must conduct all activities in conformance with the project-specific Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP).

Analog data collection and clearance operations conducted on the surface or subsurface are typically executed within a grid system or along transects. Anomalies resulting from analog or digital geophysical mapping (DGM) targets are pinpointed, investigated, documented, and resolved IAW the project planning documents. When DGM targets exist, intrusive teams perform the process of anomaly resolution, which includes reacquiring the anomaly and excavating it (uncovering, identifying, documenting, and clearing). This process is followed by quality control (QC) post-dig hole checks performed by QC personnel to provide independent verification that the source of the anomaly was removed during intrusive operations. The process of anomaly resolution for DGM targets is covered in this SOP and in SOP 551.01: DGM Using a Geonics EM61-MK2.

This SOP primarily details the procedures and safety measures required for analog and digital clearance of munitions-related materials on the surface and subsurface. This SOP also details the general data collection, documentation, and reporting requirements for these tasks.

3.0 DEFINITIONS AND ABBREVIATIONS/ACRONYMS

3.1 DEFINITIONS

Essential Personnel: U.S. Department of Defense and contractor personnel necessary for the safe and efficient completion of field operations conducted in an exclusion zone (EZ). Multiple multidisciplinary MEC teams project performing project tasks may be in the EZ while MEC procedures are being performed as long as team separation distances (TSDs) are maintained.

Exclusion Zone (EZ): A safety zone established around a MEC operations work area. Only essential personnel and authorized/escorted visitors are allowed within the EZ.

- Examples of EZs include safety zones around MEC intrusive activities and safety zones where MEC is intentionally detonated.
- For chemical warfare material projects sites, the EZ is the area within the no significant effects zone.

Munitions and Explosives of Concern (MEC): Specific categories of military munitions that may pose unique explosive risks, including the following:

- UXO, as defined in 10 U.S.C. § 101(e)(5);
- Discarded military munitions, as defined in 10 U.S.C. § 2710(e)(2); or
- Munitions constituents (for example, TNT, RDX) as defined in 10 U.S.C. § 2710(e)(3), present in high enough concentrations to pose an explosive hazard.

MEC Operations: 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.

Minimum Separation Distance (MSD): The distance that personnel in the open must maintain from an intentional or unintentional detonation.

Team Separation Distance (TSD): The distance that teams of essential personnel must be separated from one another during the conduct of MEC activities on a Military Munitions Response Program (MMRP) site. Normally this the K40 distance of the munitions with the greatest fragmentation distance (MGFD) for the site.

Unexploded Ordnance (UXO): As defined by 10 U.S.C. § 101(e)(5)(A) through (C), UXO includes 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.

A more detailed description of the term UXO is provided in Public Law 106-65, § 3031 (c)(5)(A)

3.2 ABBREVIATIONS/ACRONYMS

APP	Accident Prevention Plan
BIP	blow-in-place

DGM	digital geophysical mapping
EMM	earth moving machinery
EZ	exclusion zone
GIS	Geographical Information System
GPS	Global Positioning System
HGL	HydroGeoLogic, Inc.
IAW	in accordance with
MD	munitions debris
MEC	munitions and explosives of concern
MGFD	munitions with the greatest fragmentation distance
MMRP	Military Munitions Response Program
MPPEH	material potentially presenting an explosive hazard
MQO	measurement quality objective
MSD	minimum separation distance
PPE	personal protective equipment
QC	quality control
RTK	real time kinematic
RTS	robotic total station
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SUXOS	Senior UXO Supervisor
TSD	team separation distance
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer

4.0 PERSONNEL

This section describes the personnel, responsibilities, and qualifications required to implement this SOP. The following individuals are involved in operations:

- **Senior UXO Supervisor (SUXOS) –** Responsible for ensuring that all intrusive operations are performed IAW this SOP and the project planning documents.
- **UXO Safety Officer (UXOSO) –** Communicates directly with the Corporate Health and Safety Director on all matters concerning safety and ensures that all explosive safety procedures are performed IAW project planning documents.
- **UXO Field Team Leader –** Directs intrusive teams during field operations.
- **UXO Quality Control Specialist (UXOQCS) –** Communicates directly with the Quality Manager on all matters concerning quality and signs off (UXOQCS or designee) on completeness and accuracy of intrusive documentation.
- **UXO Technician –** responsible for performing intrusive operations IAW the SOPs and the project planning documents.
- **Data Processor/Analyst or Geographical Information System (GIS) Specialist –** Uploads and checks intrusive data for completeness and accuracy; works with UXO Team to resolve any discrepancies.

5.0 EQUIPMENT AND SUPPLIES

The following equipment is typically used during clearance operations:

Detector(s):

- Flux-gate magnetometers:
  - Schonstedt GA 52-CX
  - Schonstedt GA 72-CD
  - Forester FEREX 4.032
  - Ebinger MAGEX 120 LW
  - Vallon EL 1302D1 or 1303D
  - Chicago Steel Tape (Magna-Trak 102)
- Frequency-Domain Electromagnetic Induction Metal Detectors:
  - White's All Metals Detector
  - Fisher 1266X
  - Garrett
  - Foerster Minex
  - Minelab Explorer II
- Production-Time Domain Electromagnetic Induction Metal Detectors
  - Geonics EM61 (various models)
  - Schiebel AN PSS-12

  - Vallon VMH3
  - Minelab F3

- Positioning system (if applicable): Global Positioning System (GPS) with survey areas (transects or grids) uploaded for visual reference; real time kinematic (RTK) GPS or robotic total station (RTS) for reacquisition of DGM targets.
- Measuring tapes (if local grid is to be used).

6.0 SAFETY

During MEC clearance operations, HGL personnel must adhere to the APP/SSHP and the following general safety practices:

- Conduct operations only during daylight hours.
- Allow only qualified UXO technicians to handle MEC.
- Do not conduct MEC operations until all applicable plans for the site in question are prepared and approved.
- Conduct operations on the concept of limiting exposure to the minimum number of personnel, for the minimum amount of time, to the minimum amount of MEC consistent with safe and efficient operations.
- Before taking any action on an ordnance item, definitively identify all fuzing, including fuze type by function and the physical state/condition (armed or unarmed) of the fuze (for example, burned, broken, parts exposed/sheared).

The following practices also apply:

- All personnel must attend the Daily Safety Briefing before entering the operating area.
- Anyone who observes an unsafe act or situation can stop operations.
- Any safety violation and/or unsafe act/practice must be reported to the UXOSO immediately.

6.1 MEC SAFETY PROTOCOLS

Death or injury can occur from MEC and explosives-related accidents. MEC exposed to the elements for an extended period can become more sensitive to shock, movement, and friction because the stabilizing agent in the explosives may be degraded. The general MEC safety precautions and protocols are as follows:

- Remain alert at all times for MEC and related scrap or material potentially presenting an explosive hazard (MPPEH) hazards.

- Observe the cardinal principle of limiting the exposure to a minimum number of personnel, for the minimum amount of time, to a minimum amount of hazardous material consistent with a safe and efficient operation during activities involving ordnance, explosives, ammunition, severe fire hazards, or toxic materials.
- Always assume that MEC hazards contain a live charge until determined otherwise.
- Clearly mark the location of any ordnance item found so it can be easily located and avoided.
- Follow the procedures of the approved project planning documents.
- Upon locating any MEC hazards, immediately notify the UXO technician to take appropriate measures.
- Consider MEC that has been exposed to fire as extremely hazardous. Chemical and physical changes to the contents may have occurred that render it more sensitive than its original state. DO NOT touch, move, or jar any ordnance items regardless of the markings or apparent condition. Under no circumstances handle any MEC during avoidance activities or move it in an attempt to make a positive identification.
- DO NOT touch, pick up, kick, or move anything unfamiliar or unknown.
- DO NOT roll an unknown item over or scrape the item to identify markings.
- DO NOT approach or enter a munitions site if an electrical storm is occurring or approaching. If a storm approaches during site operations, leave the site immediately and seek shelter.
- DO NOT walk across an area where the ground surface cannot be seen and that has not been cleared of MEC hazards by a UXO technician.
- DO NOT rely on color codes for positive identification of ordnance items or their contents.
- DO NOT be misled by markings on a MEC item stating, “practice bomb,” “dummy,” or “inert.” Practice ordnance can have explosive charges used to mark and/or spot the point of impact, or the item could be marked incorrectly.

– W A R N I N G –

Removing or taking any munitions, explosives, or UXO or munitions-related debris from the site by any employee is strictly prohibited.

6.2 OTHER HAZARDS

Hazards that may be present during MEC operations may include sharp metal, industrial chemicals, and other hazards as described below:

- *Metal Debris*: Metal debris, to include munitions debris (MD) and other debris (for example, nails, banding, barbed wire) are typically encountered during intrusive operations. Wear the appropriate personal protective equipment (PPE) to protect personnel from hazards caused by sharp objects.
- *Chemicals*: Locating industrial-type chemicals is a possibility during intrusive MEC activities. If sealed drums, contaminated soils, or other suspect conditions that indicate a potential health or safety hazard are encountered, do the following:
  - Stop work and follow proper notification procedures. The SUXOS notifies the Project Manager using established notification procedures.
  - Do not continue work in the area where the hazard was discovered until the SUXOS and UXOSO evaluate the situation and confer with the Project Manager and HGL's Corporate Health and Safety Director, and all agree that it is safe to proceed.

6.3 EXCLUSION ZONES AND MINIMUM SEPARATION DISTANCES

6.3.1 Exclusion Zones

During intrusive MEC operations, only essential project personnel may be within the EZ.

- The UXOSO and UXO Team Leaders monitor and keep the EZ intact until intrusive operations are complete.
- If a MEC item larger than the identified MGFD is encountered, notify the appropriate authority and use an EZ appropriate for the found munition.

6.3.2 Essential Personnel

Only project personnel necessary for the safe and efficient completion of field operations are allowed in an EZ. Multiple multidisciplinary MEC project teams performing tasks required to execute the project may be in the EZ while MEC procedures are being performed as long as TSDs are maintained. Team locations must be closely coordinated with the SUXOS and UXOSO. Personnel are not allowed to work in the EZ without the following:

- Briefing on the use of the buddy system,
- PPE IAW the APP/SSHP,
- Applicable training and certifications,
- Understanding of the APP/SSHP, and
- Approval of SUXOS.

6.3.3 Minimum Separation Distance

6.3.3.1 Unintentional Detonations

All nonessential personnel should be evacuated from within the EZ/MSD during intrusive operations in areas with known or suspected MEC.

6.3.3.2 Intentional Detonations

Evacuate all personnel from within the EZ/MSD during intentional detonation of MEC items.

7.0 PROCEDURES

7.1 EQUIPMENT FUNCTION CHECKS

Upon arrival at the site, verify the condition and functionality of the analog detectors as follows:

- Inspect all instruments and equipment that requires maintenance and/or calibration upon arrival, regardless of source, and periodically as required in the manufacturers' equipment manual.
- Check instrument and equipment functionality to ensure operational readiness IAW project plans.
- Remove or replace equipment from service if a functionality check indicates that it is not operating correctly and that it cannot be repaired in the field immediately.
    - Remove the item from service until it can be repaired, or
    - Replace the equipment item with a like model or an approved substitute that meets the same specifications for accuracy and precision as the item removed from service.

7.1.1 Instrument Function Checks

Check analog detectors at least daily by using the instrument in a designated instrument test plot (function check area) to verify response to known target(s). Instrument settings are determined based on the response results from the test plot. After completing the function check, document the instrument type, serial number, and results IAW project planning documents. General procedures include the following:

- Turn on the instrument to warm up the system electronics.
- Ensure that the required sensitivity settings are selected.
- Spot check readings to locate a noise-free background area.
- Perform any nulling procedures.
- Perform a personnel metal interference source check.
- Survey the test strip.
- Perform a known position check for the positioning system (if applicable).
- Document instrument tests IAW project planning documents.
- Perform post-data collection QC tests and document the findings (as required).

7.2 EARTHMOVING EQUIPMENT

7.2.1 For Removing Soil Overburden

Earth moving machinery (EMM) may be used to excavate overburden from suspected MEC. Do not use EMM to excavate within 12 inches of a suspected MEC item. Once the EMM is within 12 inches of the suspected MEC, complete the excavation using hand excavation methods. Personnel who are not UXO qualified may operate the EMM only when supervised by a UXO Technician III or higher.

- If more than one EMM is to be used on site, the same MSD for multiple work teams applies.
- There is no need to harden/shield the EMM to protect its operator when EMM is used to remove soil overburden to within 12 inches from the anomaly.

7.2.2 For Intentional Excavation of MEC

If the intent of the mechanized MEC procedure is to intentionally dig up anomalies that could be MEC without practicing MEC avoidance techniques, the equipment must be hardened/armored appropriately. The operator must also be afforded protection for blast overpressure to the K24 factor. If hearing protection is used, the K18 factor can be used.

If mechanized MEC procedures are being performed, the MSD for unintentional detonations for nonessential personnel must be the maximum fragmentation range-horizontal.

7.3 ANALOG MEC CLEARANCE PROCEDURES

During analog MEC clearance activities, the UXO technicians perform the following:

- Operate the geophysical instrument at a pace that ensures that the entire lane is searched and that the instrument is able to appropriately respond to anomalies.
- Use geophysical instruments to locate and pinpoint the anomaly.

- For subsurface anomalies, carefully remove the earth overburden to expose the source of the subsurface metallic anomaly and positively identify the source of the anomaly.
- Ensure anomalies are resolved IAW the project planning documents.

The UXO Team Leader will periodically perform QC checks behind the UXO team to ensure that the MEC clearance objectives detailed in the project planning documents are achieved.

7.3.1 Analog Grids

Teams implement the MEC surface or subsurface clearance by establishing lanes and sweeping the lanes using analog geophysical instruments. Teams establish the lanes by laying lines (ropes) or other suitable means such as marking lanes with pin flags. Unless otherwise noted, lanes must be established at a maximum of 5-foot intervals to ensure 100 percent coverage of the clearance footprint. The SUXOS typically determines which techniques will be used to mark and sweep boundaries based on site conditions.

Data collected during analog removal actions typically consist of the UXO Team Leader documenting the following on grid sheets:

- Estimated weight of MD and range related debris in grid;
- Estimated weight of other debris (for example, trash, scrap metal) in grid;
- Item description, condition, location coordinates, and disposition;
- Digital photos of MEC found during the investigation; and
- Significant items such as obstacles, structures, seeds, and detonation locations.

While not typically required for MEC removal actions, some projects require detailed documentation for each individual anomaly encountered during analog investigations. Some additional requirements could include the following:

- If required in project planning documents, grid corner locations (position coordinates) must be measured and recorded with a GPS unit and uploaded to the GIS database at the end of each survey day.
- If required in project planning documents, each anomaly investigated must be documented on digital media (for example, PDA, tablet computer) or on a hard copy dig sheet. Section 7.4.2 documents the general procedures used to recover the object(s) that caused the anomaly.
- If required in project planning documents, relevant information must be transferred to the HGL GIS at the end of each analog survey day (for example, craters, cultural features, and impassable areas).

7.3.2 Analog Transects

The team will either use predetermined virtual transects preloaded on GPS or establish transects IAW project planning documents. Teams will maintain a survey speed (~2 miles per hour or adjusted to match terrain) that allows adequate detection of subsurface anomalies. Personnel will systematically sweep the area along each transect using the appropriate sensitivity settings for the detector.

While not typically required for MEC removal actions, some projects require detailed documentation for anomalies encountered during analog investigations. Some additional requirements may include the following:

- If required in project planning documents, each anomaly investigated must be documented on digital media (for example, PDA, tablet computer) or on a hard copy sheet. Section 7.4.2 documents the general procedures used to recover the object(s) that caused the anomaly.
- If required in project planning documents, relevant information must be transferred to the HGL GIS at the end of each analog survey day (for example, craters, cultural features, and impassable areas).

7.4 DIGITAL MEC CLEARANCE PROCEDURES

There are three key aspects to digital anomaly resolution: anomaly reacquisition, anomaly excavation (including reporting dig results), and post-dig verification sampling.

7.4.1 Anomaly Reacquisition

Anomaly reacquisition is a critical element because this task must physically match anomalies on dig lists with their sources. To resolve all anomalies on the dig list and achieve project-specific measurement quality objectives (MQOs), the UXO intrusive team often must clear the entire footprint of an anomaly. The UXO intrusive team typically performs the following reacquisition process:

- Using the approved method to navigate to the selected location, typically an RTK GPS, an RTS, or measuring tapes.
- Reproducing DGM signal at the target location with the approved sensor referenced in the project planning documents.
- Placing a plastic pin flag and/or painting the ground surface near the reacquired source (usually the coordinates of the peak intensity) and documenting peak intensity, offset, and direction from dig sheet coordinates.

A more thorough discussion of anomaly reacquire is presented in SOP 551.01: DGM Using a Geonics EM61-MK2.

7.4.2 Digital Anomaly Excavation

The disposition and final location details of each anomaly excavated are normally recorded on hard copy dig sheets. The reported dig results will ultimately be reviewed by the geophysical team, which has authority to require additional reacquisition and/or excavation activities to be performed for anomalies having characteristics not unambiguously explained by the reported dig results. The UXO intrusive team typically conducts anomaly excavation as follows:

1. Excavate each anomaly from the side of anomaly location and carefully remove overburden to expose anomaly features for evaluation.
2. If suspect MEC is encountered, the UXO Technician II and UXO Technician III (team leader) determine the item's condition. If determined to be MEC, notify the SUXOS and follow the MEC disposition guidance in the project planning documents.
3. Record the anomaly characteristics required on the dig sheets. Typical information required on the dig sheets includes the following:
    a. Team number,
    b. Date investigated,
    c. Anomaly type (for example, UXO, MD, cultural debris, seed, other (no find, grid corner nail),
    d. Source depth, approximate dimensions and/or weight,
    e. Quantity,
    f. General description of anomaly (for example, water table at 1 foot, rocky soil, hard ground),
    g. Post-dig instrument reading (for example, mV for EM61).
4. Collect, process, and dispose of the anomaly item(s) per the project planning documents. Adhere to the following procedure for source removal:
    a. If a recovered anomaly is classified as MEC, only the SUXOS and UXOSO can determine whether the item is acceptable to move.
    b. If the item **can** be safely moved, remove and relocate the item pending further disposition, depending on project planning document guidance, and inspect under the removed item to ensure additional source(s) are removed from the anomaly footprint.
    c. If the item **cannot** be safely moved, designate it blow-in-place (BIP) and execute the BIP procedure. Do not move MEC designated as BIP for any reason. If needed,

use engineering controls to decrease the possibility of damage to personnel or property. Upon disposition, inspect the anomaly location to ensure anomalies are removed from the anomaly footprint.

d. Collect anomalies classified as MPPEH for further inspection.

5. Dispose of all MEC and MPPEH IAW the approved procedures in the project planning documents.
6. Photograph the MEC items.
7. If required, after removing the anomaly sources, ensure that the entire anomaly footprint achieves the post-dig MQO(s) requirements IAW project planning documents.

7.4.3 Post-Dig Anomaly Resolution

Post-dig anomaly resolution is performed after excavation by the intrusive team by the UXOQCS (or designee) to verify that the source(s) of the anomaly have been adequately resolved and achieved the MQO for anomaly resolution. The same technology and instrument used to identify anomalies should be used to verify that the anomalies have been resolved.

The project planning documents detail the number of anomalies that required post-dig verification. The UXOQCS (or designee) implements the post-dig anomaly resolution process IAW project planning documents.

7.5 MEC AND MPPEH PROCEDURES

Upon encountering a MEC item, a minimum of one UXO Technician II and one UXO Technician III will identify and mark the item for future disposition IAW the approved project planning documents. Only the SUXOS and UXOSO, jointly, will determine if a MEC item is acceptable to move.

7.5.1 MEC Disposal

Conduct all MEC disposal procedures IAW the project specific planning documents (Work Plan, and when applicable, ESP or ESS). The SUXOS is responsible for coordinating with the proper authorities for the final disposition of all MEC hazard(s) discoveries. Refer to the following HGL SOPs for MEC disposal and explosives procedures:

- SOP 501.01 Explosive Materials Accountability and Management
- SOP 502.01 Explosive Demolition Operations
- SOP 503.01 Explosives Storage Inspections and Security

7.5.2 MPPEH Processing

Process all MPPEH IAW the project specific planning documents. MPPEH will be processed IAW HGL SOP 504.01 MPPEH Inspection and Management, as well as any other applicable laws, regulations and restrictions.

8.0 REPORTING

Reporting of the activities associated with this SOP consist of copies of the field notes/logbooks and hard copy forms or digital files with the intrusive results. The UXO Field Team Leader must maintain a record of site conditions and metadata in either written form (for example, field logbook) or digital form (for example, tablet-based forms), and the UXOQCS must review the intrusive records for completeness and accuracy at regular intervals during project execution. Typically, the following types of information will be documented:

- Date,
- Weather,
- Field team members,
- Instrument types, serial numbers, and sensitivity settings,
- Equipment function test results,
- Potential sources of interferences,
- Intrusive results (anomaly type, depth, characteristics, etc.),
- GPS file names and track paths (if applicable), and
- Location and description of obstacles or inaccessible areas where anomalies could not be investigated.

9.0 QUALITY CONTROL

The MQOs for intrusive operations and testing of analog and digital detectors are presented in the project planning documents. Performance relative to the MQOs is assessed during the processing of the collected data. The SUXOS or UXOQCS uses the three-phase inspection process during intrusive operations.

10.0 REFERENCES

U.S. Army Corps of Engineers (USACE), Engineer Manual 200-1-15.

USACE, Engineer Manual 385-1-97.

U.S. Department of Defense Explosive Safety Board (DDESB), Technical Paper 16.

DDESB, Technical Paper 18.

U.S. Department of Defense Manual 6055-09-M.

11.0 REVISION HISTORY

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HGL HydroGeoLogic, Inc Exceeding Expectations	STANDARD OPERATING PROCEDURE
Vegetation Removal Operations on MMRP Sites	**SOP No.: 509.01** **SOP Category: MMRP and Geophysics** **Revision No.: 0** **Revision Date: August 15, 2018** **Review Date: August 2020**

Approved By:

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8/16/2018

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1.0 PURPOSE

This standard operating procedure (SOP) describes the procedures for safely conducting vegetation removal operations on a munitions site.

2.0 SUMMARY OF METHOD

This SOP applies to HydroGeoLogic, Inc. (HGL) employees who are involved in vegetation removal activities by manual removal, mechanized removal, or controlled burning. All HGL employees tasked with performing munitions or explosives of concern (MEC) avoidance support during vegetation removal activities must be qualified in unexploded ordnance (UXO) in accordance with (IAW) U.S. Department of Defense Explosive Safety Board (DDESB) Technical Paper (TP) 18.

HGL staff must perform all work in a manner consistent with Occupational Safety and Health Administration (OSHA) standards and requirements. Staff should refer to the project site-specific health and safety plan for relevant health and safety requirements. All activities must be conducted in conformance with the approved project planning documents, including the Accident Prevention Plan (APP), the Site Safety and Health Plan (SSHP), task-specific Activity Hazard Analyses and when applicable the DDESB-approved Explosive Safety Submission or Explosive Site Plan.

Vegetation removal is usually required to facilitate follow-on activities such as analog removal actions or digital geophysical mapping.

3.0 DEFINITIONS AND ABBREVIATIONS/ACRONYMS

3.1 DEFINITIONS

Anomaly Avoidance: Techniques employed to allow entry into a specified area to perform required operations on property known to contain or suspected of containing MEC, other munitions in high enough concentrations to pose an explosive hazard regardless of configuration, or chemical agent (CA). Anomaly avoidance techniques focus on avoiding contact with potential surface or subsurface explosives or CA hazards.

Minimum Separation Distance (MSD): 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 10 United States Code (U.S.C.) §101(e)(5).
- Discarded military munitions, as defined in 10 U.S.C. § 2710(e)(2).

- Munitions constituents (such as, TNT, RDX), as defined in 10 U.S.C. § 2710(e)(3), present in high enough concentrations to pose an explosive hazard.

Unexploded Ordnance (UXO): As defined by 10 U.S.C. § 101(e)(5)(A) through (C), 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.

3.2 ABBREVIATIONS/ACRONYMS

APP	Accident Prevention Plan
CA	chemical agent
CFR	Code of Federal Regulations
DDESB	(U.S.) Department of Defense Safety Board
HGL	HydroGeoLogic, Inc.
IAW	in accordance with
MEC	munitions and explosives of concern
MMRP	Military Munitions Response Program
MSD	minimum separation distance
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SUXOS	Senior UXO Supervisor
TP	Technical Paper
U.S.C.	United States Code
UXO	unexploded ordnance
UXOSO	UXO Safety Officer

4.0 PERSONNEL REQUIREMENTS

All HGL employees and subcontractor personnel performing vegetation removal activities must meet the training certification and qualification requirements specified by the project APP/SSHP, and possess the following:

- Site-specific MEC awareness training prior to field activities, and
- Requisite experience in the use and safety protocol for the hand-held vegetation clearance equipment and machinery used for each task.

The presence of a UXO technician who meets the requirements of DDESB TP 18 is required in the field during vegetation clearance activities to provide oversight and MEC avoidance. Field personnel must meet all requirements for the specific activity they perform as specified in 29 Code of Federal Regulations (CFR) 1910 including, but not limited to, vehicle operation, hazardous material handling, personal protective equipment (PPE), and documentation of training records related to safety and equipment operation.

5.0 TRAINING

Before beginning any vegetation removal operations, all employees and supervisors must be trained on the hazards and safety precautions associated with the vegetation removal methods as described in the APP/SSHP. Training may include the following:

- Initial use, operation, and maintenance of vegetation removal manual tools, machines, and vehicles IAW the manufacturers' directions, and acknowledgment of warnings and precautions for that equipment; and
- Recognition, prevention, and control of other safety and health hazards in the vegetation removal.

6.0 PROCEDURES AND PLANNING

Listed below are the procedures for vegetation removal.

- Disturb only the vegetation necessary and required for safe and effective access for follow-on activities.
    - In typical situations, remove vegetation to within 4 to 6 inches of the ground surface, and trim tree limbs from the ground surface to approximately 8 feet in height.
    - Remove larger deadfall that impedes the progress and safety of personnel and equipment during follow-on activities.

- Typically, leave mature trees in place. Trees of 4 inches in diameter or greater as measured from chest height are typically considered mature. This criterion is site specific and based on agreements with the project client and specified in the project planning documents.
- Dispose of vegetation or leave it in place per agreement with the client. Stipulate site-specific disposal methods in the project planning document.
- Consider site topography, terrain and soil conditions, and drainage patterns.
- Adhere to the required level of environmental and natural resource protection identified in project planning documents.

6.1 MECHANICAL VEGETATION REMOVAL METHODS

Mechanized vegetation removal operations have several advantages in that they are usually more expedient, reduce personnel exposure and the likelihood of injuries, and may reduce project costs compared to manual methods.

6.2 ROBOTIC/REMOTE MECHANICAL VEGETATION REMOVAL METHODS

Remote/robotic-controlled mechanized operations have several advantages in that, because the operator is not on board, they can be used in dangerous, steep, or uncomfortable areas. Depending on site conditions, remote/robotic equipment production can be slower and more expensive.

6.3 MANUAL VEGETATION REMOVAL METHODS

Manual vegetation removal methods can be suitable when there is limited or low-density vegetation.

6.4 CONTROLLED BURN METHODS

Controlled burns may be used to remove dense brush or clear areas of vegetation. When controlled burn methods are used on a project site, keep all personnel beyond the MSD for the munition with the greatest fragment distance until the UXO Safety Officer (UXOSO) and Senior UXO Supervisor (SUXOS) jointly deem the area safe to enter following the burn.

– W A R N I N G –

Controlled burning of vegetation on ranges is not an approved method to clear MEC hazards.

When planning controlled burns, it is essential to coordinate with the client regarding local regulations, restrictions, and support requirements.

Controlled burns can only be conducted when authorized and approved by the appropriate agency per the project planning documents.

7.0 EQUIPMENT

Specific equipment requirements for each project are detailed in the approved project planning documents.

- The SUXOS or the UXOSO ensures that all equipment/instruments used by site personnel are working properly and that the functionality of vegetation removal equipment is verified and documented.
- Each UXO team leader/escort ensures that the team's safety equipment is inspected before beginning work each day and verifies that required equipment is available and operational.
- Staff must immediately remove from service any machinery or equipment found to be unsafe, or that exhibits a deficiency that affects the safe operation of equipment. The equipment should be properly tagged and removed from service until the unsafe conditions are corrected or the equipment is replaced.

7.1 VEGETATION REMOVAL EQUIPMENT

Consider current site conditions when deciding which equipment is needed. The following equipment is typically used for vegetation removal:

- Chainsaws,
- Weed cutters/trimmers,
- Hand saws,
- Machetes,
- Axes,
- Wood chipper,
- Brush hog (tractor or skid steer), and
- Masticating head/mulching head (skid steer or excavator).

7.2 CHAINSAWS

7.2.1 Chainsaw Operations Requirements

Each chainsaw should be adjusted and operated IAW the manufacturer's instructions. Follow the manufacturer's recommendations for chainsaw use at all times.

- Ensure that each chainsaw used on site is equipped with a functional chain brake and a protective device that minimizes chainsaw kickback. Do not remove or disable chainsaw kickback devices.
- Ensure that each gasoline or fuel-powered chainsaw is equipped with a continuous pressure throttle control system that will stop the chain when pressure on the throttle is released.
- DO NOT fuel a chainsaw if the engine is hot. Allow the engine to cool before refueling.
- Place chainsaws on the ground or in a firmly supported position before starting the machine. If necessary, use plywood or other protective measures to ensure that the chain does not contact the ground.
    - Drop starting a chainsaw is prohibited.
    - Start with the chain brake engaged.
- Control the saw with two hands during saw operations. Exceptions to this policy include adjusting the throttle or reaching for and activating the kill switch.
- Establish secure, stable footing before starting to cut. Do not use the chainsaw in a position or at a distance that could cause insecure footing, loss of balance, or an insecure grip on the saw.
- DO NOT cut directly overhead or above shoulder height.
- Carry chainsaws in a manner that prevents operator contact with the chainsaw bar or chain.
- Shut down the saw whenever it is carried farther than 50 feet or when terrain conditions, such as obstructed ground, slippery surfaces, or dense underbrush, could cause the operator to stumble, slip, or fall.

7.2.2 Chainsaw Personal Protective Equipment

Chainsaw operators must wear the following PPE or PPE detailed in the APP/SSHP:

- Leg protection constructed with cut-resistant material, such as ballistic nylon. Leg protection must cover the full length of the thigh to the top of the boot on each leg to protect against contact with a moving chainsaw blade.

- Foot protection that covers and provides support to the ankle. Each employee who operates a chainsaw must wear foot protection constructed with cut-resistant material that will protect the employee against contact with a running chainsaw (safety toe).
- Safety glasses or goggles.
- Leather gloves.
- Ear plugs.
- Hard hat with attached hearing protection and mesh face shield.

7.2.3 Chainsaw "Kickback"

Kickback is the leading cause of injury among chainsaw users. It occurs when the teeth on the chain catch on an object as they rotate around the tip of the blade. The teeth may have enough force to cause the blade to kick back violently toward the operator. The actions prone to cause kickbacks include the following:

- Striking another object with the nose of the blade,
- Starting a bore cut improperly,
- Catching the bottom or side of a saw cut during reinsertion of the blade nose or tip, and
- Cutting objects above shoulder height.

Some defenses against kickback are as follows:

- Keep the tip guard on the chainsaw.
- Keep a firm hold on the saw.
- Use a saw that has a chain-brake or kickback guard.
- Keep the saw teeth sharp since dull teeth are more likely to cause kickback.
- Never cut anything above shoulder height. At that height, the saw is difficult to control and could potentially kickback toward the head and face.

7.2.4 Chainsaw Pinching

A pinched chainsaw can cause kickback and result in injury. Chainsaw operators should always watch for potential blade pinching situations and plan accordingly. Use the base of the blade to cut branches rather than the tip of the blade and use a high chain speed when reinserting the blade in a cut or removing it from a cut.

7.2.5 Chainsaw Inspection and Maintenance

Check the following elements regularly during each day, but no less than before starting work and at the end of the workday:

- Controls: ensure proper function.
- Chains: ensure proper adjustment.
- Mufflers: ensure that they are in place and operational.
- Chain brakes and nose shielding devices: ensure that they are in place and operational.
- Cutting edges: ensure that they are properly shaped and sharp.
- Ensure that all other safety devices are in place and function properly.

If any chainsaw needs repair, remove it from service and properly tag the equipment. Repair and reinspect it before use.

7.3 BRUSH CUTTER PROCEDURES

7.3.1 Brush Cutter Safety and Operation

The following procedures must be followed to ensure safe operation of brush cutters.

- Space individuals conducting brush cutting and removal with fuel-powered brush cutters at least 50 feet apart while the brush cutters are in use.
- Greater distances than those listed above may be required if specified by the manufacturer in the manufacturer's operating manual or other applicable documents.
- Ensure that operators are wearing proper PPE per the APP/SSHP.
    - For Nylon Line – foot protection with high traction soles and ankle protection, leather gloves, safety glasses or goggles, hard hat with mesh face shield and ear muffs, and hearing protection.
    - For Metal Cutting Blades – prescribed PPE for chainsaw operations.
- Use gas-powered brush cutters/trimmers IAW the manufacturer's operating manual. Ensure that the cutters/trimmers return to idle speed or shut off when the trigger is released.
- Start the cutter/trimmer on the ground or position the unit where it is firmly supported in an open area.
- Control equipment with both hands during operations (exceptions to this policy include the minimal time needed to adjust the throttle or reach for and activate the kill switch).
- Establish stable footing with feet firmly planted.

- Keep the trimmer head below waist level.

7.3.2 Brush Cutter Inspection and Maintenance

At a minimum, include the following in brush cutter inspections:

- Inspect the brush cutter prior to use for potential hazards, such as loose belts and missing or damaged guards.
- Examine the equipment for accumulations of grass, leaves, or excessive grease to reduce fire hazard.
- Conduct routine maintenance and inspections IAW the manufacturer's operating manual.
- If any brush cutter/trimmer needs repair, remove it from service and properly tag the equipment. Repair and reinspect it before use.

7.4 WOOD CHIPPER PROCEDURES

7.4.1 Wood Chipper Operations

During wood chipping operations, it is necessary to provide a safe work environment and to comply with the appropriate safeguarding of machinery standards. In addition to adhering to manufacturer-specific safety precautions or procedures, adhere to the following requirements:

- DO NOT open chipper access covers or doors until the drum or disc is completely stopped.
- Ensure that guards are fitted and secure on the feed chute and discharge chute to prevent contact with the disc, knives, or blower blades.
- Shut down the chipper when an employee performs any service or maintenance.
- Properly chock chippers to prevent rolling or sliding.
- Verify that operators are properly trained and supervised when operating machinery.
- DO NOT wear loose items or clothing that may catch or snag on the chipper.
- Feed the chipper from the side position away from the front of the in-feed chute. Once the in-feed rollers catch the wood, move away from the feed line of the chipper.
- Feed the butt end of branches into the chipper in-feed rollers first.
- Completely stop the in-feed rollers before correcting an action or cleaning up small pieces of wood or leaves on the machine.

- Maintain in place all guarding and emergency control mechanisms and keep them operational at all times when the machine is running.

7.4.2 Wood Chipper Inspection

Inspect and maintain wood chippers IAW manufacturers' instructions, conducting at least one inspection prior to use each day. Never operate the chipper if the required controls and guards are not in place. If chipper needs repair, remove it from service and properly tag the equipment. Repair and reinspect before use.

7.5 BRUSH HOG AND MULCHING HEAD PROCEDURES

7.5.1 Brush Hog and Mulching Head Attachment Operations

Brush hogs (mechanized mower deck attachment) and masticating/mulching heads can be an effective, efficient, and safe method for clearing vegetation. Hazard control and accident prevention depend on the awareness, concern, prudence, and proper training of personnel in the operation, transport, maintenance, and storage of equipment, in addition to the design and configuration of equipment. Use the following precautions as a general guide to safe operations when using brush hogs and masticating/mulching heads:

- Keep all guards in place while when the machine is in operation.
- Permit no riders on the attachment.
- Stop the engine, disconnect the power source, and wait for all machine movement to stop before servicing, adjusting, cleaning, or unclogging the equipment. The exception is when the machinery must be kept running for proper servicing or maintenance. In this case, follow the manufacturer's guidelines on all steps and procedures necessary to safely service or maintain the equipment.
- Make sure all personnel are clear of machinery before starting the engine, engaging power, or operating the machine.
- Become familiar with all of the machine's controls and the caution, warning, and danger decals affixed to the machine before attempting to start or operate.
- Complete a walk-around inspection to check for obvious defects, such as loose mounting bolts and damaged components, before starting or operating the machine. Correct deficiencies before starting.
- Lower the implement to ground, stop the machine engine, apply the parking brake, and allow the blades to stop completely before leaving the tractor/skid steer.
- DO NOT operate the equipment near any area where people may be present unless all safety chains or other factory-approved safety shields are in good repair.

- Establish the safe personnel working distance (depending on the size and type of attachment, the ejection hazard can be upwards of several hundred feet).
- Securely fasten the seat belt and ensure that the equipment has a rollover protection system.
- Where possible, avoid operating near ditches, embankments, and holes.
- Reduce speed when turning, crossing slopes, and operating on rough, slick, or muddy surfaces.
- Stay off slopes too steep for safe operation.
- Wear PPE such as, but not limited to, protection for eyes, ears, feet, hands, and head when operating or repairing the equipment.
- Stand clear of brush hog wing(s) and attachments when raising or lowering.

7.5.2 Brush Hog and Masticating/Mulching Head Inspection and Maintenance

Inspect and maintain the attachments IAW the manufacturer's instructions with at least one inspection before use each day. The following are the guidelines for inspection and maintenance:

- Grease and lubricate machine prior to each use and at required intervals following the manufacturer's operating manual.
- Verify that driveline shields are in place and in good repair to minimize entanglement injuries caused by rotating drivelines.
- Verify that deflector shields (chains, bands, and similar items) are in good repair to minimize injuries caused by the discharge of high-speed objects.
- Inspect blades for wear (replace if necessary).
- Check blade bolts for tightness.
- Check blades and spindles to verify that no foreign objects, such as wire or steel strapping bands, are wrapped around them.
- Inspect hydraulic lines and fittings for wear or leaks (repair or replace if needed).
- Inspect wheel(s) for wear, damage, or foreign objects (repair or replace if necessary).
- Check tractor tire air pressure (refer to manufacturer operating manual).
- During operation, listen for abnormal sounds that might indicate loose parts, worn bearings, or other damage.
- Remove vegetative debris from the engine compartment often enough to prevent fires.
- Conduct the following after each use:

- Clean all debris from the machine, especially the underside of the deck and affixed safety decals.
- Inspect cutter for worn or damaged components (repair or replace if necessary).

7.6 TREE FELLING PROCEDURES

Refer to OSHA guidelines for tree felling operations:
https://www.osha.gov/SLTC/etools/logging/manual/felling.html.

Safety must be of utmost concern when approaching a tree to cut. According to OSHA, "More people are killed while felling trees than during any other logging activity." Cutting trees with a chainsaw is particularly hard on the eyes and ears. OSHA Regulation 29 CFR 1910.266 requires that chainsaw operators wear the following:

- Head protection,
- Hearing protection (a combination head and ear protection may be used),
- Eye and face protection,
- Protective chaps or pants, and
- Protective footwear.

7.6.1 General Tree Felling Safety and Operation

7.6.1.1 Personnel Separation Distance

Designate work areas so trees cannot fall into an adjacent occupied work area.

- The distance between occupied work areas must be at least two lengths of the trees being felled.
- Calculate the distance between adjacent occupied work areas considering the degree of slope, the density of the growth, the height of the trees, the soil structure, and other hazards reasonably anticipated at that work site.

7.6.1.2 Overhead Hazards

To the greatest extent practicable, no tree felling should be conducted near overhead electric lines, but if necessary, conduct tree felling operations near overhead electric lines IAW the requirements of Title 29 CFR § 1910.333(c)(3). The site safety officer must notify the power company immediately if a felled tree contacts a power line. Each employee must remain clear of the area until the power company advises that there are no electrical hazards.

7.6.2 Tree Felling Operations

Follow these general requirements during all tree felling operations:

- Fell or remove each tree posing a danger using mechanical or other techniques that minimize employee exposure before beginning work in the area of the danger tree.
  - Lodged trees and snags are particularly dangerous. If not removed, flag and avoid the tree.
  - DO NOT work within two tree lengths of the flagged tree unless the Site Safety and Health Officer indicates that a shorter distance will not create a hazard for an employee.
- Carefully check each tree for signs of loose bark, broken branches and limbs, or other damage before felling or removing the tree.
- Remove or hold in place accessible loose bark and other damage that may create a hazard for an employee before felling or removing the tree.
- Felling on any slope where rolling or sliding of trees or logs is reasonably foreseeable must be done uphill from, or on the same level as, previously felled trees.

Before felling each tree, the feller evaluates conditions and takes precautions to avoid creating a hazard for the feller or other site personnel. Conditions evaluated include snow and ice accumulation, the wind, the lean of the tree, dead limbs, and the location of other trees. During manual tree felling, the chainsaw operator takes the following steps:

- Establish secure footing before starting to cut. Do not use the chainsaw in a position or at a distance that could cause off balance stance, insecure footing, or loss of firm grip on the saw.
- Clear away brush or other potential obstacles that might interfere with cutting the tree or using the retreat path.
- Plan and clear a retreat path:
  - The retreat path extends diagonally away from the expected felling line at an angle of approximately 45 degrees.
  - After making the back cut, immediately shut down the saw, place the saw on the ground, and move a safe distance away from the tree on the retreat path.
- Keep employees other than the feller at least two trees lengths away when cutting a spring pole or other tree under stress. Injury is possible when the cut releases stress.

Highlights of Manual Felling Techniques

- See the following for information about tree cutting: https://www.osha.gov/SLTC/etools/logging/manual/felling/cuts.html
- An undercut must be made in each tree being felled. The undercut must be of a size so that the tree will not split and will fall in the intended direction.
- A backcut must be made in each tree being felled. The backcut must leave sufficient hinge wood to hold the tree to the stump during most of its fall so that the hinge is able to guide the tree's fall in the intended direction. Except in open face felling, the backcut must be above the level of the horizontal facecut to provide an adequate platform to prevent kickback.
- The backcut may be at or below the horizontal facecut in tree pulling operations.
- Domino felling is prohibited.

8.0 GENERAL SAFETY

8.1 ENVIRONMENTAL CONDITIONS

When environmental conditions create a hazard for employees in the performance of the job, cease all vegetation and tree removal work and move each employee to a place of safety. Potentially dangerous conditions include, electrical storms, strong winds that may affect the fall of a tree, heavy rain or snow, extreme cold, dense fog, fires, mudslides, and darkness.

8.2 MUNITIONS AND EXPLOSIVES OF CONCERN SAFETY

Maximum safety in conducting any MEC operations can be achieved through adherence to applicable safety precautions, a planned approach, intensive supervision, and MEC avoidance. UXO-qualified personnel lead a site safety briefing before operational activities begin each workday. General safety considerations applicable to all essential and nonessential personnel at project sites where MEC may be encountered include the following:

- DO NOT become complacent because of familiarity with MEC or the reported probability level of MEC.
- DO NOT conduct operations during inclement weather.
- Avoid contact with MEC.

9.0 QUALITY CONTROL

The MQOs for vegetation clearance are presented in the project planning documents. Performance relative to the MQOs is assessed during the activity by designated personnel. The

SUXOS or UXOQCS uses the three-phase inspection process during vegetation clearance operations.

This SOP will be reviewed at least every 2 years IAW HGL procedures for review of controlled documents.

10.0 REFERENCES

CFR, Title 29, Section 1910.266, Logging.

CFR, Title 29, Section 1910.333(c)(3), Selection and Use of Work Practices.

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HGL HydroGeoLogic, Inc Exceeding Expectations	STANDARD OPERATING PROCEDURE
MEC Anomaly Avoidance Support	SOP No.: 510.01 SOP Category: MMRP and Geophysics Revision No.: 1 Revision Date: February 27, 2019 Review Date: February 2021

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1.0 PURPOSE

This standard operating procedure (SOP) describes the procedures for all HydroGeoLogic, Inc. (HGL) and subcontractor personnel providing munitions and explosives of concern (MEC) anomaly avoidance support during field operations where there is a potential for encountering MEC hazards.

2.0 SUMMARY OF METHOD

All HGL employees tasked with performing MEC-related activities must qualify in accordance with (IAW) Department of Defense Explosive Safety Board (DDESB) Technical Paper (TP) 18. Perform all work in a manner consistent with Occupational Safety and Health Administration-established standards and requirements. Conduct all activities in conformance with the project-specific Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP).

This MEC SOP discusses surface and subsurface anomaly avoidance procedures and techniques to be used while conducting munitions response and hazardous, toxic, or radioactive waste (HTRW)-related activities during investigative, design, and remedial actions. Anomaly avoidance techniques must be employed on properties known or suspected to contain MEC or chemical agent to avoid surface and subsurface explosive and chemical hazards. Anomaly avoidance techniques are implemented for activities that include the following:

- Surveying and mapping,
- Environmental and natural resource assessments,
- Surface and subsurface sampling,
- Boring and drilling,
- Groundwater monitoring, and
- Sign and fence installation.

3.0 DEFINITIONS AND ABBREVIATIONS/ACRONYMS

3.1 DEFINITIONS

Anomaly Avoidance: Techniques employed on property known or suspected to contain MEC or chemical agent, regardless of configuration, to avoid contact with potential surface or subsurface hazards, to allow entry into the area for the performance of required operations.

Hazardous, Toxic, and Radioactive Waste (HTRW) Activities: Activities undertaken for the following:

- The U.S. Environmental Protection Agency's Superfund program,
- The Defense Environmental Restoration Program, including Formerly Used Defense Sites (FUDS),
- Installation Restoration Program sites at active U.S. Department of Defense (DoD) facilities,
- HTRW actions associated with civil works projects, and
- Any other mission or non-mission work performed for others at HTRW sites.

HTRW actions during the investigative/design phase of an HTRW project on a site with known MEC or unknown fillers require anomaly avoidance procedures. MEC removal actions may be required in advance of HTRW activities (construction) on a HTRW project site with known MEC hazards.

Munitions and Explosives of Concern (MEC): Specific categories of military munitions that may pose unique explosives safety risks, including the following:

- Unexploded ordnance (UXO), as defined in 10 United States Code (U.S.C.) § 101(e)(5)(A) through (C);
- Discarded military munitions (DMM), as defined in 10 U.S.C. § 2710(e)(2); or
- Munitions constituents (such as TNT or RDX), as defined in 10 U.S.C. § 2710(e)(3), present in high enough concentrations to pose an explosive hazard.

Munitions Constituents: Any materials originating from UXO, DMM, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.

Munitions Debris: Remnants of munitions remaining after munitions use, demilitarization, or final disposition. Examples of munitions remnants include fragments, penetrators, projectiles, shell casings, links, and fins. Munitions debris also includes inert munitions-related material recovered during an MEC removal.

Recovered Chemical Warfare Materiel (CWM): Non-stockpiled CWM previously discarded, buried, or fired and discovered either unexpectedly or during planned environmental restoration operations that DoD has either secured in place or placed under DoD control pending final disposition. CWM is normally secured in a DDESB-approved storage location or interim holding facility, pending final disposition.

Unexploded Ordnance (UXO): As defined by 10 U.S.C. § 101(e)(5)(A) through (C), 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, installation, personnel, or material; and
- Remain unexploded whether by malfunction, design, or any other cause.

UXO-Qualified Personnel: Personnel who have performed successfully in military explosive ordnance disposal positions or are qualified to perform in the following contractor positions as listed in the Department of Labor's Service Contract Act Directory of Occupations: UXO Technician II, UXO Technician III, UXO Safety Officer, UXO Quality Control Specialist, or Senior UXO Supervisor.

3.2 ABBREVIATIONS/ACRONYMS

APP	Accident Prevention Plan
bgs	below ground surface
CWM	chemical warfare materiel
DDESB	Department of Defense Explosive Safety Board
DMM	discarded military munition
DoD	(U.S.) Department of Defense
DPT	direct push technology
FUDS	Formerly Used Defense Site
GPS	global positioning system
HGL	HydroGeoLogic, Inc.
HTRW	hazardous, toxic, and radioactive waste
IAW	in accordance with
MEC	munitions and explosives of concern
MMRP	Military Munitions Response Program
PA/SI	Preliminary Assessment/Site Inspection
SSHP	Site Safety and Health Plan

SOP	standard operating procedure
TP	Technical Paper
U.S.C.	United States Code
UXO	unexploded ordnance

4.0 PERSONNEL

For anomaly avoidance on a site with potential MEC, HGL provides a UXO team consisting of a minimum of two personnel, one of whom must be a UXO Technician II or above (see exception in following paragraph). The UXO Technician serves as the UXO Team Leader and has ultimate responsibility for ensuring that all MEC anomaly avoidance support activities are performed IAW this SOP, project planning documents, and/or the APP/SSHP. The UXO Technician directs all MEC anomaly avoidance support during field operations.

A UXO Technician I can provide escort duties if under the supervision of UXO-qualified personnel. (Note: Although escort by a UXO Technician I is typically performed under the supervision of UXO-qualified personnel, the responsible commander or authority may approve UXO Technician I personnel to perform escort duties without supervision. Such approval must be based on an approved risk assessment and implementation of methods to mitigate potential exposures). Escorts will help ensure that MEC on the surface and subsurface anomalies are avoided.

4.1 UXO PERSONNEL

UXO personnel perform the following:

- Provide MEC recognition, location, and explosive safety functions.
- Conduct explosive safety briefing for all site personnel and visitors.
- Conduct a surface and subsurface anomaly avoidance.
- Work closely with U.S. Army Corps of Engineers/client personnel on all MEC-related matters.
- Coordinate and report MEC discoveries IAW project planning documents.

4.2 NON-UXO PERSONNEL

Non-UXO personnel perform the following:

- Obtain training in recognizing the potential hazards associated with MEC.

- Remain with the UXO Technician at all times unless otherwise cleared to work without a UXO escort.
- Follow the instructions given by the UXO Technician if an accident occurs.
- Exercise caution when walking on site and follow UXO Technician directions.

5.0 EQUIPMENT AND SUPPLIES

5.1 GENERAL EQUIPMENT AND SUPPLIES

The following geophysical equipment is typically used during MEC anomaly avoidance operations:

- Magnetometers such as the Schonstedt GA 52-CX,
- Frequency-domain electromagnetic induction metal detectors such as the White's All Metals Detector, and
- Downhole monitors.

The following supplies are typically used during MEC anomaly avoidance operations:

- Flagging ribbon,
- Pin flags,
- Global positioning system (GPS) units, and
- High visibility, biodegradable spray paint.

5.2 EQUIPMENT INSPECTIONS

Staff must perform the following equipment inspections:

- Perform a daily equipment function check on all geophysical instruments and GPS equipment. Describe the performance results of the equipment check in the logbook or in an instrument maintenance and calibration log following each functionality test.
- If an equipment function check indicates that any piece of equipment is not operating correctly, and it cannot be field repaired immediately, remove the equipment from service until it can be repaired.

6.0 SAFETY

Before entering an area requiring MEC anomaly avoidance, the UXO Technician must conduct a safety brief covering emergency procedures, operations, MEC hazards, and anomaly avoidance procedures. If MEC is encountered during any phase of work, follow the procedures in the project planning documents. In general, adhere to the following MEC safety precautions and protocols:

- Observe this cardinal principle when work may involve ordnance, explosives, ammunition, severe fire hazards, or toxic materials: limit the exposure to a minimum number of personnel, for the minimum amount of time, to a minimum amount of hazardous material consistent with a safe and efficient operation.
- DO NOT touch, move, or jar any ordnance items regardless of their markings or apparent condition.
- **Under no circumstances handle any MEC during avoidance activities or move MEC in an attempt to make a positive identification.**
- DO NOT touch, pick up, kick, or move anything that is unfamiliar or unknown.
- DO NOT roll the item over or scrape the item to identify markings.
- DO NOT approach or enter a munitions site if an electrical storm is occurring or approaching. If a storm approaches during site operations, leave the site immediately and seek shelter.
- DO NOT transmit radios or cellular phones in the vicinity of suspect MEC hazards.
- DO NOT walk across an area where the ground surface cannot be seen or that has not been cleared of MEC hazards by the UXO Technician.
- DO NOT rely on color codes for positive identification of ordnance items nor their contents.
- DO NOT drive vehicles into a suspected MEC area until anomaly avoidance techniques have been implemented.
- DO NOT be misled by markings on the MEC item stating "practice" or "dummy." Practice ordnance can have explosive charges used to mark and/or spot the point of impact, or the item could be marked incorrectly.
- Clearly mark the location of any ordnance item found during anomaly avoidance activities so that it can be easily located and avoided.

— WARNING —
Removing or taking any munitions, explosive, or unexploded ordnance or munitions-related debris from the site by any employee is strictly prohibited.

7.0 ANOMALY AVOIDANCE PROCEDURES

Conduct anomaly avoidance procedures during field investigation activities whenever there is a potential for encountering MEC. The purpose of the procedures is to avoid any potential surface and subsurface MEC hazards during these activities. Anomaly avoidance procedures including the following are outlined in the subsections below:

- Establishing site access routes and site boundaries, and conducting MEC avoidance surveys;
- Conducting land surveying and mapping;
- Conducting Preliminary Assessments/Site Inspections (PAs/SIs) on FUDS and Base Realignment and Closure sites;
- Conducting geophysical surveying; and
- Assessing environmental and natural resources:
    - Surface soil sampling,
    - Subsurface soil sampling,
    - Boring and drilling,
    - Groundwater monitoring, and
    - Test pits and trenches excavations.

7.1 ACCESS SURVEY AND MEC AVOIDANCE PROCEDURES

The UXO escort must conduct an access path survey for surface hazards and subsurface anomalies before any type of activities commence, including foot and vehicular traffic. The UXO escort is responsible for conducting the access survey using the following steps:

- Conduct an access survey of the footpath and/or vehicular lanes approaching and leaving work areas with known or suspected MEC. Typically, the access route will be twice as wide as the widest vehicle that will use the route.
- Conduct an access survey around the proposed work site that is large enough to support all planned operations. The size of the area will consider the maneuverability of the equipment and the space required to stage support vehicles or equipment.
- Use geophysical instrumentation capable of detecting the smallest known or anticipated MEC to locate anomalies just below the ground surface that may be encountered because of erosion from rain or because of continual foot or vehicular traffic. If the emplacement depth is greater than the detection capabilities, then the escort must complete the geophysical survey in intervals until the required depth is reached (for example, every 6 inches, 1 foot, 2 feet, and so forth).
- Clearly mark the route(s) for future entry control.
- If anomalies or surface MEC are encountered, mark the items and relocate the work area to an anomaly free area to avoid contact.
- Prohibit personnel from working outside of the surveyed areas.

7.2 CLEARING AND GRUBBING

Initial clearing and grubbing operations may be required before field activities. The objective of clearing and grubbing is to create unhindered access for the field teams. In areas with potential MEC hazards, the UXO Team must perform the following:

- Survey the proposed clearing and grubbing area with a geophysical instrument. Mark hazards with survey flagging or pin flags.
- Begin clearing and grubbing within the area established by the survey.
- Use qualified UXO Technicians to escort grubbing teams at all times.
- Exercise caution when using mechanical grubbing equipment.
- Keep the lowest part of the cutting deck of mechanized equipment at least 6 inches above ground level to avoid potential contact with any MEC hazards remaining after the initial survey.

7.3 LAND SURVEYING AND MAPPING PROCEDURES

The UXO Technician performs the following during land surveying and mapping activities:

- Conducts an access survey of the routes to and from the proposed survey site and an area around the site.
- Visually inspects the surface of each proposed survey point for any indication of MEC or MEC-related contamination.
- Uses a handheld geophysical instrument to assess the presence or absence of subsurface anomalies at the locations where survey points/stakes installation is planned. If responses indicate an anomaly, the UXO Technician disallows survey point/stake installation at that specific location and assists in selecting an alternate location.

7.4 SAMPLING AND DRILLING PROCEDURES

7.4.1 Surface Soil Sampling (Zero to 6 Inches)

The following paragraphs describe anomaly avoidance procedures for surface soil sampling between 0 and 6 inches below ground surface (bgs) in areas with potential MEC.

- Conduct a surface access survey of the routes to and from the proposed investigation site as well as of a support area around the investigation site.
- Visually inspect the surface of each proposed surface soil sampling site for any indication of MEC or MEC-related contamination.

- Survey the proposed sample locations using handheld geophysical instruments.
- Select an alternate location to collect surface soil samples if anomalies are detected at a proposed sampling location or too many anomalies are detected in a general area of interest.

7.4.2 Subsurface Soil Sampling (Below 6 Inches) and Monitoring Well Installation

The following paragraphs describe anomaly avoidance procedures for subsurface soil sampling and monitoring well installations in an area with potential MEC. Subsurface soil sampling is defined as the collection of samples below a nominal depth of approximately 6 inches with a split-spoon, Shelby tube, direct push sampler, or bucket auger (hand auger) soil sampler using drilling techniques. Drilling techniques are also used to install groundwater monitoring wells for HTRW investigations. The UXO team adheres to the following procedures:

- Conduct a surface access survey of the routes to and from the proposed investigation site as well as an area around the investigation site.
- Conduct a subsurface survey of the proposed drill hole location(s) with a handheld, geophysical instrument to detect subsurface MEC anomalies.
- Prominently mark the locations of any anomalies detected with survey flagging or non-metallic pin flags for avoidance.
- Select a new sampling or borehole location if an anomaly is detected.
- Incrementally complete the downhole geophysical survey (for example, every 2 feet) if the subsurface sampling depth is greater than the geophysical detection capabilities.

7.4.3 Incremental Geophysical Survey for Conventional MEC Avoidance

For intrusive sampling (subsurface sampling and well drilling) in areas with suspected MEC, the team completes follows this procedure:

1. **Begin the installation:**
    - Complete the access survey of the area.
    - Complete the geophysical survey and install a pilot hole at the sample or drill location if no anomalies are detected.
    - As long as no anomalies are detected, advance the pilot hole to the maximum reach of the auger or to the maximum depth of the proposed drill hole.
    - During installation, incrementally complete the downhole geophysical survey (for example, every 2 feet) if the subsurface sampling depth is greater than the geophysical detection capabilities.

- When working in impact areas, the UXO team may discontinue incremental screening once a depth of 30 feet bgs is reached or the depth of MEC penetration has been exceeded, whichever is less.
- For all other areas, incremental geophysical screening will be determined based on an assessment of the site's characteristics and history.

2. **If anomalies are detected:**

- Stop installation immediately and backfill the pilot hole IAW project-specific procedures.
- Direct HTRW sampling personnel to select a new location.

7.4.4 Test Pits and Trench Excavations

Test pits and trench excavations are used to identify and characterize large subsurface HTRW areas of concern. Adhere to the following procedures:

- Conduct an access survey of the routes to and from the proposed excavation locations.
- If an anomaly is detected, select a new excavation location.
- If the proposed excavation depth is greater than the geophysical instrument detection capabilities, the UXO team proceeds as follows:
  - HTRW personnel can begin excavation in 1-foot increments.
  - At the end of each 1-foot increment, the UXO team screens for anomalies. If an anomaly is detected, the HTRW team must modify the excavation to avoid the anomaly.
  - If MEC is encountered, all operations must cease. The UXO team accesses the item and follows MEC procedures detailed in the project planning documents.
  - After the MEC hazard has been removed, excavation using anomaly avoidance can continue.
- If potentially hazardous waste, debris, or drums are encountered during test pit or trenching operations, stop all excavation activities. The Site Safety Officer adheres to the following procedure:
  - Assess the situation and direct a change to the personal protective equipment for site workers, if necessary.
  - Notify the appropriate personnel IAW the project planning documents.
  - Handle wastes IAW the project planning documents.

7.4.5 Soil Sampling with Direct Push Technology

The following paragraphs describe anomaly avoidance procedures for soil sampling and use of direct push technology (DPT) in areas with potential MEC. Soil sampling with DPT typically involves manual or mechanical penetration at the desired location, followed by withdrawal and collection of a soil sample. The UXO Team adheres to the following procedure:

- Conduct a surface access survey of the routes to and from the proposed investigation site as well as an area around the investigation site.
- Follow the anomaly-avoidance procedures described above for subsurface soil sampling and monitoring well installations as follows:
  - Conduct an incremental down-hole geophysical survey for metallic anomalies.
  - Conduct actual sampling and geophysical instrument screening through the DPT borehole.
  - Backfill the sampling location IAW project-specific procedures after collection of the soil samples.

7.4.6 Groundwater Monitoring

Groundwater monitoring activities include measuring groundwater elevations, measuring free product thickness, and collecting analytical samples. Unless a path is clearly marked, HTRW sampling personnel must be escorted by UXO-qualified personnel when conducting groundwater monitoring/aquifer characterization activities in areas with potential MEC.

7.5 PRELIMINARY ASSESSMENT AND SITE INSPECTION

On sites were MEC hazards may be present, UXO Technicians perform anomaly avoidance measures to prevent non-UXO personnel conducting PA/SI work on the site from contacting MEC hazards.

8.0 MUNITIONS AND EXPLOSIVES OF CONCERN

8.1 MEC ENCOUNTERED

If MEC is encountered, the UXO Technician performs the following:

- Stops the team, draws attention to the hazard, and marks the hazard with a high-visibility pin flag, paint, or surveyors tape.
- If safe to do so, attempts to identify the MEC hazard via markings and other external features such as shape, size, and external features.
- Records the locations of any MEC hazard items in a GPS, if possible.

- Photographs the hazard.
- Makes notifications required in the project planning documents.

8.2 MEC DISPOSITION

The UXO escort is not authorized or equipped to perform MEC disposition. MEC discoveries must be reported to the designated personnel/agencies identified in project planning documents. If staff encounter a MEC item that cannot be avoided or that, based on its fuzing or current condition, presents an imminent hazard, the UXO escort must immediately notify the personnel/agencies designated in project planning documents.

9.0 QUALITY CONTROL

The Military Munitions Response Program (MMRP) Operations Manager ensures that this SOP is reviewed at least every two years for completeness, accuracy, and safety. Project Managers and supervisors ensure that all site personnel read, understand, and follow this SOP, and they must bring any discrepancies with procedural steps or safety issues pertaining to this SOP to the attention of the responsible supervisor for corrective action.

The senior UXO-qualified person on site has final on-site authority on all munitions and MEC procedures and safety issues. This individual has direct reporting and communications responsibility with all responsible authorities as directed by the HGL Project Manager.

10.0 REFERENCES

U.S. Department of Defense (DoD), Defense Explosives Safety Regulation 6055.09, Edition 1.

DoD Explosives Safety Board, Technical Paper 18, Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities.

U.S. Army Corps of Engineers (USACE), Engineer Manual 385-1-97, Explosives Safety and Health Requirements Manual.

HGL HydroGeoLogic, Inc Exceeding Expectations	STANDARD OPERATING PROCEDURE
Munitions and Explosives of Concern Construction Support	**SOP No.: 511.01** **SOP Category: MMRP and Geophysics** **Revision No.: 0** **Revision Date: August 22, 2018** **Review Date: August 2020**

Approved By:

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8/23/2018

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1.0 PURPOSE

This standard operating procedure (SOP) provides basic guidance and procedures for performing munitions and explosives of concern (MEC) construction support.

2.0 SUMMARY OF METHOD

All HGL employees tasked with performing MEC-related activities must qualify in accordance with (IAW) Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 18. Perform all work in a manner consistent with Occupational Safety and Health Administration established standards and requirements. Conduct all activities in conformance with the project-specific Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP).

These procedures apply to all HydroGeoLogic, Inc. (HGL) and subcontractor personnel during MEC construction support activities in areas where there is a probability of encountering MEC.

3.0 DEFINITIONS AND ABBREVIATIONS/ACRONYMS

3.1 DEFINITIONS

Chemical Warfare Materiel (CWM): Items generally configured as a munition containing a chemical compound that is intended to kill, seriously injure, or incapacitate a person through its physiological effects. CWM includes V- and G-series nerve agents or H-series (mustard) and L-series (lewisite) blister agents in other-than-munition configurations; and certain industrial chemicals (e.g., hydrogen cyanide [AC], cyanogens chloride [CK], or carbonyl dichloride [called phosgene or CG]) configured as a military munition. Because of their hazards, prevalence, and military-unique application, chemical agent (CA) identification sets are also considered CWM.

CWM does not include the following:

- Riot control devices,
- Chemical defoliants and herbicides,
- Industrial chemicals such as AC, CK, or CG not configured as a munition,
- Smoke and other obscuration producing items,
- Flame and incendiary producing items, and
- Soil, water, debris or other media contaminated with low concentrations of CAs where no CA hazards exist.

Construction Support: Assistance provided by unexploded ordnance (UXO)-qualified personnel and/or by personnel trained and qualified for operations involving CA, regardless of configuration, during intrusive construction activities on property known or suspected to contain

MEC or CA, regardless of configuration, to ensure the safety of personnel or resources from any potential explosive or CA hazards.

Construction Support/On-Call: Construction support provided, on an as-needed basis, where the probability of encountering MEC or CA, regardless of configuration, has been determined to be low. This support can respond from off site when called or be on site and available to provide required construction support.

Construction Support/On-Site: Dedicated construction support where the probability of encountering MEC or CA, regardless of configuration, has been determined to be moderate to high.

Material Potentially Presenting an Explosive Hazard (MPPEH): Material owned or controlled by the U.S. Department of Defense (DoD) that, prior to determination of its explosives safety status, potentially contains explosives or munitions (e.g., 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 (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts associated with munitions production, demilitarization, or disposal operations).

Excluded from MPPEH are munitions within the DoD-established munitions management system, non-munitions related material (e.g., 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 (e.g., gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions.

Munitions and Explosives of Concern (MEC): This term distinguishes the following specific categories of military munitions that may pose unique explosives safety risks:

- UXO, as defined in 10 United States Code (U.S.C.) § 101(e)(5)(A) through (C);
- Discarded military munitions, as defined in 10 U.S.C. § 2710(e)(2); or
- 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.

Munitions Debris: Nonhazardous remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or final disposition.

Recovered Chemical Warfare Materiel (RCWM): Non-stockpile CWM previously discarded, buried, or fired and discovered either unexpectedly or during planned environmental restoration operations that DoD has either secured in place or placed under DoD control pending final

disposition. CWM is normally secured in a DDESB-approved storage location or interim holding facility, pending final disposition.

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, installation, personnel, or material; and
- remain unexploded either by malfunction, design, or any other cause.

For the purpose of this project, the definition of UXO is limited to items larger than 50-caliber. A more detailed description of the term UXO is provided in Public Law 106-65, § 3031 (c)(5)(A).

UXO-Qualified Personnel: Personnel who have performed successfully in military explosive ordnance disposal positions or are qualified to perform in the following contractor positions as listed in the Department of Labor's Service Contract Act Directory of Occupations: UXO Technician II, UXO Technician III, UXO Safety Officer (UXOSO), UXO Quality Control Specialist (UXOQCS), or Senior UXO Supervisor (SUXOS).

3.2 ABBREVIATIONS/ACRONYMS

AC	hydrogen cyanide
APP	Accident Prevention Plan
CA	chemical agent
CG	carbonyl dichloride
CK	cyanogens chloride
CWM	chemical warfare materiel
DDESB	Department of Defense Explosives Safety Board
DoD	(U.S.) Department of Defense
ESP	Explosives Safety Submission
ESS	Explosives Site Plan
HGL	HydroGeoLogic, Inc.
IAW	in accordance with
MEC	munitions and explosives of concern
MPPEH	material potentially presenting an explosive hazard
RCWM	recovered chemical warfare material

SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SUXOS	Senior UXO Supervisor
TP	Technical Paper
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer
WP	Work Plan

4.0 PERSONNEL

For MEC construction support, the UXO team will consist of a minimum of two UXO qualified personnel (one UXO Technician III and one UXO Technician II). Depending on the scope of work, some projects may require the two personnel to be SUXOS and UXOSO qualified. The UXO team may include additional UXO-qualified personnel depending on on-site/task-specific conditions and requirements. The senior UXO-qualified person serves as the UXO Team Leader and has ultimate responsibility for ensuring that all MEC construction support activities are performed IAW this SOP and project planning documents.

The UXO team responsibilities include the following:

- Reviewing any archival information available on the area of the proposed construction footprint in an effort to determine the probable types of MEC that may be encountered and identify specific hazards and safety precautions;
- Providing MEC recognition, location, and safety functions for the construction contractor during construction activities; and
- Conducting MEC safety briefings for site personnel and visitors.

5.0 EQUIPMENT

5.1 GEOPHYSICAL EQUIPMENT AND SUPPORT EQUIPMENT

The type of geophysical equipment depends on site conditions and the type of work being conducted. For the purposes of construction support, the following geophysical equipment is typically used:

- Magnetometers, such as the Schonstedt GA 52-CX,
- Frequency-domain electromagnetic induction metal detectors, such as the White's All Metals Detector, and
- Downhole monitors.

Additional equipment items that may be required for construction support are as follows:

- Flagging ribbon,
- Pin flags,
- High-visibility, biodegradable spray paint (as required),
- Hard hat and safety vest (construction site),
- UXO team gear, and
- MEC demolition kit.

5.2 EQUIPMENT INSPECTIONS

The following inspections must be performed:

- Perform a daily equipment function check on all geophysical instruments. Describe the performance results of the equipment check in the logbook or in an instrument maintenance and calibration log following each functionality test.
- If an equipment function check indicates that any piece of equipment is not operating correctly, and it cannot be field repaired immediately, remove the equipment from service until it can be repaired.
- Inspect all instruments and equipment items that require routine maintenance and/or calibration upon arrival and periodically as required in the manufacturers' equipment manual.

6.0 SAFETY

In general, adhere to the following MEC safety precautions and protocols:

- Observe this cardinal principle when work may involve ordnance, explosives, ammunition, severe fire hazards, or toxic materials: limit the exposure to a minimum number of personnel, for the minimum amount of time, to a minimum amount of hazardous material consistent with a safe and efficient operation.
- Always assume that MEC hazards contain a live charge until determined otherwise.
- Understand that the age or condition of a MEC hazard does not decrease the effectiveness. MEC that has been exposed to the elements for an extended period of

time becomes more sensitive to shock, movement, and friction because the stabilizing agent in the explosives may be degraded.

- DO NOT touch, move or jar any ordnance items regardless of the markings or apparent condition. Under no circumstances handle any MEC during avoidance activities or moved in an attempt to make a positive identification.
- DO NOT touch, pick up, kick, or move anything that is unfamiliar or unknown.
- DO NOT roll the item over or scrape the item to identify markings.
- DO NOT approach or enter a munitions site if an electrical storm is occurring or approaching. If a storm approaches during site operations, leave the site immediately and seek shelter.
- DO NOT transmit radios or cellular phones in the vicinity of suspect MEC hazards.
- DO NOT walk across an area where the ground surface cannot be seen or that has not been cleared of MEC hazards by the UXO Technician.
- DO NOT rely on color codes for positive identification of ordnance items or their contents.
- DO NOT drive vehicles into a suspected MEC area until anomaly avoidance techniques have been implemented.
- DO NOT be misled by markings on the MEC item stating "practice" or "dummy." Practice ordnance can have explosive charges used to mark and/or spot the point of impact, or the item could be marked incorrectly.
- Clearly mark the location of any ordnance item found during anomaly avoidance activities so that it can be easily located and avoided.

— WARNING —
Removing or taking any munitions, explosives, or UXO or munitions related debris from the site by any employee is strictly prohibited.

7.0 CONSTRUCTION SUPPORT PROCEDURES

Support during construction activities may require only MEC "on-call" (standby) or "on-site" (direct) support during intrusive activities. The level of effort for construction support is site/task-specific and determined on a case-by-case basis by the project development team in coordination with the appropriate DoD agency or service component. The UXO construction support team is responsible for the following activities:

- Meet construction contractor site management and construction personnel and conduct a general work and safety briefing.

  - Probable site hazards and safety considerations,
  - MEC construction support procedures,
  - Responsibilities and lines of authority for any MEC response, and
  - Emergency response procedures.

- Physically inspecting the construction footprint with construction contractor site management and construction contractor to identify areas of concern.
- Monitoring construction activities and, if potential MPPEH is encountered, determining the item's status and if disposal action is required.
- If part of construction support scope, providing anomaly avoidance for construction contractor activities such as the following:
  - Installation of survey points,
  - Installation of utility lines,
  - Installation of signs, poles, or structures, and
  - Downhole support while driving piles.

7.1 ON-CALL CONSTRUCTION SUPPORT (LOW PROBABILITY OF ENCOUNTERING MEC)

If it is determined that there is a "low probability" of encountering MEC at a project site, at a minimum on-call support will be required. On-call support means coordinating with UXO-qualified personnel to ensure their availability, advising them about the project, and placing them "on-call" to assist if suspected MEC is encountered during construction activities. This support can respond from off site when need or be on site and available to provide required construction support.

7.2 ON-SITE CONSTRUCTION SUPPORT (MODERATE TO HIGH PROBABILITY OF ENCOUNTERING MEC)

If it is determined that there is a "moderate to high probability" of encountering MEC at a project site, the activity must be conducted using anomaly avoidance techniques, or UXO-qualified personnel must attempt to identify and remove any explosive or CA hazards in the construction footprint before any other activities begin. Any actions requiring MEC removal in the construction footprint must be designed and authorized in coordination with the appropriate authorities (for example, a USACE military munitions design center).

Subsurface removals require close coordination with the client and the construction contractor. Subsurface removal actions must be accomplished IAW approved project plans (Work Plan [WP], APP/SSHP, Explosives Site Plan [ESP], and Explosives Safety Submission [ESS], if required).

8.0 MUNITIONS AND EXPLOSIVES OF CONCERN

8.1 MEC ENCOUNTERED

If MEC is discovered during construction support, the construction work crew takes the following actions:

- RECOGNIZE the hazard, RETREAT from the area, and REPORT the item to the appropriate personnel.
- Mobilize MEC construction support personnel to the project site (if not already on site).
- If MEC construction support personnel are already on site, notify the construction support team.
- If MEC is found on a "low probability" site, conduct a new probability assessment.

8.2 MEC DISPOSAL

If part of the project scope, the construction support team must dispose of MEC as specified in the project planning documents (WP, and when applicable, ESP or ESS). The senior UXO-qualified person is responsible for coordinating with the proper authorities for the final disposition of all MEC hazards discoveries. If construction support personnel are tasked with MEC destruction, address the following considerations in the project planning documents:

- Teams conducting MEC destruction activities must consist of at least three personnel, with a minimum of two UXO-qualified personnel (one UXO Technician III and one UXO Technician II).
- Teams follow the MEC disposal and explosives procedures detailed in the applicable project planning documents (WP, Explosive Management Plan, ESS, ESP).
    - The plan includes guidance on acquisition, receipt, storage, transportation, inventory, and loss/theft of explosives.
    - Explosives must be used IAW federal, state, and local laws and regulations.
- Refer to the following HGL SOPs for MEC disposal and explosives procedures:
    - SOP 501.01: Explosive Materials Accountability and Management,
    - SOP 502.01: Explosive Demolition Operations, and
    - SOP 503.01: Explosives Storage Inspections and Security.

8.3 MPPEH DISPOSITION

If MPPEH processing is included in the construction support scope of work, ensure that the project is staffed with personnel qualified to certify and verify MPPEH (SUXOS and UXOQCS).

If required, MPPEH procedures must be detailed in the project planning documents. MPPEH must be processed IAW HGL SOP 504.01: MPPEH Inspection and Management, as well as any other applicable laws, regulations, and restrictions.

8.4 RECOVERED CHEMICAL WARFARE MATERIAL

Any time that recovered chemical warfare material (RWCM) or munitions with unknown fillers are identified, the MEC construction support team must notify the agencies designated in the project planning documents. When RWCM or munitions with unknown fillers are encountered during MEC construction support, all work must immediately cease. Project personnel withdraw along paths upwind from the discovery. The site is secured to prevent unauthorized access, and personnel providing security position themselves as far upwind as possible while still securing the area.

9.0 QUALITY CONTROL

The Military Munitions Response Program (MMRP) Operations Manager ensures that this SOP is reviewed at least every 2 years for completeness, accuracy, and safety. Project Managers and supervisors ensure that all site personnel read, understand, and follow this SOP, and they must bring any discrepancies with procedural steps or safety issues pertaining to this SOP to the attention of the responsible supervisor for corrective action.

The senior UXO-qualified person on site has final on-site authority on all munitions and MEC procedures and safety issues. This individual has direct reporting and communications responsibility with all responsible authorities as directed by the HGL Project Manager.

10.0 REFERENCES

U.S. Department of Defense (DoD), DoD Manual 6055.09-M, DoD Ammunition and Explosives Safety Standards.

DoD Explosives Safety Board, Technical Paper 18, Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities.

U.S. Army Corps of Engineers (USACE), Engineer Manual 385-1-97, Explosives Safety and Health Requirements Manual.

HGL HydroGeoLogic, Inc Exceeding Expectations	STANDARD OPERATING PROCEDURE

Remote Mechanical Demilitarization	SOP 522.01
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1.0 PURPOSE

This standard operating procedure (SOP) establishes standard safe practices and techniques for performing remote mechanical demilitarization (demil) of ordnance during munitions response projects conducted by HydroGeoLogic, Inc. (HGL) unexploded ordnance (UXO)-qualified personnel.

These techniques are intended to provide means and methods to fulfill the requirements of Engineer Manual (EM) 385-1-97, I.2.J.08: "Inert ordnance will not be disposed of as munitions debris until the internal fillers/voids have been exposed and unconfined." Additionally, these procedures may be used as an alternate disposal technique for material potentially presenting an explosive hazard (MPPEH) and munitions and explosives of concern (MEC) when approved in the project planning documents such as a Work Plan, Explosives Safety Submission (ESS), or Explosives Safety Plan (ESP). As stated in U.S. Department of Defense (DoD) Manual 6055.09-M, V7. E3.8.4.2:

> The use of remotely operated equipment (e.g., excavators, sifters, and shredders) or other standoff technologies (e.g., lasers) may offer the safest approach for excavating **and destroying UXO** and should be considered.

The demil techniques discussed in this SOP have been demonstrated to be safe and effective on Military Munitions Response Program (MMRP) projects, and the following language from an ESS has been approved by the U.S. Army Corps of Engineers (USACE) Environmental and Munitions Center of Expertise (EM CX), U.S. Army Technical Center for Explosive Safety (USATCES), and Department of Defense Explosive Safety Board (DDESB).

> MPPEH PROCEDURES
>
> The UXO Team may use mechanical demilitarization techniques to open single or multiple material potentially possessing an explosive hazard (MPPEH) for internal inspection using remotely operated equipment. This is a high input operation and high order detonations are possible. Nonessential personnel and unshielded essential personnel must withdraw to the minimum safe distance for intentional detonation. Essential persons may withdraw to the K24 distance if shielded for intentional detonation with material outlined in the fragmentation data review form for the munition involved. The K24 may be reduced to the K18 when personnel use double hearing protection.
>
> ALTERNATIVE DISPOSAL TECHNIQUES
>
> The UXO Team may use remotely operated equipment to induce heat, shock, and friction to dispose of MEC. Items determined safe to move by the SUXOS and UXOSO may be moved to an area designated for alternate disposal methods, or the alternate disposal method may be adapted for items that cannot be moved. This is a high input operation intended to cause MEC to detonate. Nonessential personnel and unshielded essential personnel must withdraw to the minimum safe distance for intentional detonation. Essential persons may withdraw to the K24 distance if shielded for intentional detonation with material outlined in the fragmentation data review form

for the munition involved. The K24 may be reduced to the K18 when personnel use double hearing protection.

2.0 SUMMARY OF METHOD

This SOP details the procedures and safety measures required for remote operation of rail saws and chop saws used for mechanical demil. These procedures may be used as an alternate disposal technique for MPPEH and MEC. All HGL employees tasked with performing mechanical demil must be qualified in accordance with (IAW) DDESB Technical Paper (TP) 18. They must perform all work in a manner consistent with Occupational Safety and Health Administration-established standards and requirements, and they must conduct all activities in conformance with the project-specific Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP).

3.0 DEFINITIONS AND ABBREVIATIONS/ACRONYMS

3.1 DEFINITIONS

Essential Personnel: DoD and contractor personnel necessary for the safe and efficient completion of field operations conducted in an exclusion zone (EZ). Multiple multidisciplinary MEC teams performing project tasks may be in the EZ while MEC procedures are being performed as long as team separation distances (TSDs) are maintained.

Exclusion Zone (EZ): A safety zone established around a MEC operations work area. Only essential personnel and authorized/escorted visitors are allowed within an EZ.

- Examples of EZs include safety zones around MEC intrusive activities and safety zones where MEC is intentionally detonated.

Munitions and Explosives of Concern (MEC): Specific categories of military munitions that may pose unique explosive risks, including the following:

- UXO, as defined in 10 U.S. Code (U.S.C.) § 101(e)(5);
- Discarded military munitions, as defined in 10 U.S.C. § 2710(e)(2); or
- Munitions constituents (for example, TNT, RDX) as defined in 10 U.S.C. § 2710(e)(3), present in high enough concentrations to pose an explosive hazard.

MEC Operations: 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.

Minimum Separation Distance (MSD): The distance that personnel in the open must maintain from an intentional or unintentional detonation.

Team Separation Distance (TSD): The distance that teams of essential personnel must be separated from one another during the conduct of MEC activities on a MMRP site. Normally this the K40 distance of the munition with the greatest fragmentation distance (MGFD) for the site.

Unexploded Ordnance (UXO): As defined by 10 U.S.C. § 101(e)(5)(A) through (C), UXO includes 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.

A more detailed description of the term UXO is provided in Public Law 106-65, § 3031 (c)(5)(A).

3.2 ABBREVIATIONS/ACRONYMS

AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
DDESB	Department of Defense Explosive Safety Board
demil	demilitarization
DoD	U.S. Department of Defense
EM	Engineer Manual
EM CX	Environmental and Munitions Center of Expertise
ESP	Explosives Site Plan
ESS	Explosives Safety Submission
EZ	exclusion zone
GFCI	ground fault circuit interrupter
HGL	HydroGeoLogic, Inc.
IAW	in accordance with
MD	munitions debris
MEC	munitions and explosives of concern
MGFD	munition with the greatest fragmentation distance
MMRP	Military Munitions Response Program
MPPEH	material potentially presenting an explosive hazard
MSD	minimum separation distance
PPE	personal protective equipment
QA	quality assurance
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SUXOS	Senior UXO Supervisor
TP	Technical Paper
TSD	team separation distance
U.S.C.	United States Code

USACE	U.S. Army Corps of Engineers
USATCES	U.S. Army Technical Center for Explosive Safety
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer

4.0 PERSONNEL

This section describes the personnel, responsibilities, and qualifications required to implement this SOP. The following individuals are involved in operations:

- **Senior UXO Supervisor (SUXOS) –** Responsible for ensuring that demil operations are performed IAW this SOP and the project planning documents.
- **UXO Safety Officer (UXOSO) –** Communicates directly with the Corporate Health and Safety Director on all matters concerning safety and ensures that all explosive safety procedures are performed IAW project planning documents.
- **UXO Field Team Leader –** Directs team when demil techniques are used as an alternate disposal technique.
- **UXO Quality Control Specialist (UXOQCS) –** Communicates directly with the Corporate Quality Assurance (QA) Manager on all matters concerning quality and signs off (UXOQCS or designee) on completeness and accuracy of intrusive documentation.
- **UXO Technician –** Responsible for performing demil operations IAW the SOPs and the project planning documents.

5.0 EQUIPMENT AND SUPPLIES

The following equipment is typically used during demilitarization operations:

- Saws
  - Rail saw
  - Chop saw
- T Posts (approximately 4 feet tall)
- T Post Driver
- Pulleys
- Rope
- Cordless drill with driver attachments
- Generator
- Extension cord
- Ground fault circuit interrupter (GFCI) adapter
- Tape measure
- Fire extinguisher

6.0 SAFETY

During demil operations, HGL personnel must adhere to the APP/SSHP and the following general safety practices. An Activity Hazard Analysis (AHA) for mechanical demil will be included in the APP/SSHP.

- Conduct operations only during daylight hours.
- Allow only qualified UXO technicians to perform demil operations.
- Do not conduct demil operations without an approved SOP and AHA.
- Ensure that only items approved by the SUXOS are subject to demil operations.
- When demil is authorized and used as an alternate disposal technique,
    - Conduct operations on the concept of limiting exposure to the minimum number of personnel, for the minimum amount of time, to the minimum amount of MEC consistent with safe and efficient operations, and
    - Before taking any action on an ordnance item, definitively identify all fuzing, including fuze type by function and the physical state/condition (armed or unarmed) of the fuze (for example, burned, broken, parts exposed/sheared).

6.1 MECHANICAL DEMILITARIZATION SAFETY PROTOCOLS

Death or injury can occur from MEC and explosives-related accidents caused by incorrect identification of ordnance items selected for mechanical demilitarization. The general mechanical demil safety precautions and protocols are as follows:

- Remain alert at all times for MEC and MPPEH hazards.
- DO NOT rely on color codes for positive identification of ordnance items or their contents.
- DO NOT be misled by markings on a MEC item stating, “practice bomb,” “dummy,” or “inert.” Practice ordnance can have explosive charges used to mark and/or spot the point of impact, or the item could be marked incorrectly.
- DO NOT enter the exclusion zone while the saw is energized.
- Anyone who observes an unsafe act or situation can stop operations.
- Any safety violation and/or unsafe act/practice must be reported to the UXOSO immediately.

6.2 MECHANICAL DEMILITARIZATION HAZARDS

Hazards that may be present during demil operations may include hot and sharp metal, dust, noise, and other hazards as described below:

- *Metal Debris*: Metal debris, to include munitions debris (MD), sharp edges and metal grindings will be present during demil operations. Wear the appropriate personal protective equipment (PPE) to protect personnel from hazards caused by sharp objects.
- *Thermal Hazards*: Items that have been cut with an abrasive cutting blade will be hot! Wear leather gloves to protect hands while handling items that have been demiled.
- *Noise and Dust*: Noise and dust related to the operation of the saw are not typically a problem because the saw is operated remotely, which greatly reduces exposure to both noise and dust.
- *Fire*: Abrasive cutting saws generate hot sparks that may start a fire. Select a site that is free of combustible materials including vegetation.
- *Electrical Shocks*: Use a GFCI and inspect electrical cords for serviceability. Ensure that weather conditions are suitable for operating an electric chop saw.

6.3 EXCLUSION ZONES AND MINIMUM SEPARATION DISTANCES

6.3.1 Exclusion Zones

During mechanical demil operations, only essential project personnel may be within the EZ.

- The UXOSO and UXO Team Leaders will monitor and keep the EZ intact until demil operations are complete.
- A minimum EZ of 20 feet is recommended between the saw and the team while demilitarizing inert ordnance. This is intended to reduce the hazards associated with broken cutting blades and exposure to noise and dust. This distance may be adjusted based on local site conditions.

6.3.2 Minimum Separation Distance

6.3.2.1 Unintentional Detonations

The MSD for unintentional detonations applies to nonessential personnel when exposing internal cavities on inert ordnance. This distance will be IAW approved project planning documents.

6.3.2.2 Intentional Detonations

The MSD for intentional detonations applies to essential and nonessential personnel when cutting MPPEH or MEC.

- MSDs must be IAW the required distances detailed in DDESB TP 16 and/or the current version of the DDESB Fragmentation Database.
- Nonessential personnel and unshielded essential personnel must withdraw to the minimum safe distance for an intentional detonation. Essential persons may withdraw to the K24 distance if shielded for intentional detonation with material outlined in the fragmentation data review form for the munition involved. The K24 may be reduced to the K18 when personnel use double hearing protection."
- Engineering controls must meet the requirements specified in DDESB TP 16 and/or the current version of the DDESB Fragmentation Database.

7.0 PROCEDURES

7.1 SITE SELECTION

Select an appropriate location to set up the saw. Consider the following factors when selecting a site:

- The site must be able to accommodate the required EZ.
- A site where the EZ can be observed visually is preferable.
- The site should be fairly level and free of obstacles between the saw and the operating area.
- Dry vegetation and other combustible materials should be removed to mitigate the risk of fire. Additionally, engineering controls may be used to reduce the risk of fire.

7.2 TOOL DESCRIPTION

7.2.1 Single Item Remote Chop Saw

The single item remote chop saw uses a standard chop saw that has been modified for remote operation. Photographs of a single item chop saw are included in Attachment 1. Standard modifications are as follows.

- The on/off switch is secured in an "always on" position.
- An eyebolt is added to the front of the base to allow for remote operations with an actuator line.
- The guard of the saw is sometimes removed to accommodate placement of larger ordnance items for demil. (This is allowable because the saw is intended for remote operation and cannot be energized while personnel are within the EZ.)

7.2.2 Rail Saw

The rail saw uses a modified chop saw mounted in a fixed location on a metal frame that is mounted to two adjustable sawhorses. MPPEH or MEC items (typically 20mm or 25mm, but can be modified for larger items) are pulled through the saw on fixed rails. Two actuator lines are used: one line advances the cartridge while the second line withdraws it. Photographs of a rail saw are included in Attachment 2. Standard modifications to the chop saw are as follows:

- The on/off switch is secured in an "always on" position.
- The guard of the saw is removed.

8.0 TOOL SETUP

It is helpful, but not required, to orient the saw so that the operator has a side view of the saw.

8.1 SINGLE ITEM REMOTE CHOP SAW

The steps for setting up the single item remote chop saw are as follows:

- Select an appropriate site IAW Section 7.0 of this SOP.
- Construct engineering controls to mitigate the risk of fire if required.
- Use shielding material to mitigate the effects of fragmentation and blast IAW DDESB TP 16 and/or the current version of the DDESB Fragmentation Database.
- Anchor the saw to the ground or other fixed object (such as a pallet). This can be accomplished with a short piece of rope tied around the rear of the chop saw and secured to an anchor such as a sandbag or a stake driven into the ground.
- Thread the actuator line through the pulley and the eyebolt and attach to the handle of the saw.
- Use a pulley to fairlead the actuator line to the required MSD.
- Plug in the saw and run the extension cord to the same location as the actuator line at the MSD.
- Establish a power source for the saw at the MSD.
- With the saw not energized, have a team member use the actuator line while an observer checks for proper operation of the saw.

8.2 RAIL SAW

The steps for setting up the rail saw are as follows:

- Select an appropriate site IAW Section 7.0 of this SOP.

- Construct engineering controls to mitigate the risk of fire if required.
- Use shielding material to mitigate the effects of fragmentation and blast IAW DDESB TP 16 and/or the current version of the DDESB Fragmentation Database.
- Place an empty cartridge between the rails and lower the saw through the slot in the cartridge. Secure the saw in the down position with a tie-down.
- Attach an actuator line to each end of the cartridge.
- Use pullies to fairlead the actuator lines to the required MSD.
- Plug in the saw and run the extension cord to the same location as the actuator line at the MSD.
- Establish a power source for the saw at the MSD.
- With the saw not energized, have a team member pull an empty cartridge back and forth through the saw while an observer checks for smooth operation and proper orientation of the actuator lines to the saw.

9.0 OPERATION

9.1 SINGLE ITEM CHOP SAW

The steps required for operation of the single item chop saw are as follow:

- With the saw de-energized:
  - Place the ordnance item in the saw and secure with the included clamp,
  - Verify that the blade will cut in the desired location, and
  - Return to the MSD.
- Ensure that all personnel are clear of the EZ.
- Energize the saw by plugging it into the established power source.
- Activate the saw by pulling on the actuator line.
- Continue to pull on the actuator line to complete the cut.
- De-energize the saw.
- With the saw de-energized, proceed downrange and remove the item from the saw.

All demilitarized items are subject to inspection IAW established procedures.

9.2 RAIL SAW

The steps required for operation of the rail saw are as follows:

- Load the cartridge with projectiles. NOTE: A portion of the cartridge must remain empty to allow for the blade to be lowered into the cartridge in preparation for cutting. This area is marked for reference.
- With the saw de-energized:
  - Place the loaded cartridge into the saw rails and lower the saw into the portion of the cartridge that was intentionally left empty,
  - Secure the saw into the "down" position against its stop with a tie-down,
  - Attach the actuator lines to the cartridge, and
  - Return to the MSD.
- Ensure that all personnel are clear of the EZ.
- Energize the saw by plugging it into the established power source.
- Activate the saw by pulling on the actuator line. If the saw slows or binds, use the reverse actuator line to reverse the direction of the cartridge.
- Continue to pull on the actuator line until the cartridge reaches the stop that is integral to the rails of the saw.
- De-energize the saw.
- With the saw de-energized, proceed downrange and remove the actuator lines from each end of the cartridge.
- Remove the cartridge from the saw. Typically, a second loaded cartridge would be placed at this time and the process would be repeated until all projectiles have been cut.
- At the MSD, remove the cut projectiles from the cartridge and, if desired, reload the cartridge for continuous operations.

All demilitarized items are subject to inspection IAW established procedures.

10.0 REFERENCES

USACE, Engineer Manual (EM) 385-1-97.

U.S. Department of Defense Explosive Safety Board (DDESB), Technical Paper (TP) 16.

DDESB, TP 18.

U.S. Department of Defense (DoD) Manual 6055-09-M.

11.0 REVISION HISTORY

Revision 0 November 2018, Initial Release.

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ATTACHMENT 1

CHOP SAW PHOTOS

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Attachment 1: Single Item Chop Saw

1. Modified Chop Saw
2. Eyebolt
3. Anchor
4. Actuator Line

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ATTACHMENT 2

RAIL SAW PHOTOS

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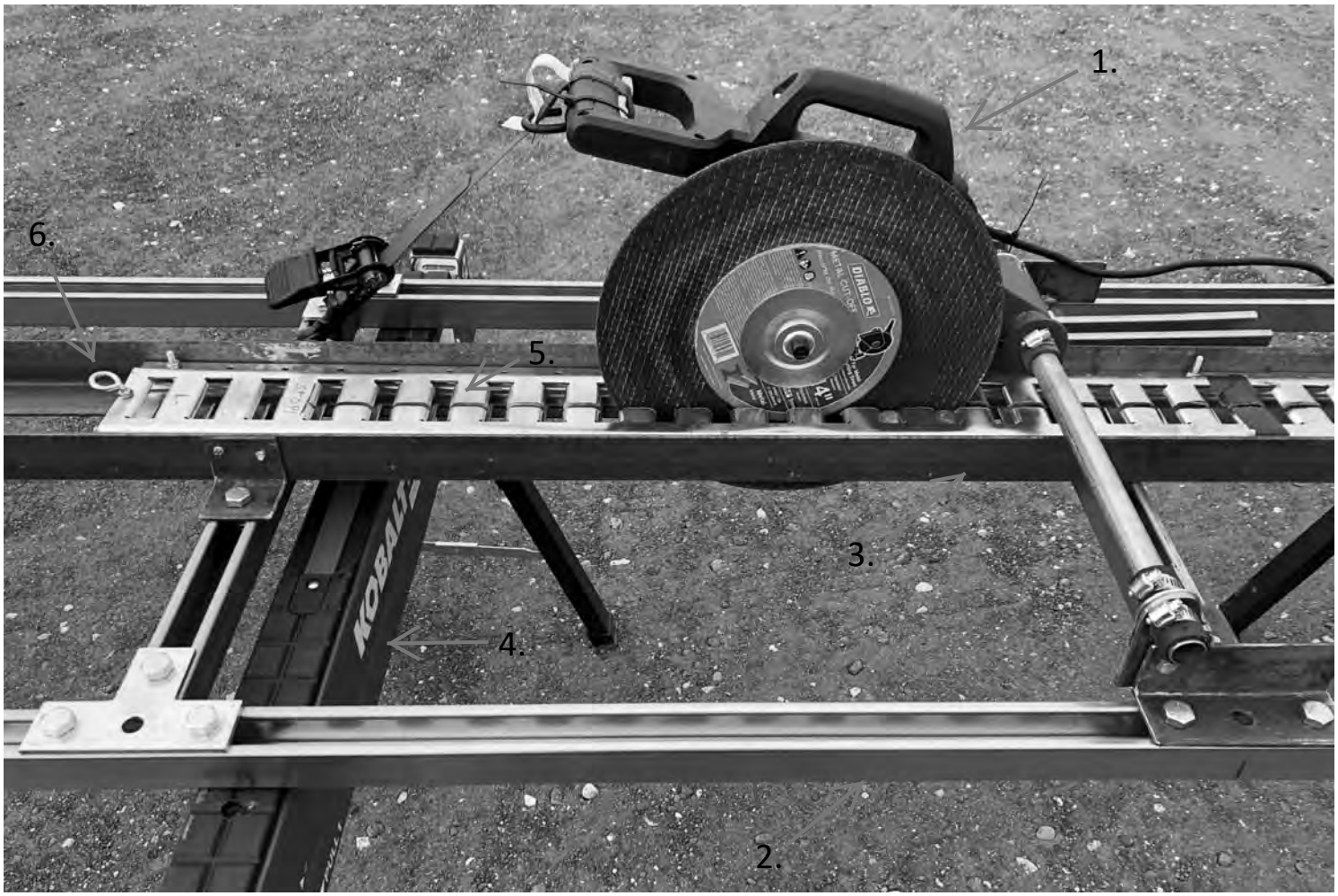
Attachment 2: Rail Saw Components

1. Modified Chop Saw
2. Fixed Frame
3. Rails
4. Adjustable Saw Horses
5. Cartridge
6. Actuator Line Attachment Points

Attachment 2: Rail Saw Components



HGL HydroGeoLogic, Inc Exceeding Expectations	**STANDARD OPERATING PROCEDURE**

Digital Geophysical Mapping Using a Geonics EM61-MK2	**SOP 551.01**
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1.0 PURPOSE

This standard operating procedure (SOP) describes activities associated with digital geophysical mapping (DGM) including civil surveying (grid or transect construction), geophysical system verification (GSV), geophysical data collection, data processing and analysis, and anomaly resolution as well as the geophysical quality control (QC) program.

DGM data can be collected with a variety of sensor technologies and positioning systems/methods. Most applications at munitions response (MR) sites involve the use of the EM61-MK2 and global positioning system (GPS), robotic total station (RTS), or relative coordinate method of positioning (line and fiducial).

This SOP is specific to the use of the Geonics EM61-MK2, but is applicable to all terrestrial DGM surveys and may be adapted for use with other digital geophysical instruments such as a frequency-domain electromagnetic (EM) system or magnetometer.

This SOP provides information on general theory, equipment, methodology, and personnel requirements to perform DGM using the Geonics EM61-MK2 coupled with a positioning system such as a real time kinematic (RTK) GPS or an RTS such that a digital record of geophysical responses and coincident position are recorded simultaneously. The project-specific implementation of the DGM program is outlined in the project-specific planning documents. Project documents such as the Quality Assurance Project Plan (QAPP) or Work Plan supersede the information in this SOP.

2.0 SUMMARY OF METHOD

EM techniques can detect both ferrous and nonferrous metals. Geophysical methods require sufficient contrast between the item or feature sought and local background to detect targets of interest. The detection capability also is limited by the size, orientation, and depth of the item or feature. In general, the larger an item is, the deeper it can be detected.

The time domain EM (TDEM) method is a nondestructive geophysical method commonly used in environmental and MR investigations to detect buried ferrous and nonferrous metal objects. Typical objects that can be detected include burial pits containing metal, 55-gallon drums and underground storage tanks, metal utilities, and munitions.

For the EM61-MK2, the Naval Research Laboratory (NRL) has generated detection curves for many munitions items of interest; these detection curves can be used as a general guide for system performance.

The TDEM method generates a primary magnetic field by pulsing an electrical current through a transmitter (Tx) coil. The illuminating field causes eddy currents to flow in the ground and nearby metallic objects, resulting in a secondary current and associated magnetic field.

- The time decay of the geophysical response is measured when the transmitter is off and is a function of the material properties of the source (type of metal and its electrical properties, size, shape, thickness, and orientation), its depth of burial, and the conductive properties of the soil (background) in which the field is measured.
- The system response is the cumulative voltage derived from all materials within the area illuminated by the primary signal.
- Consequently, the measured response may be caused by individual or multiple objects within the influence of the primary field.
- The geophysical response is measured by a receiver (Rx) coil, typically at 3 or 4 time gates, and recorded in units of millivolts (mV) by a data logger.
- In the absence of metallic materials, background noise levels are typically a few mV, and the measured response from a metal object can vary from several mV to several thousand mV.

3.0 DEFINITIONS AND ABBREVIATIONS/ACRONYMS

3.1 DEFINITIONS

NMEA String: A type of data string that supplies geospatial information. The *GGK* National Marine Electronics Association (NMEA) message is a commonly used GPS data string that provides positional information (X, Y, and Z), time, number of satellites visible, and relative position accuracy. It is usually input into the data recorder using a serial data or universal serial bus (USB) cable at regular intervals (e.g., every second). Many different types of NMEA data strings that supply geospatial information are currently in use.

Hertz (Hz): A measure of the frequency of repetition of a signal. A sampling rate of 10 Hz corresponds to the collection of 10 samples per second.

Line-and-Fiducial: A method of collecting digital geophysical data that relates the positions of the geophysical measurements to a relative coordinate system established using survey tapes and flags placed at known coordinates (X and Y). Data is collected at a regular recording interval between the flagged locations and a marker (fiducial), and it is entered into the data file when the sensor is coincident with each flag. The coordinates of the known locations are used to interpolate the geophysical measurements.

3.2 ABBREVIATIONS/ACRONYMS

cm	centimeter
DGM	digital geophysical mapping
EM	electromagnetic
FTP	File Transfer Protocol
GPS	global positioning system

GSV	geophysical system verification
HGL	HydroGeoLogic, Inc.
Hz	Hertz
ID	identifier
ISO	industry standard object
IVS	instrument verification strip
MR	munitions response
MS	Microsoft
mV	millivolts
NMEA	National Marine Electronics Association
NRL	Naval Research Laboratory
PCMCIA	personal computer memory card international
PDT	Project Delivery Team
PM	Project Manager
QAPP	Quality Assurance Project Plan
QC	quality control
RTK	real time kinematic
RTS	robotic total station
Rx	receiver
SNR	signal to noise ratio
SOP	standard operating procedure
SUXOS	Senior UXO Supervisor
TDEM	time domain electromagnetic
TPP	Technical Project Planning
TSR	task-specific review
Tx	transmitter
USACE	U.S. Army Corps of Engineers
USB	universal serial bus
UTM	Universal Transverse Mercator
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist
VTA	vehicle towed array
WAAS	wide area augmentation system

4.0 PERSONNEL

4.1 QUALIFICATIONS AND RESPONSIBILITIES

The personnel who perform DGM activities at sites where munitions are present must have a combination of education, training, and requisite experience to ensure that the data collected are of sufficient quantity and quality to meet the project objectives. The responsibilities discussed are the general requirements for a large-scale project (e.g., removal action over several hundred acres, significant Remedial Investigations, etc.). For smaller projects, it may be justified for one

individual to perform multiple roles. For example, if only one DGM team system is deployed for a survey of 5 acres, it may be possible to combine the roles of the Project Geophysicist and Data Processor/Analyst, depending upon the project requirements.

- Personnel who collect DGM data must be trained and familiar with the specific instruments and their operation and understand the specific data acquisition methodology for the project.
- Personnel who process and analyze data must have an in-depth understanding of the software, practices and procedures, and specific project objectives.

Required project personnel include the following:

- The Project Geophysicist of Record, who is required to meet the basic requirements of the MR industry, as described in several U.S. Army Corps of Engineers (USACE) publications;
- The QC Geophysicist, who is responsible for directing the DGM QC program in conjunction with the Project and Site Geophysicists and the HydroGeoLogic, Inc. (HGL) Project Manager (PM);
- The Site Geophysicist, who is required on most larger-scale geophysical surveys performed for the MR industry to direct the survey efforts;
- A Geophysical Equipment Operator to guide each DGM team (at least two persons are required for safety purposes to deploy the instrumentation for each DGM team); and
- The Data Processor/Analyst, who is responsible for assessing the DGM data and reporting the results to the client.

For some projects, a professional civil surveyor is necessary to meet the requirements of the project. Project personnel should meet the following general qualifications:

Project Geophysicist of Record – This person serves as the technical team leader and is charged with ensuring that the geophysical survey is designed and performed to meet the project objectives. Specific responsibilities include the following:

- Planning and reviewing the Geophysical Investigation Plan or QAPP, field scheduling and execution, and oversight of the data processing and interpretation;
- Designing the quality program for the geophysical investigation; and
- Serving as the primary point of contact for the HGL PM and the technical representatives of the client and regulatory agencies.

QC Geophysicist – The QC Geophysicist must have the same overall experience and qualifications as the Project Geophysicist. The QC Geophysicist reports to the HGL corporate quality department

to keep the lines of reporting and responsibility for quality management outside of the chain of command for project operations. Position responsibilities include the following:

- Managing the DGM QC program, and
- Reporting blind seed results to the Project Delivery Team.

Site Geophysicist – Position requirements include the following:

- A minimum of 3 to 5 years of direct experience in the field collecting, processing, and reporting geophysical survey data and results;
- An extensive background in geophysical surveys or a degree in geophysics, geology, physics, engineering, or another related field;
- Experience using the geophysical and positioning systems to be deployed and used; and
- All the experience and qualifications of the Geophysical Equipment Operator.

Geophysical Equipment Operator – Position requirements include the following:

- A minimum of 1 year of experience with geophysical and positioning instruments, or as required by the project;
- Experience with multiple data acquisition platforms and modes of acquisition;
- Experience with QC field testing; and
- Experience with field documentation.

Geophysical Data Processor/Analyst – The Data Processor/Analyst must have the same overall experience and qualifications as the Site Geophysicist, in addition to requisite experience with the software and methods used for data processing and analysis. The Data Processor/Analyst also must have knowledge and experience with information management, including management of the DGM and intrusive data streams using Microsoft (MS) Access or other appropriate GIS software. Position requirements include the following:

- Experience with applicable modules in Geosoft Oasis Montaj, MS Access, DAT61-MK2, and other software such as Visual Sample Plan; and
- The same general experience and qualifications as the Site Geophysicist.

Professional Land Surveyor or Registered Land Surveyor – The Professional Land Surveyor or Registered Land Surveyor must be registered in the state or region where the MR project is performed. The surveyor reports to the HGL PM and Project Geophysicist.

4.2 TASK-SPECIFIC REVIEW

Before each major activity associated with the DGM effort, the Project or QC Geophysicist (or their designee) performs a task-specific review (TSR) for the technical leads of each activity to explain in detail the methods and requirements specific to each activity, QC and documentation requirements, and lines of reporting. The TSR is equivalent to a readiness review or a Preparatory Phase Inspection (for projects conducted under the U.S. Army Corps of Engineers' three-phase QC system).

In general, the TSR includes the following elements:

- Activity (e.g., civil survey, instrument verification strip [IVS], production DGM, data processing and analysis, anomaly reacquire, and acceptance sampling [hole checks]);
- Detailed approach and protocol for the activity and associated quality metrics;
- Lines of communication; and
- Documentation.

5.0 EQUIPMENT AND SUPPLIES

The equipment and supplies typically needed for DGM activities that use the EM61-MK2 include the following:

- EM61-MK2 high-sensitivity metal detector(s);
- Appropriate platform specified in project-specific planning documents (e.g., wheeled cart, tethered carry, stretcher carry, vehicle towed array, etc.):
- Positioning system (as applicable for the activity) - GPS, RTK GPS, RTS, or tapes and pin flags (or ropes) for line and fiducial;
- Standardization jig (for static spike test);
- Standard item (for static spike test);
- Traffic cones, pin flags, or other markers for navigation during data collection;
- Field notebook;
- Miscellaneous supplies (e.g., flash drive, tool kit, voltmeter, flagging, stakes, permanent markers, indelible ink pens, electrical tape); and
- Higher end laptop or desktop computer with licensed software for Geosoft Oasis Montaj, DAT61-MK2, and MS Access.

The general components necessary for a single-sensor, person-portable EM61-MK2 survey include the following:

- Upper and/or lower coils;
- Wheeled cart with wheel counter (optional);
- Tripod for positioning system component (e.g., GPS antenna, RTS prism);
- Console containing system electronics;
- Power supply (battery and battery chargers);
- Data logger with battery charger (e.g., Allegro or Archer);
- Extra batteries for the EM61 and data logger;
- Cables to connect electronic console to lower coil and electronic console to data logger;
- Cable to connect data logger to GPS receiver (if appropriate);
- Cable to connect lower and upper coil, or shorting plug if only using lower coil;
- Extra set of all cables; and
- Applicable positioning system and all system components (cables, batteries, etc.).

The general components necessary for a towed array (multiple EM61 sensors) EM61-MK2 survey include those listed above plus the following components:

- Tow vehicle (diesel engine preferred);
- Sensor platform for mounting EM61 coils and positioning system components; for RTK GPS, two antennas are recommended, one for the platform and one mounted on the tow vehicle for navigation.
- Materials and hitch to connect tow vehicle to platform (Determine minimum distance between EM61 coils and tow vehicle based on a noise test at the start of the project.);
- Battery setup to power all EM61s from the same power source;
- EM61 synchronization cable;
- Ruggedized laptop computer with appropriate personal computer memory card international (PCMCIA) or USB interface;
- PCMCIA or USB octopus setup;
- Swath guidance system for navigation; and
- Software to log EM61 and positioning system data simultaneously (e.g., Multi61MK2xpn, Maglog).

Some of the components listed above for single sensor or array methodologies may not be necessary depending upon the specific activity and project. Address in detail in the project-specific planning documents the specific equipment and protocol necessary for each DGM activity.

6.0 GENERAL PROCEDURES FOR DGM ACTIVITIES

6.1 CIVIL SURVEY

Civil survey for each project includes the construction of DGM grids and/or transects using a licensed land surveyor or other experienced project personnel approved by the PDT during the Technical Project Planning (TPP) process.

The responsible person for the civil survey works with the GIS department, HGL PM, and Project Geophysicist to ensure that he following elements are performed in accordance with the project-specific planning documents:

- Verify the location of all transects and grids on the site base map.
- Ensure unique identification attributes for all grids, transects, and points.
- Transfer digital location data for each point to be staked in the field to the appropriate positioning system.
- Stake out each required point using industry accepted survey methods and digitally record the actual location occupied (x, y, z, unique identifier [ID]).
- Physically mark the stakeout point using appropriate materials (lathe, flagging, survey nail, temporary monument, etc.).
- Verify that the unique ID of the stakeout point is inscribed on the appropriate material(s).
- Work in conjunction with the unexploded ordnance (UXO) technician performing anomaly avoidance to prevent placing stakes, nails, or other markers on top of significant anomalies.
- Ensure that flagging along transects is placed at appropriate intervals based on the vegetation characteristics and follow-on activity.
- Mark safety hazards that may affect follow-on activities such as DGM data collection.
- Create a backup copy of the digital survey data at least once per day.
- Transfer civil survey data to an MS Access table or MS Excel spreadsheet.
- Confirm that actual points occupied in the field achieve the project metric for accuracy and precision.

The responsible person who manages or performs the civil survey activity keeps detailed field notes. Field notes must be recorded in accordance with HGL SOP 4.07: Field Logbook Use and Maintenance, and must include the following information:

- Date and field crew members;
- Weather;

- Type of survey instrument, survey methodology, and approved monuments and control points used;
- Description and location information for temporary control points generated;
- Drawing or sketches, as necessary;
- Number of points surveyed; and
- Safety hazards noted and potential mitigation.

Include in the project-specific planning documents the surveying methodology and equipment (RTK GPS, GPS, RTS, etc.) and the accuracy requirements for grid corners, transect end points and intermediate waypoints along each transect, project boundaries, survey monuments, and other control points.

6.2 GEOPHYSICAL SYSTEM VERIFICATION

GSV is a process that combines appropriate instrument testing daily over an IVS and a blind seeding program to ensure that the data collected are of sufficient quantity and quality to meet project objectives. EM61-MK2 physics-based models are used to verify that the instrument's responses are within specifications. For a general discussion regarding the GSV process, refer to the ESTCP document titled *Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response* (ESTCP, 2009)

Use the IVS to verify the DGM sensors and equipment, acquisition methodology, and data processing and analysis strategies for the project as follows:

- Perform a background survey over the IVS area with the EM61-MK2 or appropriate analog sensor prior to the construction of the IVS.
- Once the background has been recorded and mapped, construct the IVS using the general procedures specified in the project-specific planning documents and in the U.S. Army Corps of Engineers document titled *Ordnance and Explosives Digital Geophysical Mapping Guidance-Operational Procedures and Quality Control Manual* (USACE, 2003).
- Determine the coordinates for the center of each item with an RTK GPS or RTS to an accuracy of 3 centimeters (cm), or as specified in the project-specific planning documents.
- For IVS sites located in heavily wooded areas, measure the lateral location of each item along the IVS center line to an accuracy of 5 cm (or as specified in the project-specific planning documents) using a measuring tape.
- Record the location, depth, and orientation for each industry standard object (ISO).

Because of the sizes of some project sites, it may be necessary to install several local "satellite" IVS plots.

The IVS typically has a center line approximately 10 to 15 meters in length and a "noise" line established nearby. Items placed in an IVS usually consist of ISOs buried at representative depths along the IVS centerline separated by horizontal distances of approximately 3 to 5 meters. Place the ISOs at horizontal (long axis transverse and parallel to centerline) and vertical orientations, or as specified by the project-specific planning documents. As necessary, include inert munitions items not referenced in the NRL document titled *EM61-MK2 Response of Standard Munitions Items* (NRL, October 2008) in the IVS to verify that the anomaly selection criteria meet the project objectives.

Use the main IVS performed at the start of the project to verify the DGM system(s) and to generate the IVS report, which summarizes the results of the initial IVS and includes the minimum following information:

- As-built of the IVS;
- Digital images of each IVS item;
- Maps of DGM data and a plot of ISO responses on NRL response curves;
- Detailed summary table of geophysical sensor results for all channels and appropriate sum channel combinations, including results of initial 6-line test and static-spike values;
- Initial anomaly selection criteria and rationale;
- Proposed geophysical equipment, techniques, and methodologies;
- QC metrics for each geophysical platform; and
- Raw, processed, and final processed DGM data and corresponding MS Access database, including test files for static and static-spike, personnel (if applicable), cable shake, known position check, and pull-away and engine revolutions per minute tests for vehicle-towed systems.

Each DGM team is required to perform daily QC tests (A.M. and P.M.) at the IVS and collect data over the IVS centerline and noise line. For most projects, it is assumed that a PDT representative is available and present in the field to approve the initial IVS results in real-time. Satellite IVSs, consisting of a minimum of two ISOs (or other approved items), may be used for specific projects to document the results for the daily instrument tests.

The GSV includes a blind seed program. The blind seed program verifies that data collection, processing, and anomaly resolution meet the project requirements. In general, place blind seed items to ensure that each data acquisition team encounters a minimum of one blind seed item per day (HGL SOP 500-03: Seed Production Areas). During production DGM activities, the HGL QC Geophysicist reviews the interpretation and subsequent dig results to verify that the dynamic

position and signal response achieve the quality metrics defined in the project-specific planning documents.

The QC Geophysicist maintains the locations of the blind seed items in a secure database during project execution. Project personnel associated with data acquisition and data processing/analysis do not have knowledge of the locations of the blind seed items.

6.3 DATA COLLECTION

DGM data are routinely collected along one-dimensional transects and/or two-dimensional full coverage grids (or over large contiguous areas) using a variety of sensors, data acquisition platforms, and positioning systems. For most applications on MR projects, positioning for the geophysical measurements is obtained using a combination of wide area augmentation system (WAAS) GPS, RTK GPS, RTS, and line and fiducial or wheel mode methods. The positioning systems applicable to most MR projects are the following:

- **WAAS GPS:** WAAS GPS is used for the DGM transect application (i.e., density transects) and other applications where survey-grade positioning is not required to meet the project objectives. WAAS GPS is capable of approximately 10-meter accuracy (or less) and works well under canopy cover. One of the advantages of a WAAS system over other GPS systems is that it does not require the use of a local GPS base station. Mount the GPS antenna on the appropriate sensor platform or personnel in a position where it does not adversely affect the sensor measurements. Stream the position data directly into the data logger used to capture the geophysical data.
- **RTK GPS:** RTK GPS is used in “open” areas void of canopy for both transect and full coverage modes of DGM acquisition when it is necessary to accurately determine the position of anomalies. An RTK GPS system (for example, a Trimble R8 or Leica Viva base station and rover) consists of two dual-frequency geodetic quality receivers in radio communication with each other. Mount the rover GPS antenna directly over the EM61-MK2 coils at a height where it does not adversely affect the sensor measurements. Stream the position data directly into the data logger used to capture the EM61-MK2 data.
- **RTS:** An RTS is typically used to support the DGM full coverage mode of acquisition when accurate local survey control is nearby. In certain cases, the RTS may be used with a relative coordinate system if grid north is accurately determined and the relative distances and elevations between at least two control points are known. A motorized total station survey instrument tracks the prism during data collection. Center the RTS prism above the EM61 coils. Stream the position data via radio modem directly into the data logger used to capture the EM61-MK2 data.
- **Line-and-Fiducial Positioning and Wheel Mode**: Line and fiducial positioning is used to support DGM full coverage acquisition in wooded and “open” areas. This method uses a relative Cartesian coordinate system that is delineated and marked with pin flags at regular intervals using calibrated survey tapes. The operator emplaces marks (fiducials)

into the geophysical data as the sensor passes each pin flag and the measurements are interpolated between the known points to georeference the sensor data. If the ground surface within the full coverage grids is sufficiently smooth and flat, an encoder incorporated into the EM61 wheel may be used to trigger geophysical measurements at regular intervals along each line.

Two of the most common data acquisition platforms used for MR projects are reviewed in the following sections. The specific methodology and protocol used for data acquisition must be designed in concert with the PDT and detailed in the project-specific planning documents.

6.3.1 Person-Portable

The EM61-MK2 wheeled cart consists of two wheels and a handle mounted directly to the bottom coil. The wheels position the coil 42 cm above the ground surface. The power source and electronics console are mounted on a backpack (or within the lower coil and on the handle, respectively) and transported by the instrument operator. When used with a GPS, the GPS antenna is often centered over the coils at a standoff height determined during the initial IVS activities.

The single-sensor, person-portable system can be integrated with a WAAS GPS for transect DGM and used with RTK GPS, RTS, or line and fiducial/wheel mode positioning for full coverage DGM grids.

EM61-MK2 measurements are acquired at a minimum rate of 10 Hz, and the position information from the NMEA GPS message is streamed into the data logger at a minimum rate of 1 Hz. GPS fix quality and the number of satellites are monitored during data collection.

EM61-MK2 wheeled cart configured with WAAS GPS

Document significant obstacles such as trees, fences, debris piles, and ruts on a hard copy data acquisition form (or digitally on the data logger) so that these features can be placed on the site maps and be accounted for during the analysis of the geophysical data.

General procedures for performing DGM over full coverage grids or transects with a single sensor person portable EM61-MK2 are as follows:

a. Conduct safety meeting and perform metal check of acquisition personnel.

b. Set up the appropriate positioning system or method per the requirements in the project-specific planning documents.

   - Examine data collection area to assess for proper vegetation removal and potential safety hazards.

- Set up visual navigation aids (ropes, traffic cones, measuring tapes, spray paint, etc.) as necessary to assist the team in acquiring data at regular intervals over the full coverage grid.
- If surveying transects in wooded areas, the path for data collection should be evident and/or marked at regular intervals with flagging tape.
- If collecting data over transects in "open" areas, the GPS or RTK GPS may be adequate for purposes of navigation.

c. Turn EM61 on using master/slave switch and warm up for a period of 15 minutes, or as designated in the project-specific planning documents.

d. Null instrument at designated background location, perform A.M. instrument functional tests, and collect data over IVS center line and noise line. Use project-specific file naming protocol and specific test identifiers as outlined in the TSR.

e. Begin data collection and traverse intended survey area in a systematic fashion at a consistent pace of less than 3 to 4 miles per hour, or at a speed prescribed in the project-specific planning documents. Use the project-specific file naming protocol for production DGM files.

- During data collection activities, monitor the battery voltage and EM61 measurements every 15 minutes in static mode, more often as the battery level approaches 12 volts.
- To ensure that the spatial coverage necessary is achieved for full coverage grids, navigate using pin flags, spray paint, ropes, or other marks at regular intervals along each acquisition line.

f. At end of day, null the instrument at the designated background location, perform PM instrument functional tests, and collect data over IVS center line and noise line. Use project-specific file naming protocol and specific test identifiers for QC files.

g. Ensure that field documentation is complete and accurate (e.g., grid sheets when using line and fiducial positioning).

h. Transfer DGM data from the data logger to the dedicated geophysics field computer and immediately back up to the hard drive or USB media.

i. Complete readme.txt file for each DGM team.

j. Transfer DGM data and readme.txt file to the HGL processing center via email or upload to the secure HGL File Transfer Protocol (FTP) site.

k. Notify data processor/analyst of the data transfer using email or by phone.

l. Place all batteries on charge and visually inspect EM61, positioning system, and all cables.

6.3.2 Vehicle Towed Array

A vehicle towed array (VTA) system consists of a non-metallic fiberglass trailer platform towed by an all-terrain or other vehicle. Three (or more) EM61-MK2 coils are mounted on a trailer platform 10 to 42 cm above the ground surface with the long or short axis of each coil perpendicular to the direction of travel, resulting in a variable swath of data. An RTK or WAAS GPS antenna is mounted at a known offset from the center of the array to provide accurate positions for the EM61-MK2 measurements, and a second GPS antenna may be placed on the roof of the vehicle and linked to a swath guidance system to provide navigation assistance for the vehicle operator.

EM61-MK2 vehicle-towed array with RTK GPS

EM61-MK2 data for all sensors are recorded at a minimum rate of 10 Hz with a Panasonic Toughbook CF-31 field computer (or equivalent) using the Geomar *ML61MK2xpn* software (or equivalent). The position information from the NMEA GPS message is streamed into the Panasonic Toughbook serial port and integrated with the EM61-MK2 measurements in real time. If tall canopy exists over large regions of a survey area, WAAS GPS may be used for navigation and positioning.

Prior to using the array at the initial IVS or for production DGM activities, perform a noise test to determine the minimum allowable offset between the tow vehicle and EM61 coils that comprise the array. The test consists of collecting static EM61-MK2 data with the engine off and at variable revolutions per minute when the engine is turned on.

General procedures for performing DGM over full coverage areas or transects with a VTA are the following:

a. Conduct safety meeting and perform metal check of acquisition personnel.

b. Set up the RTK GPS base station for full coverage surveys over contiguous areas. If VTA is used for transect data collection and anomalies will not be intrusively investigated, then have available the option to use a single GPS mounted on an array platform. Provide specific details in the project-specific planning documents.

c. Assess data collection area for proper vegetation removal and potential safety hazards.

d. Turn EM61 array on using master/slave switch on primary EM61 and warm up for a period of 15 minutes, or as designated in the project-specific planning documents.

e. Null instrument at designated background location, perform A.M. instrument functional tests, and collect data over IVS center line(s) and noise line. Use project-specific file naming protocol and specific test identifiers as outlined in the TSR.

f. When collecting full coverage data over a contiguous area, ensure that the swath guidance system is configured correctly based on the area that needs to be covered with the VTA. If collecting data over transects in "open" areas, the GPS or RTK GPS may be adequate for purposes of navigation.

g. Begin data collection and traverse intended survey area in a systematic fashion at a consistent speed of less than 3 to 4 miles per hour, or at a speed prescribed in the project-specific planning documents. Use the project-specific file naming protocol for production DGM files.

   - During data collection activities, monitor the battery voltage and EM61 measurements every 15 minutes in static mode, more often as the battery level approaches 12 volts.
   - Use the swath guidance system to navigate each predetermined swath to ensure that the spatial coverage necessary is achieved for a contiguous survey area.

h. At end of day, null instrument at designated background location, perform PM instrument functional tests, and collect data over IVS center line(s) and noise line. Use project-specific file naming protocol and specific test identifiers for QC files.

i. Backup each acquisition or QC file created to USB drive or other suitable media immediately after file is collected.

j. Verify that field documentation is complete and accurate.

k. Transfer DGM data from the ruggedized laptop to the dedicated geophysics field computer and immediately back up to the hard drive or USB media.

l. Complete readme.txt file for each VTA system.

m. Transfer DGM data and readme.txt file to the HGL processing center via email or upload to the secure HGL FTP site.

n. Notify data processor/analyst of the data transfer using email or by phone.

o. Place all batteries on charge and visually inspect VTA components and tow vehicle.

6.4 SITE-SPECIFIC CONDITIONS AFFECTING DGM OPERATIONS

Dynamic events such as rain, lightning, and solar flares may affect geophysical data collection. Procedures for geophysical survey operations when these events occur are the following:

- *Rain* – The effect of rain on geophysical operations is primarily dependent on the instrument being used and the physical site conditions (terrain and vegetation). Most of the instruments commercially available are relatively water resistant. Under conditions of light rain (drizzle), survey teams should take additional measures, such as covering electronics with plastic and using electrical tape to secure connections to reduce the possibility of moisture impacting the instrument's electronics. If the rain persists and the survey team leader determines that the quality of the data could be affected, cease field

operations, and notify the site manager and Project Geophysicist. Continue operations after conditions are deemed safe by the survey team leader.

- *Lightning* – Aside from the obvious safety hazard discussed elsewhere in this SOP, lightning may cause a phenomenon known as "atmospherics" or electromagnetic noise, which may impede the performance of EM sensors. Halt data collection and monitor lightning activity in the area visually, and resume operation only when the lightning ceases.
- *Solar Flares* – Solar flares, a sun-generated phenomenon typically occurring in the afternoon, can temporarily generate high-magnitude magnetic noise sufficient to occasionally render EM sensors unusable for the duration of the event. Instrument operators throughout the area can readily observe solar flares as rapidly fluctuating signal readings with no apparent cultural or survey source. The Site Geophysicist logs the time intervals when solar flare activity is observed to help determine whether any data (for digital geophysics) may have been affected. The National Oceanic and Atmospheric Administration maintain a helpful website at http://spaceweather.com. The Site Geophysicist must monitor solar flare activity weekly, or more often as necessary, during the project.

If applicable, discuss in the project-specific planning documents any soils and rocks with increased magnetism and rugged terrain that might affect the subsurface detection capabilities of the proposed DGM sensors used for a project.

6.5 DATA PROCESSING AND ANALYSIS

The Data Processor/Analyst is responsible for the processing, analyzing, and interpreting the DGM data and uses a combination of the following software to accomplish the data processing:

- Geonics DAT61-MK2 (single sensor);
- Geomar ML61MK2xpn or Geometrics Maglog (VTA);
- Geosoft Oasis Montaj;
- MS Excel, Word, and Access programs, and
- Text editors (Notepad ++, WordPad, TextPad)

The primary software used to process and analyze the geophysical data is the Geosoft Oasis Montaj software.

The Site Geophysicist (or their designee) is responsible for backing up the DGM data to a field laptop and portable hard drive at the end of each day. Additional tasks include the following:

- Checking field notes sketches for completeness.
- Generating a comprehensive README file (readme.txt) that documents the following information:

  - Field team(s) responsible for data collection;
  - File names;
  - QC tests; and
  - Potential data issues.
- Transmitting the DGM data, field notes, sketches, and README files for each day to the secure HGL FTP site for retrieval by the HGL Data Processor/Analyst the following morning.

The Data Processor/Analyst organizes the DGM data received from the field team on the HGL server in a structured format to ensure that the raw data are never compromised.

The data processor initially reviews and processes the data as follows:

- Convert binary DGM data files into an ASCII "XYZ" format using DAT61-MK2 (or ML61MK2xpn, Maglog).
- Create a geophysical workspace in Oasis Montaj.
- Import each XYZ file into a separate Oasis Montaj geophysical database using the standard HGL naming convention.
- Perform initial visual checks of the daily instrument functional tests for each test file and immediately alert the Site Geophysicist and/or field team of any significant issues that may require immediate corrective action.

After the initial data review, the Data Processor/Analyst processes the daily instrument functional tests and production DGM data as follows:

- Remove time or distance errors (latency or lag).
- Correct channels for instrument drift.
- Review data in background areas (areas free from metal) to verify the leveling for each data channel (ensures data representativeness).
- Identify potential errors associated with navigation or positioning.
- Review survey coverage to identify any data gaps that may require additional data collection.
- Digitally document processing methods and parameters, file tracking information, results of the instrument functional tests, and information related to spatial sample density using the MS Access database.

After processing data for each production DGM session, append the data to a "master" Oasis Montaj geophysical database to document the up-to-date status of the DGM survey.

Deliver the raw and final processed DGM data, including the master geophysical database, packed Oasis map(s), and results of the instrument functional tests documented in the MS Access database to the client at regular intervals during project execution using a secure HGL FTP server or SharePoint site. The delivery schedule for the data is documented in the project-specific planning documents.

The Data Processor/Analyst is also responsible for data analysis, interpretation, and information management for the production DGM data. The primary goal of the DGM analysis and interpretation is to identify subsurface metal related to munitions use to provide relevant information that can be used for site characterization. Use the Oasis Montaj "pick peaks along profiles" algorithm for target selection along transects; use the Blakely algorithm for target selection within full coverage DGM grids. Specific parameters for anomaly selection are documented in the project-specific planning documents and /or IVS Report.

Propose the anomaly selection criteria in the IVS Report to consist primarily of signal intensity and signal to noise ratio (SNR) components. Interpolate DGM data from full coverage grids using the minimum curvature or nearest neighbor gridding routine in Oasis Montaj at an appropriate cell size to create color-coded data images used for analysis and target selection. Interpretation for full coverage grids also uses the signal intensity and SNR components to initially screen anomalies for inclusion onto the dig list. Evaluate the one-dimensional anomaly shape from the data profiles for each EM61-MK2 channel and two-dimensional anomaly shape.

The anomaly selection criteria presented below are typical based on project experience and may be modified for different MR projects:

- Signal intensity (approximately 4 to 5 mV [Channel 2], or equivalent channel sum or weighted channel sum intensity);
- SNR (minimum of 3:1, 3 times the standard deviation as the "noise" estimate, and use that value multiplied by a value of approximately 3 as the signal intensity threshold);
- >5 sample points width on data profile for each channel;
- Signal decay progression: Channel 1> Channel 2> Channel 3> Channel 4; and
- Anomaly footprint present on at least two adjacent acquisition lanes on color-coded image at an appropriate color scale.

The target selection process is usually conservative. Anomalies that initially do not meet the anomaly selection criteria are candidates for the intrusive investigation if their footprint, shape, and decay parameters indicate a relatively deeper anomaly source. In addition, add to the dig sheet a percentage of the anomalies that do not meet all attributes of the anomaly selection criteria that are not related to man-made features or significant noise sources (e.g., above or below ground power line).

The site "noise" as derived from the initial IVS may not be representative of the "noise" encountered over all areas of the site. If environmental factors such as terrain and geology/soils or man-made features are present in a specific area, revise the anomaly selection criteria in concert with the PDT.

Use an iterative approach for MR projects in terms of the anomaly selection criteria. The Project Geophysicist (or their designee) continually assesses intrusive investigation results. The anomaly selection criteria may be modified in concert with the PDT, if necessary (e.g., excessive "no finds," unknown munitions items identified, etc.).

After targets have been selected, submit hard copy and/or digital dig sheets and color-coded images to the HGL GIS department for upload to the project GIS and distribution to the intrusive teams. A color-coded image of each full coverage DGM grid is generated with an appropriate color scale and symbols identifying each target to be investigated.

The Data Processor/Analyst or GIS specialist manages the dig sheet information and verifies that the following information is included in the database for each target:

- Unique target ID;
- Easting and Northing coordinates in State Plane, Universal Transverse Mercator (UTM), or local coordinates;
- Sensor response for Channels 1 to 4 and sum or weighted sum channel;
- Signal decay;
- Dig priority based on correlation to target attributes; and
- Interpreter comments.

6.6 ANOMALY RESOLUTION

For the purposes of this SOP, anomaly resolution includes anomaly reacquisition, the geophysical feedback process, and acceptance sampling (post-intrusive hole checks). The geophysical feedback and acceptance sampling tasks are considered QC tasks and are discussed in Section 7.0: Quality Control.

Depending upon the project objectives, site characteristics, and how the DGM data were collected, anomaly reacquisition may be performed with a positioning system only (RTK GPS or RTS). When necessary, analog or digital geophysical sensor(s) may be used in conjunction with the positioning system or method. Document the specific protocol for anomaly reacquisition in the project-specific planning documents.

6.6.1 Anomaly Reacquisition

The Project or QC Geophysicist (or their designee) performs a TSR for anomaly reacquisition. Before beginning intrusive activities, field teams use the appropriate methodology (e.g., RTK GPS, RTS, measuring tapes) and geophysical sensor(s) specified in the approved project-specific planning documents to navigate to the location of each target on the dig sheet. Once the target location on the dig sheet has been reacquired and flagged to the tolerance specified in the project-specific planning documents, field team members may perform a localized survey with the EM61 near the flagged location (searching a 1-meter radius around the flag is common in the industry).

During search activities, the team monitors the signal intensity in real time on the EM61 data logger and moves the flag (if necessary) to the location with the peak signal intensity. The signal intensity, offset, and direction from the dig sheet location are documented using a hard copy sheet or ruggedized PDA.

The general procedure for anomaly reacquisition with an RTK GPS and EM61-MK2 over a relatively large, contiguous survey area is as follows:

- Upload points for reacquisition (dig sheet coordinates and Target_IDs) to the rover RTK GPS unit and configure the unit for stakeout operations.
- Set up the RTK GPS base station at an approved control point or monument.
- Perform A.M. QC tests with the EM61-MK2 and RTK GPS at an approved location (equipment warm-up, static and static spike, known position check) using the methodology and tolerances specified in the project-specific planning documents.
- Navigate to each Target_ID using the “next closest point” option on the RTK GPS rover unit and place a PVC pin flag with the unique Target_ID within 0.15 meter of the dig sheet coordinates (or place a boot mark at the location of the dig sheet coordinates).
- Check a 1-meter radius around the flag with the EM61-MK2 and locate the peak signal intensity.
- Move the PVC pin flag to the location of the peak signal intensity and document the intensity, offset, and direction from the dig sheet coordinates (as appropriate, use comments to note information that might be useful to the intrusive team).
- Repeat previous three steps.
- Perform P.M. QC tests with EM61-MK2 and RTK GPS at an approved location (static and static spike, known position check) using the methodology and tolerances specified in the project-specific planning documents.
- Upload anomaly reacquisition information to secure HGL FTP site.

6.6.2 General Intrusive Activities

Excavation teams are usually required to search a 1-meter radius (or as specified in the project-specific planning documents) around the flagged location until the source(s) of the anomaly is identified. The excavation teams remove the source(s) from the excavation and document the characteristics of the anomaly source(s) on a hard copy sheet (or digital PDA) for upload to the intrusive database.

After clearing the localized areas within the designated search radius with handheld analog detector(s) (e.g., Schonstedt, White's, Minelab F3), the intrusive team rechecks the location with an EM61-MK2 to confirm that the anomaly has been adequately resolved (i.e., the response is below the anomaly selection threshold for the project). If there is still a response above the threshold additional excavation, further explanation and/or excavation activities may be required.

6.6.3 Feedback Process

The Project Geophysicist (or their designee) is responsible for comparing the intrusive results to the geophysical anomaly characteristics and documenting the findings in the MS Access database. Intrusive investigation results that are not well understood are reviewed by the QC Geophysicist, UXO Quality Control Specialist (UXOQCS), and intrusive investigation team leader to ascertain the credibility of the reported source(s). Anomalies that are not resolved to the satisfaction of the Project or QC Geophysicists may be reinvestigated by the intrusive investigation team.

6.6.4 Acceptance Sampling (Post-Intrusive Hole Checks)

The Project Geophysicist (or their designee) performs a TSR for the acceptance sampling element of the project. After each grid has been intrusively investigated, a qualified EM61 operator completes an independent check of a percentage of the excavations within the full coverage DGM grids (the EM61 operator may not be involved in other elements of anomaly resolution for the specific work product being checked). The operator documents residual signal intensity for each anomaly location using a hard copy sheet or ruggedized PDA. Residual signal intensity that exceeds the anomaly selection threshold proposed in the IVS report requires further validation of anomalies within the grid and possible intrusive investigation.

6.7 DATA AND RECORDS MANAGEMENT

The Data Processor/Analyst documents the information generated from the DGM program in the MS Access database in predefined tables. The Data Processor/Analyst works closely with the geophysical team, UXOQCS, Senior UXO Supervisor (SUXOS), and HGL PM to produce accurate, complete information. For a typical MR project, the information from the DGM program is delivered to client in accordance with the table below.

DGM Submittals

Submittal	With Each Submittal	24 Hours After Collection	24 Hours After Request by Government Representative	By the Following Friday	7 Days After Completed Excavations of Each Grid	CD/DVD with Final Report
README File	X					
Index Map	X					
Updated DID Tables from MS Access Database	X					
First Week's Mapping and QC Data		X				
Special Request Draft Data			X			
Analog and DGM Data Package for Each Week's Data Collection (raw and final mapping and QC data, maps, field data sheets, and updated associated database tables)				X		
Intrusive Results Tables					X	
All Raw and Final Digital Data, Maps, Final Access Database, Final QC Documentation						X

7.0 QUALITY CONTROL

7.1 INSTRUMENT FUNCTIONAL CHECKS

Instrument functional checks (also known as QC tests) are performed daily during DGM activities and are designed to achieve the performance metrics in Chapter 11 of the USACE document title *Technical Guidance for Military Munitions Response Actions* (EM 200-1-15). The tests ensure that the equipment and sensors are functioning as intended. A designated area clear of subsurface metallic debris and adjacent to the main IVS (or one of the satellite IVSs) is typically used for the daily QC tests for each DGM system. The Data Processor/Analyst reviews the results of the QC tests each day and documents the results in predefined MS Access database tables.

Each DGM field team is required to use consistent test procedures, including the use of a "jig" (or equivalent) and standard item (e.g., small ISO) for the static spike test. The standard item should produce a response of approximately 50 to 100 mV (Channel 3). If the standard item is lost or damaged during the project, the DGM team leader notifies the Data Processor/Analyst within 1 day.

The daily test regimen provides information on environmental sources of interference or connectivity issues and ensures that the DGM data are of sufficient quantity and quality to meet

the project objectives. The daily test regimen at the IVS includes the following instrument functional tests. Typical quality metrics are shown in parentheses (actual metrics are specified in the project-specific planning documents):

- **EM61 Warm-Up Period**. (15 minutes):
  - Acquisition personnel metal check.
- **Static and Static Spike.** (95 percent of static measurements for all data channels within 2.5 mV of background and response for all data channels to a standard test item within +/- 10% of the response attained on the first day of instrument testing):
  - **REGIMEN**: Collect data for a minimum of 3 minutes in the designated background area. This includes 1 minute of static data followed by 1 minute of data collection with the standard item, and then 1 minute of additional static data.
  - Write the required Channel 1 to 4 response ranges on the jig and ensure that each channel is within the required range during the static spike test.
- **Personnel and Cable Shake.** (No data spikes in excess of 3 mV for any data channel):
  - **REGIMEN:** Each team member approaches and then walks away from the sensor while the other observes the response.
  - Afterward, the team leader gently wiggles each system cable (i.e., simulate the motion that occurs during data collection) and observes the signal responses on the data logger.
- **IVS Centerline.** (Dynamic response for all data channels greater than 75 percent of the average response calculated from the first six passes along the IVS centerline for designated IVS items when SNR > 5 and dynamic positioning repeatability not to exceed 0.25 meter (RTK GPS or RTS) and 0.5 meter when fiducial positioning is used):
  - **REGIMEN:** Collect data along the IVS centerline and then reverse direction, traversing the line in forward and opposite directions.
- **IVS Noise Line.** (Dynamic noise does not exceed a value for all data channels agreed to by the PDT during the TPP (e.g., 1.0 mV [standard deviation]).
  - **REGIMEN:** Collect data along the IVS noise line and then reverse direction, traversing the line in forward and opposite directions.
- **Known Position Check.** (Offset from known control point or monument within 0.10 meter [RTK GPS or RTS]).
  - **REGIMEN:** Place the positioning system antenna or prism over an approved control point and digitally record the location while also ensuring the relative offset from the known location is within tolerance.

During anomaly reacquisition and acceptance sampling activities, the field team performs a static and static spike test daily to ensure that the EM61 is operating within specifications. If RTK GPS or RTS is used, a known position check is also necessary.

To increase the efficiency of the data processing and analysis task, the DGM field team uses the following protocol to designate the QC tests on the data logger:

Line 0 – static for 1 minute;
Line 1 – static spike for 1 minute;
Line 2 – static for 1 minute;
Line 3 – personnel (as required);
Line 4 – cable shake;
Line 5 – IVS centerline and noise line; and
Line 6 – known position check.

In addition to the quality metrics for the daily instrument functional tests, typical quality metrics for the spatial sampling components of the DGM program are the following:

- Sensor velocity (95 percent of the measurements for each data collection session collected at a speed of less than 1.6 meters per second);
- Along track sampling (98 percent of the measurements for each data collection session are less than or equal to 0.25 meter);
- Grid coverage (>90 percent of the full coverage DGM grid data acquired at the project design line spacing for Remedial Investigations and >95 percent at the project design line spacing for Remedial Actions); and
- Dynamic detection capability (blind seeds detected within 0.25 meter + ½ sensor spacing (RTK GPS or RTS) or 0.5 meter + ½ sensor spacing of their known location (line and fiducial) with a signal intensity for all data channels of at least 75 percent of the minimum expected response (measured from averaging several runs during the initial IVS).

The QC Geophysicist reviews the anomaly resolution information in the project database weekly and documents the findings in a representative table. Based on the findings each week, future checks may occur at an increased rate.

7.2 GOOD FIELD PRACTICES

- Given that the EM61 instrument is a metal detector, it is important that the operators be metal-free. Unless dictated by health and safety concerns, this includes the absence of cell phones and boots with metal eyelets or shanks.
- It is important to secure cables firmly to the data acquisition platform using zip ties or other tension relief materials.

- If RTK GPS or RTS is used for positioning, the antenna or prism should be mounted as close as possible to the pivot point of the sensor system to minimize "tilt" errors, while still maintaining an adequate distance to minimize system "noise."
- If multiple single sensor EM61 systems are being used by independent teams on a project, the separation distance between the units should not be less than approximately 60 meters, or a distance determined during initial project testing at the main IVS.
- It is beneficial to digitally record the warm-up period of the EM61; designate the file name in the readme.txt file that is transferred to the Data Processor/Analyst daily.

8.0 REFERENCES

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9.0 REVISION HISTORY

Revision 1 (December 2014): Initial Release.

Revision 2 (January 2017): Added Section 4.0 to track revision history. Revised list of IVS memo deliverables. Updated dynamic positioning and static test requirements in accordance with updated EM 200-1-15. Added references to Section 3.0.

Revision 3 (August 2017): Changed the title of SOP to better reflect the subject matter.

Revision 4 (November 2018): Added updated performance metrics from EM 200-1-15 and revised the organization of the SOP to more closely match that of other HGL SOPs.

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HGL HydroGeoLogic, Inc Exceeding Expectations	**STANDARD OPERATING PROCEDURE**

Analog Geophysical Mapping	**SOP 552.01**
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Approved by:

Jan Kool

7/13/2018

Jan Kool, Ph.D.
Corporate QA Manager

Date

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Neil Feist
MMRP Operations Manager

Date

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1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to identify the means and methods to be employed when performing analog geophysical mapping (AGM) or "mag and count" for subsurface characterization.

2.0 SUMMARY OF METHOD

AGM surveys are a nondestructive means for detecting and mapping the locations of buried metal objects. Depending on the instrumentation used, the survey can detect both ferrous (magnetic) and nonferrous sources (if an electromagnetic or all-metals detector is used). The field procedures are a variant of the "mag and dig" approach commonly used in environmental and unexploded ordnance (UXO) investigations; however, the detected anomalies are not intrusively investigated. The AGM survey, also known as "mag and count," will result in a georeferenced anomaly map that can be used for planning subsequent operations.

Measurement quality objectives (MQOs) are identified in the project-specific Quality Assurance Project Plan (QAPP) or other project planning documents.

3.0 DEFINITIONS

AGM	analog geophysical mapping
GIS	geographic information system
GPS	global positioning system
HGL	HydroGeoLogic, Inc.
MQO	measurement quality objective
QAPP	quality assurance project plan
QC	quality control
SOP	standard operating procedure
SUXOS	Senior UXO Supervisor
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist

4.0 PERSONNEL

This section describes the personnel, responsibilities, and qualifications required to implement this SOP. The following individuals are involved in analog geophysical operations:

- **UXO Technician:** collects AGM data and tests instruments daily at test strip.
- **Senior UXO Supervisor (SUXOS) or UXO Quality Control Specialist (UXOQCS):** maintains a daily log of all site activities and instrument QC test results, determines

appropriate sensitivity settings for detectors at start of project, transfers quality control (QC) test results in digital format to processing center and/or GIS departments, and performs seeding (coverage seeds) when required).

- **Data Processor/Analyst or GIS Specialist:** uploads QC test results to project database or GIS.
- **Project Geophysicist:** designs overall survey approach for project.
- **QC Geophysicist:** reviews production and QC test data, and verifies that results are documented in the project database.

The qualifications of the personnel implementing this SOP are documented Worksheets 4, 7, and 8 of the QAPP or Work Plan.

5.0 EQUIPMENT AND SUPPLIES:

Typical equipment includes the following:

- Analog detector (White's, Minelab, Schonstedt, or similar),
- GPS with survey areas (transects or grids) uploaded for visual reference,
- Batteries and chargers,
- Equipment manuals,
- Measuring tapes (if local grid is to be used),
- Traffic cones, ropes, or pin flag to mark grid lanes,
- Hammer,
- Nails for anchoring measuring tapes,
- Bound weatherproof field notebook,
- Miscellaneous supplies (flash drive, tool kit, permanent markers, electrical tape), and,
- First aid kit.

6.0 SAFETY

The personnel who perform data collection must consult the project Health and Safety Plan and be aware of any site-specific hazards during performance of the task. Proper personal protective equipment is necessary and is covered in the activity hazard analysis for the task.

7.0 PROCEDURES

An AGM survey consists of data collection within full coverage grids or along parallel or meandering transects, or as specified in the project QAPP or another project planning document.

The type of detector used, a description of it, and its serial number must be documented, as must the type and model of handheld GPS unit if one is used.

7.1 TEST STRIP

The test strip must be surveyed at least once per day. General procedures include the following:

- Turn on the instrument to warm up the system electronics.
- Ensure that the required sensitivity settings are selected.
- Spot check readings to locate a noise-free background area.
- Perform any nulling procedures.
- Perform a personnel metal interference source check.
- Survey the test strip.
- Perform a known position check for a handheld GPS (if applicable)
- Document (UXOQCS) QC tests in a logbook, in hard copy form, or digitally (preferred).
- Collect production data.
- Perform post-data collection QC tests and document the findings (as required).
- Review, sign, and date (Team Leader) field logs and documentation at the end of each survey day.

7.2 TRANSECTS

The AGM Team Leader oversees the collection of data along transects. The team uses the virtual transects on the GPS to navigate the survey area along the meandering or parallel transects. Survey speed must be maintained at a pace, usually between 2 and 3 feet per second (~ 2 miles per hour), that allows adequate detection of subsurface anomalies. Personnel systematically sweep the area along each transect using the appropriate sensitivity settings for the detector. Detector counts ("hits") are tracked at regular intervals along each transect and documented on the GPS or on a hard copy sheet. Features such as craters, berms, cultural features, and impassable areas must be documented and relevant information transferred to the GIS at the end of each survey day.

7.3 GRIDS

The AGM team leader oversees the collection of data within grids. Survey speed is limited such that the mapping progresses at a relatively slow walking pace that can be maintained over the course of the day. Typically, a walking pace of 2 to 3 feet per second allows all team members to maintain position for a grid-based survey and achieve an effective sweep over the ground surface with the analog instruments.

As required, stakes or markers are used to mark the boundary of the survey area, and ropes or pin flags are used to mark search lanes. The grid corner locations (position coordinates) are measured and recorded with the GPS and uploaded to the GIS at the end of each survey day.

Personnel systematically and thoroughly search assigned search lanes using the appropriate sensitivity settings for the detector. The operator slowly moves forward along the search lane, sweeping the instrument from side to side, keeping the sensor-ground standoff geometry consistent, and ensuring that the entire width of the search lane is swept. Detector counts ("hits") are tracked for each search lane and documented on the GPS or on a hard copy sheet. Features such as craters, cultural features, and impassable areas are documented, and relevant information is transferred to the GIS at the end of each survey day.

8.0 REPORTING

Reporting of the activities associated with this SOP consist of copies of the field notes/logbooks and digital files from the GPS. The AGM Team Lead must maintain a record of site conditions and metadata in either written form (e.g., field logbook) or digital form (e.g., tablet-based forms), and the Data Processor/Analyst or GIS Specialist must review these records daily. At a minimum, the following information will be documented:

- Date,
- Weather,
- Field team members,
- Visitors,
- Instrument types and sensitivity settings,
- QC test results,
- Potential sources of interferences,
- GPS file names and track paths, and
- Location and description of obstacles or inaccessible areas where AGM data could not be collected.

9.0 QUALITY CONTROL

The MQOs for AGM are presented in the project QAPP. Performance relative to the MQOs is assessed during the processing of the collected data. The SUXOS or UXOQCS use the three-phase inspection process during AGM.

10.0 REFERENCES

U.S. Army Corps of Engineers. *Technical Guidance for Military Munitions Response Actions (EM-200-1-15)*, October 2015.

11.0 REVISION HISTORY

Revision 0 December 20, 2010, Initial Release.
Revision 1 June 15, 2018, Updated to the current HGL SOP format.

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APPENDIX H

BLIND SEED FIREWALL PLAN

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APPENDIX H
BLIND SEED FIREWALL PLAN

REMOVAL ACTION
FORT JACKSON NATIONAL CEMETERY
RICHLAND COUNTY, SOUTH CAROLINA

Contract No. W912DY-17-D-0004
Delivery Order No. W912DY-19-F-0217

Prepared for:

U.S. Army Corps of Engineers, Charleston District
U.S. Army Engineering and Support Center, Huntsville

Prepared by:

HydroGeoLogic, Inc.
4835 University Square, Suite 15
Huntsville, Alabama 35816

August 2019

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1.0 INTRODUCTION

This Blind Seed Firewall Plan has been developed to describe general procedures for maintaining the confidentiality for the locations of blind quality control (QC) seeds placed within full coverage grids for the terrestrial EM61 detection survey. Only specific project personnel are required to have knowledge and access to the QC seed information to ensure the integrity of the data collection, processing, analysis, and classification efforts. After the Quality Assurance Project Plan (QAPP) is finalized and before mobilization, the HydroGeoLogic, Inc. (HGL) QC Geophysicist, and the U.S. Army Corps of Engineer (USACE) Technical Representative will agree on the number, type, and spatial distribution of QC seeds for digital geophysical mapping (DGM).

2.0 QUALITY CONTROL PERSONNEL

HGL and subcontractor personnel involved in data collection, processing/classification and intrusive investigation activities on the project will be prevented from having access to information related to the detailed information for the QC seeds. The information will be provided to them only as needed for post-classification analyses, such as a root-cause analysis (RCA), and only after documented permission to share the information has been received from the USACE Technical Representative and/or Project Manager (PM). The following personnel are the only members of the project team who will have access to the detailed QC seed information:

- HGL QC Geophysicist (Charles Nycum)
- HGL QC Geophysicist (Tim Deignan)
- HGL Unexploded Ordnance (UXO) QC Specialist (UXOQCS) (to be determined [TBD])
- HGL QC Manager (Jan Kool)
- USACE Geophysicist (Daryl Donatelli)

3.0 INFORMATION TRANSFER/STORAGE

The QC seed information will be recorded by the HGL UXOQCS upon placement of the seeds in the field. Unless permission is received from the USACE Geophysicist to share with other members of the project team, information may only be transferred between the individuals identified above. The information will be transferred to the HGL QC Geophysicist(s). Transfer of QC blind seed data may occur as email attachments or directly to a protected network drive. The information and data will be stored only in: 1. Password protected files on local hard drives of the PCs assigned to the individuals listed above; 2. Protected folders on the HGL file server accessible only to the staff listed above and the server administrator. The QC seed information will be transferred to the USACE Technical Representative on a weekly basis during the blind seed program in digital format (e.g., Microsoft Excel or Microsoft Access).

Seeding positioning equipment will be separate from equipment used by the field teams. If the need arises and the seeding team and field survey teams share equipment, the seeding operations data will be deleted from the survey/GPS equipment each day.

4.0 COMMITMENT TO CONFIDENTIALITY

The personnel identified in this document, or others added with the USACE Geophysicist and/or PM's permission, will be required to provide a letter of confidentiality (either email or hard copy) to comply with the requirements established in this document (Attachment 1). The letters of confidentiality will be kept on record by the HGL QC Geophysicist or PM on the SharePoint site.

HydroGeoLogic, Inc
Exceeding Expectations

Blind Seeding Firewall Confidentiality Agreement

Category: 500 — MMRP and Geophysics
Revision No.: 0
Revision Date: November 09, 2017
Review Date: November 2017

Fort Jackson National Cemetery
Letter of Confidentiality

In performing my assigned duties and responsibilities with HydroGeoLogic Inc. (HGL), I understand that maintaining confidentiality is critical to the mission of our company and clients. "I will abide by the requirements of the Blind Seed Firewall Plan and not distribute any information related to the blind QC seeds to any other project personnel except those specified in the Blind Seed Firewall Plan"

My signature below indicates my agreement to maintain strict confidentiality of all information gained or exposed to during the course of fulfilling my job duties and responsibilities.

Print Name: _____

Signature: _____

Date: _____

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APPENDIX I

SITE MAPS

Figure 1 Site Location
Figure 2 Prior Removal Action Areas
Figure 3 2009 Master Plan
Figure 4 Phase 2 Areas
Figure 5 Boundary and Grids
Figure 6 Historical Range Fans

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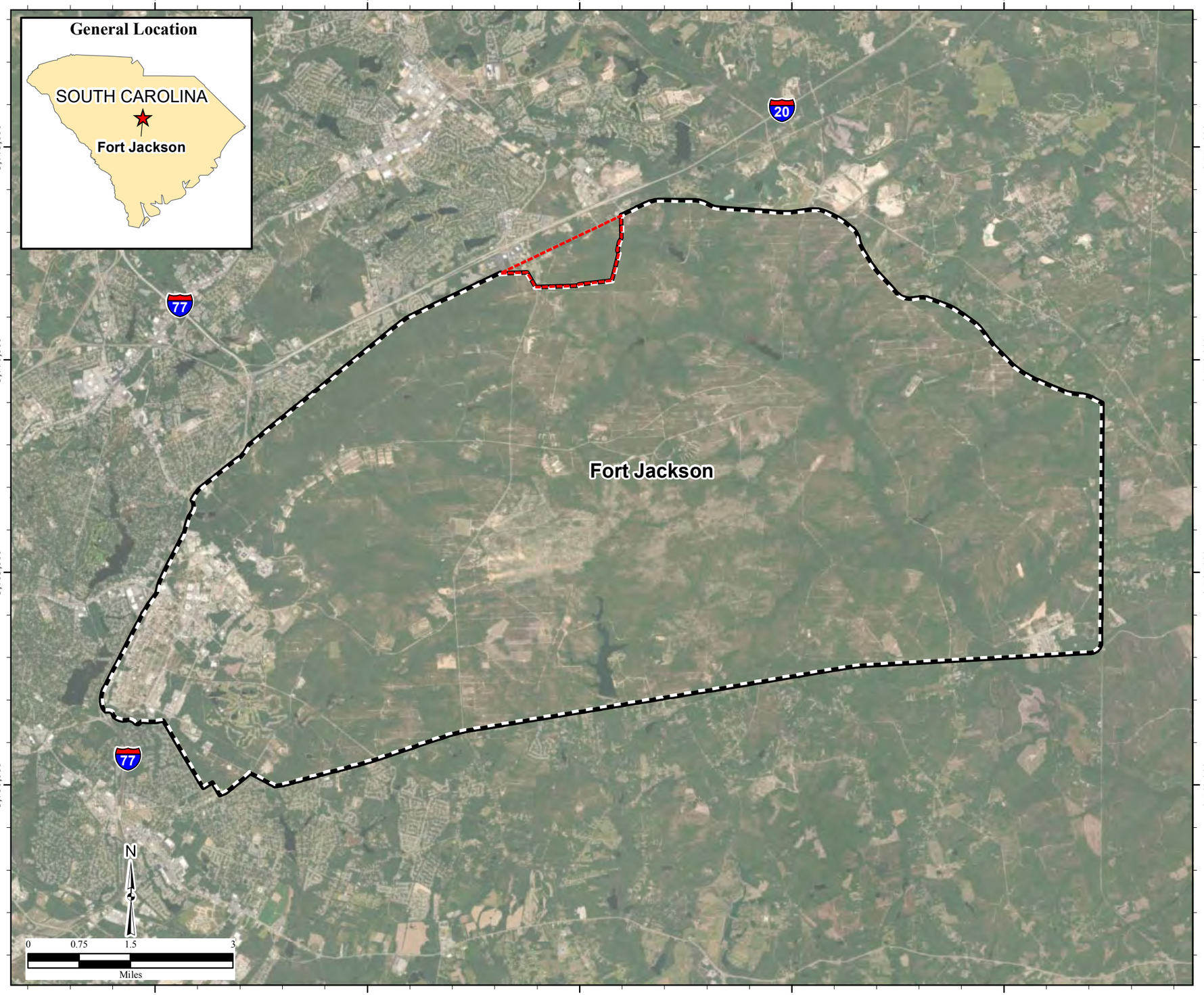
Figure 1
Fort Jackson National Cemetery Location



Legend

Cemetery Boundary

Fort Jackson

Notes:
Coordinates shown in UTM Zone 17N, NAD83, meters.

UFP-QAPP=Uniform Federal Policy Quality Assurance Project Plan

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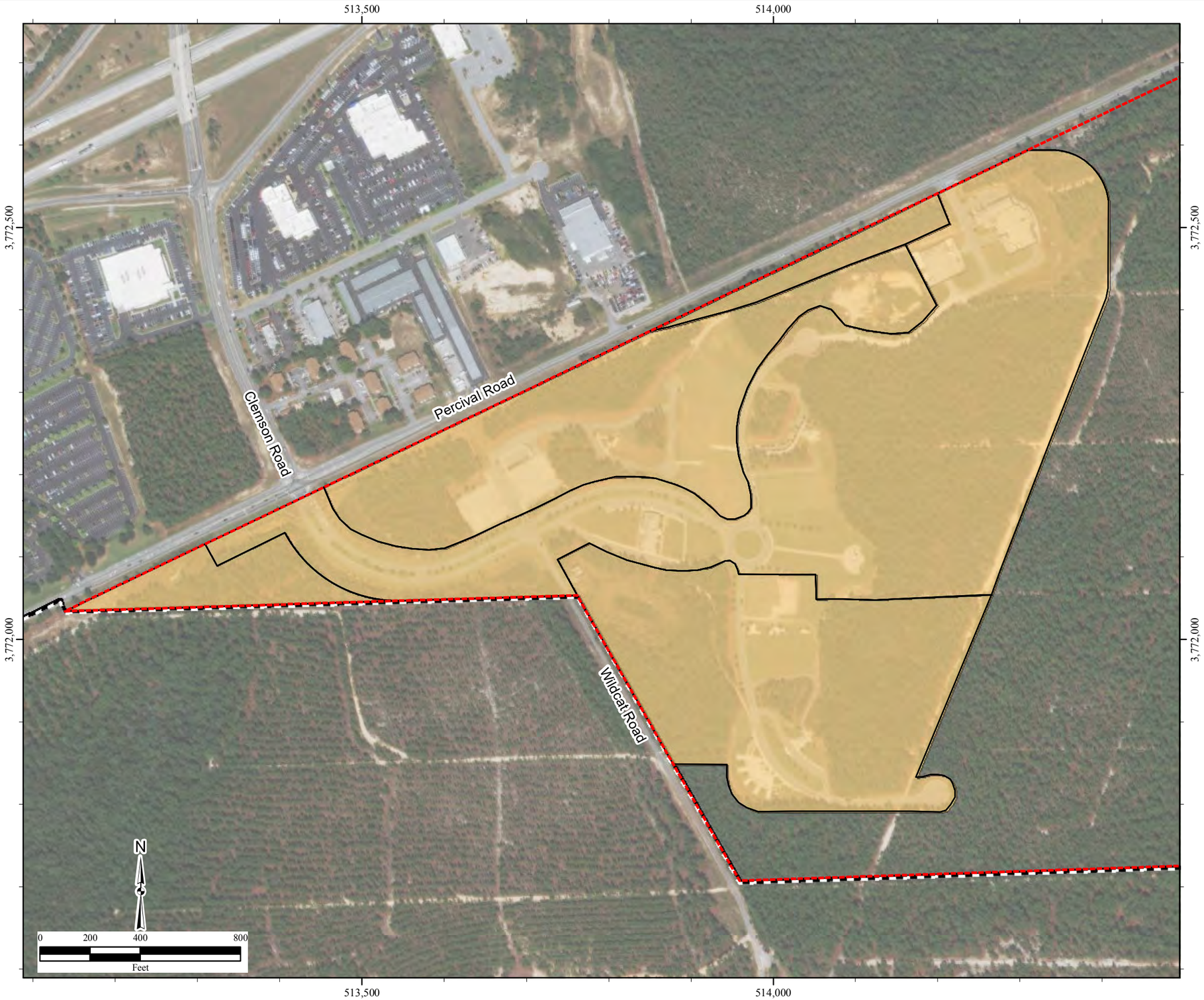
(01)Site_Location.mxd
6/13/2019 RR
Source: HGL, USACE
ArcGIS Online Imagery

Figure 2
Prior Removal Action Area



Legend

- Prior Removal Action Area
- Cemetery Boundary
- Fort Jackson

Notes:
Coordinates shown in UTM Zone 17N, NAD83, meters.

UFP-QAPP=Uniform Federal Policy Quality Assurance Project Plan

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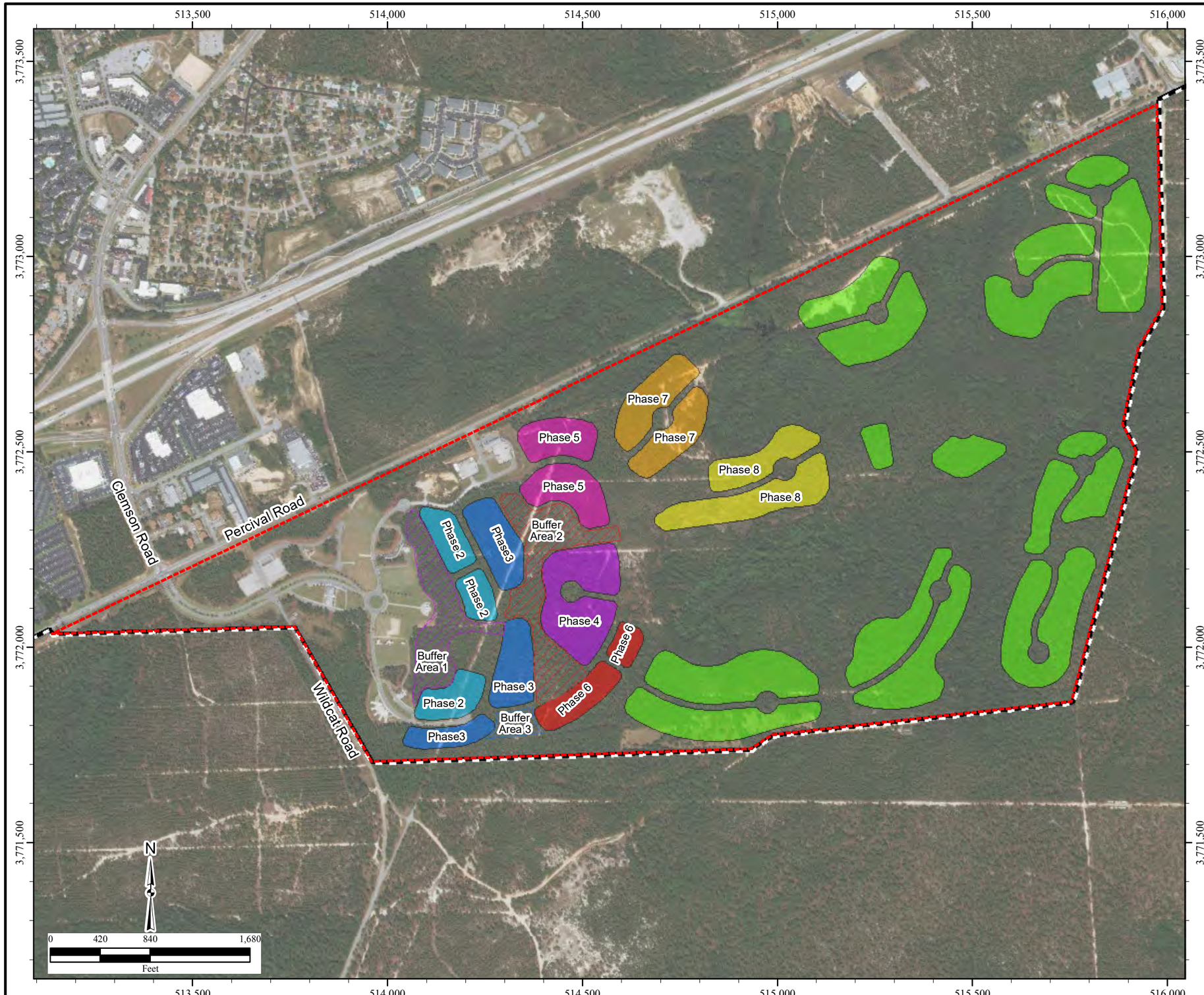
(02)Prior_Removal_Areas.mxd
6/12/2019 RR
Source: HGL, USACE
ArcGIS Online Imagery

Figure 3
Historical Master Plan



Legend

- Buffer Area 1
- Buffer Area 2
- Buffer Area 3
- Phase 2
- Phase 3
- Phase 4
- Phase 5
- Phase 6
- Phase 7
- Phase 8
- Phase Future
- Cemetery Boundary
- Fort Jackson

Notes:
Coordinates shown in UTM Zone 17N, NAD83, meters.

UFP-QAPP=Uniform Federal Policy Quality Assurance Project Plan

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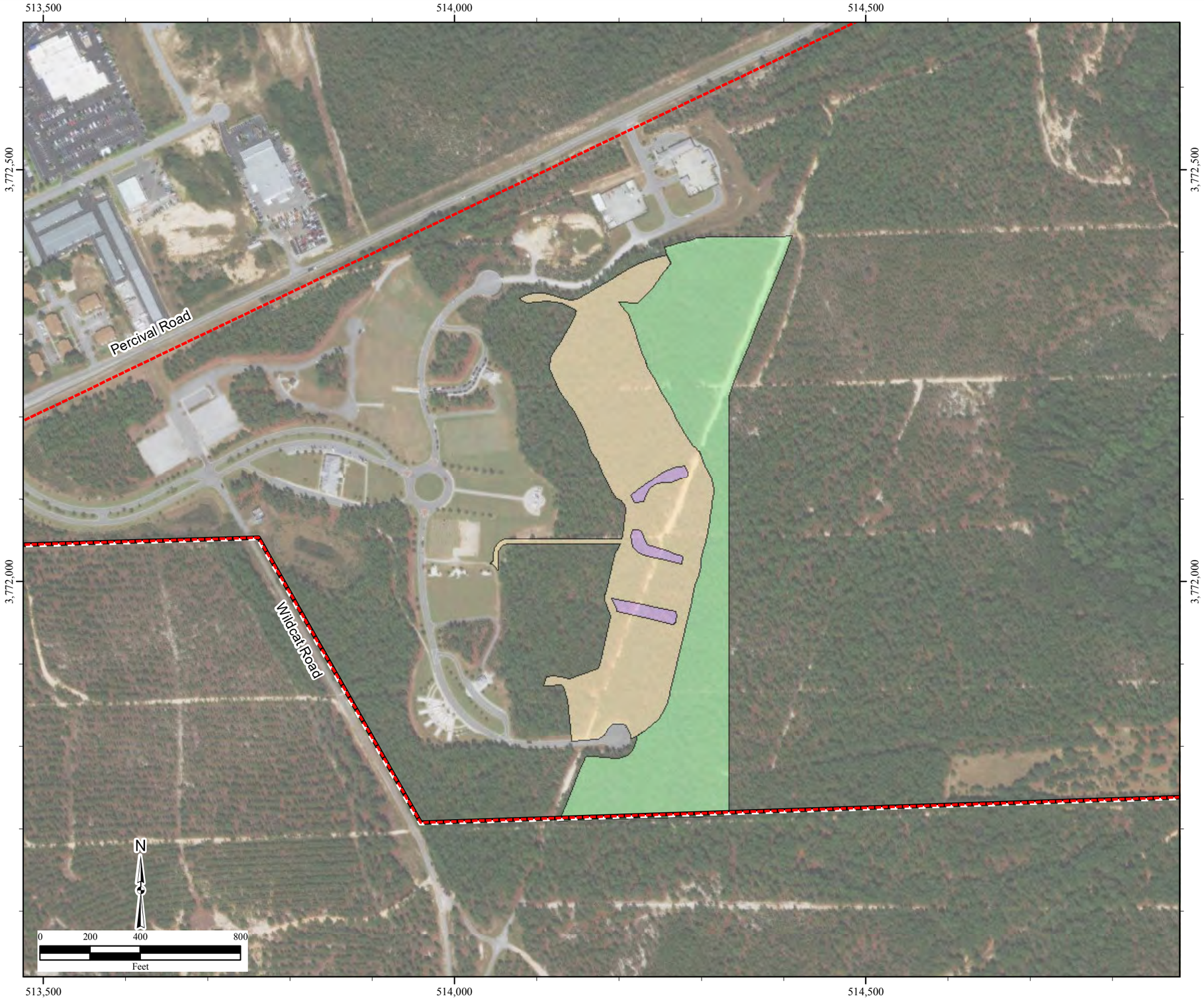
6/13/2019 TH
Source: HGL, USACE
ArcGIS Online Imagery

Figure 4
Phase 2 Construction Area



Legend

- Cemetery (14.52 Acres)
- Wooded Area (15.57 Acres)
- Trees to Remain (0.75 Acres)
- Cemetery Boundary
- Fort Jackson

Notes:
Coordinates shown in UTM Zone 17N, NAD83, meters.

UFP-QAPP=Uniform Federal Policy Quality Assurance Project Plan

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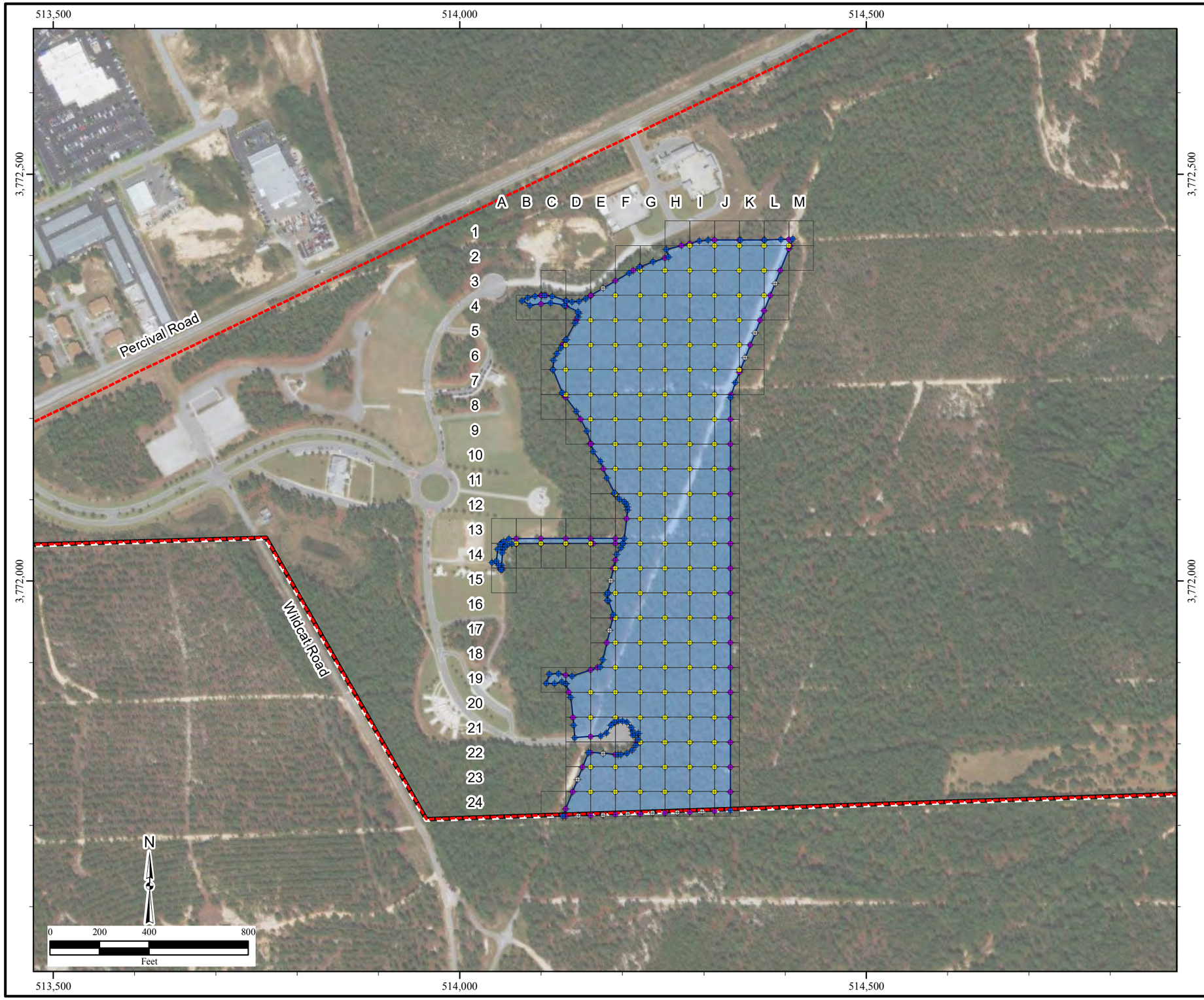
Source: HGL, USACE
ArcGIS Online Imagery

Figure 5
Boundary and Grids



Legend

- Clearance Vertex (103)
- Grid Corner (134)
- Grid-Boundary Intersection (98)
- 100ft Max Distance Stake (14)
- 100ft x 100ft Grid
- Subsurface Clearance Area (30.8 ac)
- Cemetery Boundary
- Fort Jackson

Note:
Coordinates shown in UTM Zone 17N, NAD83, meters.

UFP-QAPP=Uniform Federal Policy Quality Assurance Project Plan

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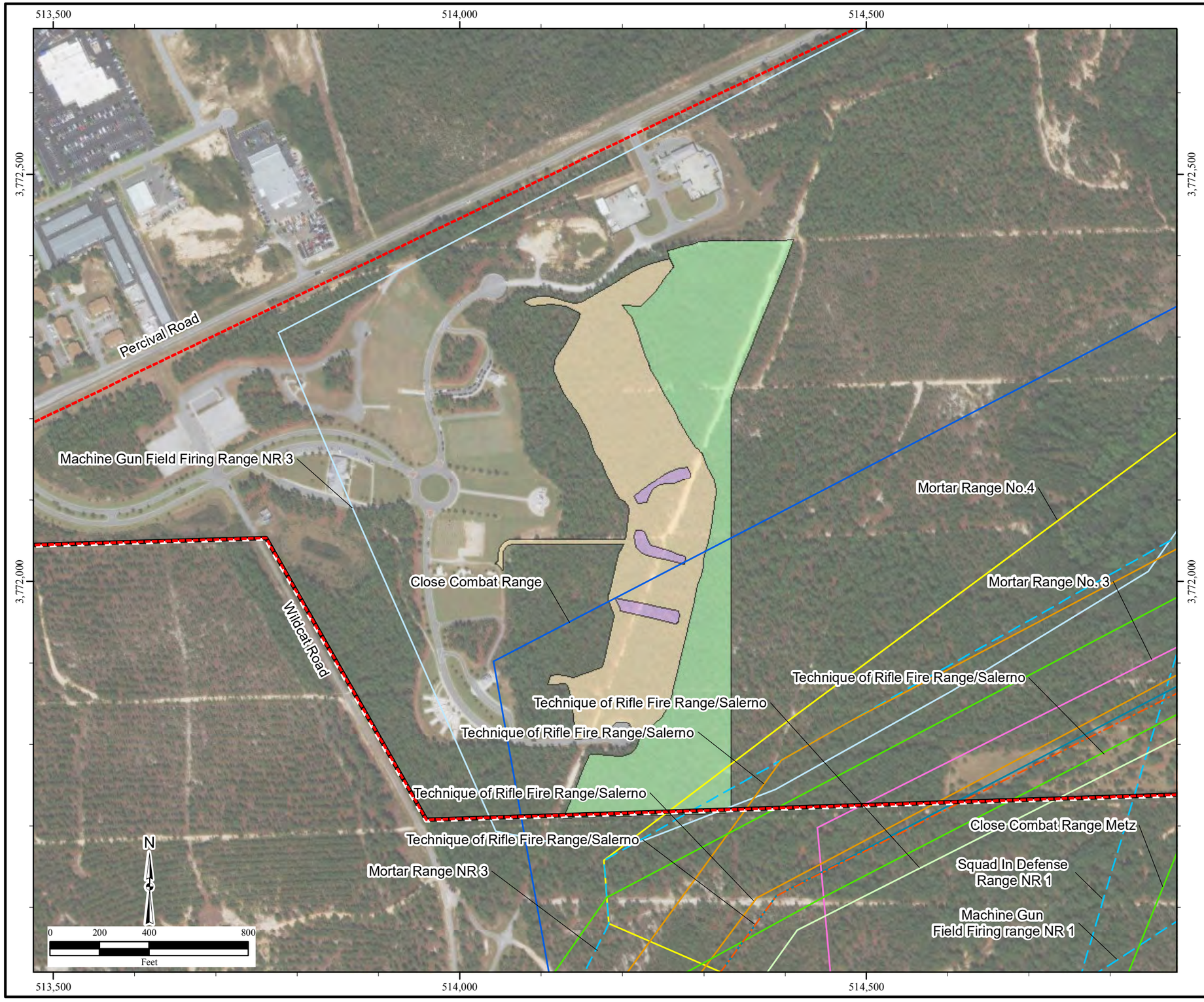
6/13/2019 RR
Source: HGL, USACE
ArcGIS Online Imagery

Figure 6
Range Fan Overlay



Legend

- Range (1949)
- Range (1952)
- Range (1955)
- Range (1956)
- Range (1962)
- Range (1969)
- Range (1970)
- Range (1977)
- Range (1981)
- Range (1994)
- Cemetery (14.52 Acres)
- Wooded Area (15.57 Acres)
- Trees to Remain (0.75 Acres)
- Cemetery Boundary
- Fort Jackson

Note:
Coordinates shown in UTM Zone 17N, NAD83, meters.

UFP-QAPP=Uniform Federal Policy Quality Assurance Project Plan

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6/13/2019 RR
Source: HGL, USACE
ArcGIS Online Imagery

APPENDIX J

SCHEDULE

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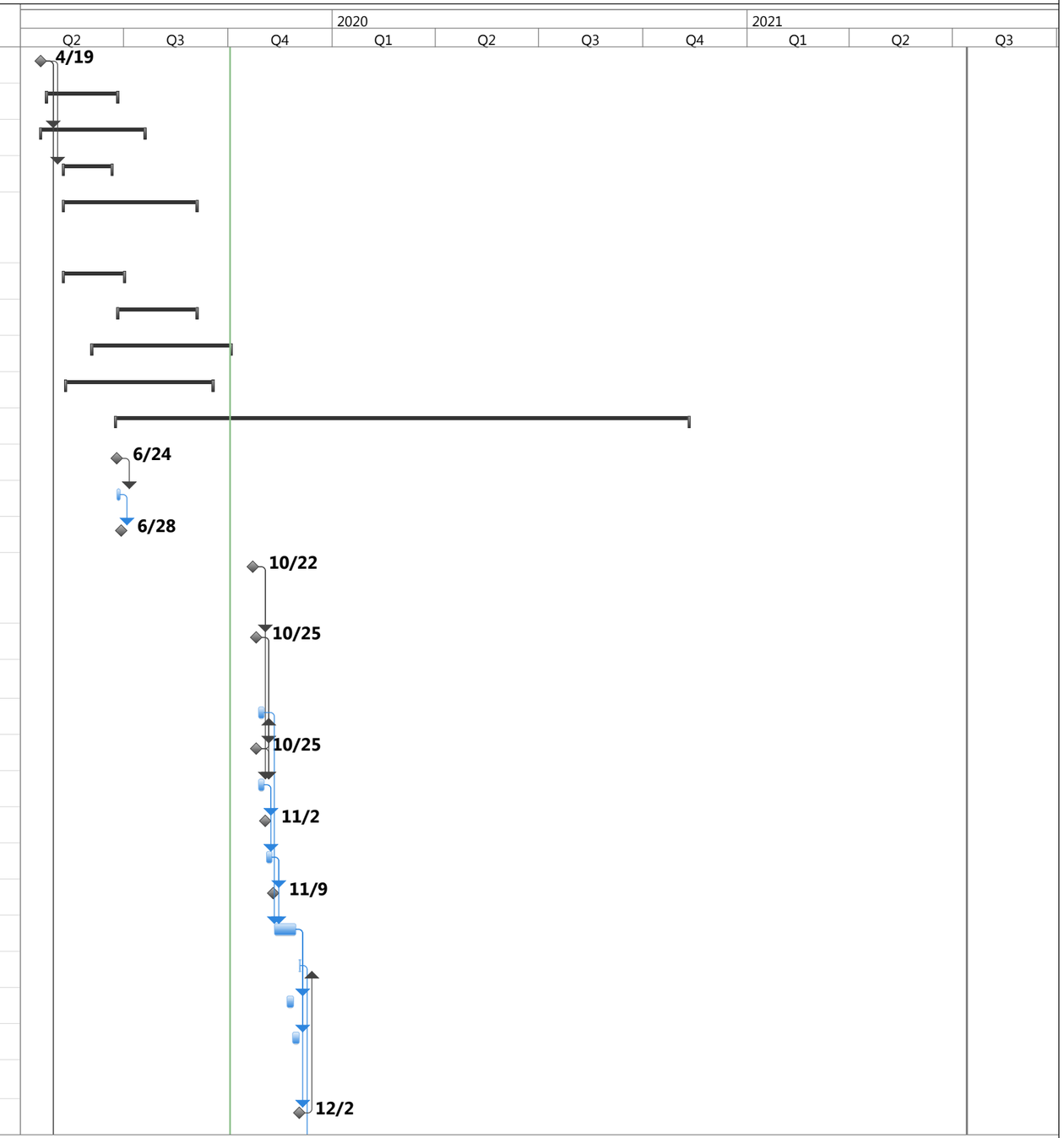
Project Schedule - Removal Action at Fort Jackson National Cemetery

ID	Milesto	Task Name	Duration	Start	Finish
1	**Yes**	**Task Order Award**	**0 days**	**Fri 4/19/19**	**Fri 4/19/19**
2	**No**	**Kick Off Teleconference**	**45 days**	**Wed 4/24/19**	**Wed 6/26/19**
11	**No**	**Project Management Plan (PMP)**	**66 days**	**Fri 4/19/19**	**Fri 7/19/19**
19	**No**	**Construction Support Work Plan**	**31 days**	**Thu 5/9/19**	**Fri 6/21/19**
25	**No**	**Quality Assurance Project Plan (UFP-QAPP) and Quality Assurance Surveillance Plan (QASP)**	**84 days**	**Thu 5/9/19**	**Tue 9/3/19**
26	**No**	**Systematic Project Planning (SPP) Meeting #1**	**38 days**	**Thu 5/9/19**	**Mon 7/1/19**
32	**No**	**Systematic Project Planning (SPP) Meeting #2**	**50 days**	**Wed 6/26/19**	**Tue 9/3/19**
43	**No**	**Submittal of Draft MMRP UFP-QAPP, APP/SSHP, QASP**	**89 days**	**Sun 6/2/19**	**Thu 10/3/19**
60	**No**	**CEHNC Led Explosives Safety Submission (ESS)**	**92 days**	**Fri 5/10/19**	**Wed 9/18/19**
68	**No**	**Field Activities**	**362 days**	**Mon 6/24/19**	**Tue 11/10/20**
69	Yes	CS - Mobilization Survey Escort (UXOSO)	1 day	Mon 6/24/19	Mon 6/24/19
70	No	CS - One Week of Surveyor Escort (UXOSO)	3 edays	Tue 6/25/19	Fri 6/28/19
71	Yes	CS - Demobilization Survey Escort (UXOSO)	1 day	Fri 6/28/19	Fri 6/28/19
72	Yes	Mobilization for Site Setup, Harvest & Cleanup, Surface Clearance (SUXOS, UXOSO/QCS)	1 day	Tue 10/22/19	Tue 10/22/19
73	Yes	Site Setup, Site Magazine (SUXOS, UXOSO/QCS)	3 days	Wed 10/23/19	Fri 10/25/19
74	No	Fence Removal and Staging ahead of Harvesting	3 days	Tue 10/22/19	Thu 10/24/19
75	No	Timber Harvest West of Bull Run Road	5 days	Mon 10/28/19	Fri 11/1/19
76	Yes	Mobilization for Surface Clearance (1T3, 3T2)	1 day	Fri 10/25/19	Fri 10/25/19
77	No	Surface Sweep of Area East of Bull Run Road (1T3, 3T2)	5 days	Mon 10/28/19	Fri 11/1/19
78	Yes	Demobilization post Surface Clearance (1T3, 3T2)	1 eday	Fri 11/1/19	Sat 11/2/19
79	No	Timber Harvest East of Bull Run Road (SUXOS, UXOSO/QCS)	5 days	Mon 11/4/19	Fri 11/8/19
80	Yes	Demobilization post Harvest (SUXOS)	1 eday	Fri 11/8/19	Sat 11/9/19
81	No	Post Harvest Cleanup (UXOSO)	15 days	Mon 11/11/19	Fri 11/29/19
82	No	Site Setup and Training	1 day	Tue 12/3/19	Tue 12/3/19
83	No	Blind Seeding	4 days	Fri 11/22/19	Wed 11/27/19
84	No	PLS Survey of RA Area & Blind Seeds	4 days	Wed 11/27/19	Mon 12/2/19
85	No	Thanksgiving	2 days	Thu 11/28/19	Fri 11/29/19
86	Yes	Mobilization for DGM (1Geo, 3T2)	1 day	Mon 12/2/19	Mon 12/2/19



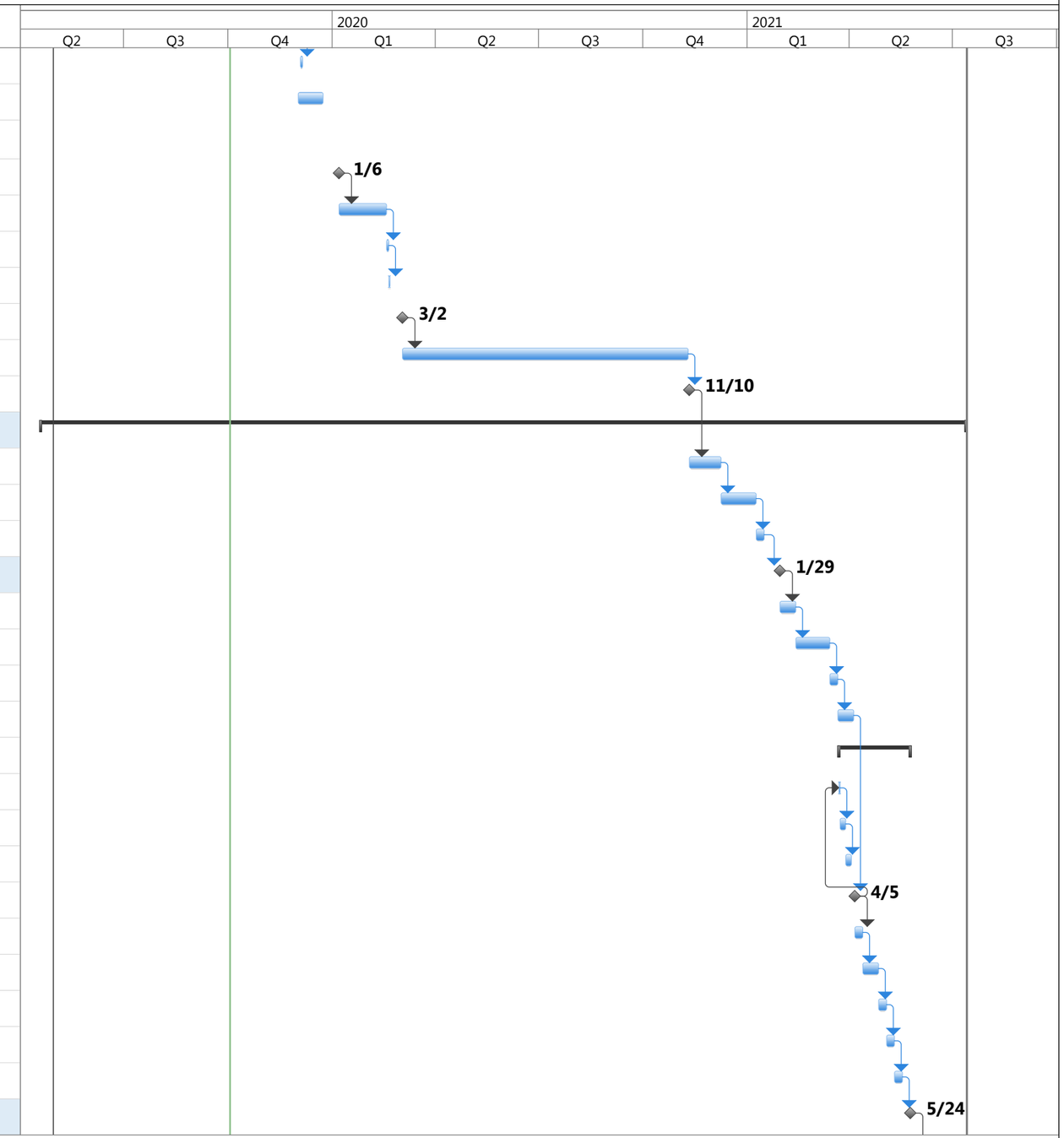
PROJECT SCHEDULE
Removal Action at Fort Jackson National Cemetery

Task Milestone Summary

Payment Milestones are highlighted in blue.

Project Schedule - Removal Action at Fort Jackson National Cemetery

ID	Milesto	Task Name	Duration	Start	Finish
87	No	IVS Installation and Memo	2 days	Wed 12/4/19	Thu 12/5/19
88	No	DGM RTK GPS / Line-Fid	16 days	Mon 12/2/19	Mon 12/23/19
89	No	Christmas and New Years	10 days	Mon 12/23/19	Fri 1/3/20
90	Yes	Mobilization for Instrusive	1 day	Mon 1/6/20	Mon 1/6/20
91	No	Reacquisition and Intrusive (SM, 2Tms<15, 20d, 10d float)	30 days	Tue 1/7/20	Mon 2/17/20
92	No	MPPEH Disposition and Site Breakdown	2 days	Tue 2/18/20	Wed 2/19/20
93	No	Demobilization	1 day	Thu 2/20/20	Thu 2/20/20
94	Yes	CS - Mobilization CS (SUXOS, UXOSO)	1 day	Mon 3/2/20	Mon 3/2/20
95	No	CS - Onsite CS (SUXOS, UXOSO)	9 mons	Tue 3/3/20	Mon 11/9/20
96	Yes	CS - Demobilization CS (SUXOS, UXOSO)	1 day	Tue 11/10/20	Tue 11/10/20
97	**No**	**Site Specific Final Report (SSFR) Report**	**582 days**	**Fri 4/19/19**	**Tue 7/13/21**
98	No	Submittal of Draft SSFR Report	28 edays	Tue 11/10/20	Tue 12/8/20
99	No	Army Stakeholder Review of Draft SSFR Report	31 edays	Tue 12/8/20	Fri 1/8/21
100	No	Submittal of RTCs	7 edays	Fri 1/8/21	Fri 1/15/21
101	Yes	Milestone 6.1: Back Check and Approval of RTCs (50%)	14 edays	Fri 1/15/21	Fri 1/29/21
102	No	Submittal of Draft Final SSFR Report	14 edays	Fri 1/29/21	Fri 2/12/21
103	No	DHEC Review of Draft Final SSFR Report	30 edays	Fri 2/12/21	Sun 3/14/21
104	No	Submittal of RTCs	7 edays	Sun 3/14/21	Sun 3/21/21
105	No	Back Check and Approval of RTCs	14 edays	Sun 3/21/21	Sun 4/4/21
106	**No**	**SPP Meeting #4**	**45 days**	**Tue 3/23/21**	**Mon 5/24/21**
107	No	Submittal of SPP Meeting #4 Read-Ahead Package	1 eday	Tue 3/23/21	Wed 3/24/21
108	No	USACE Review of Draft Read-Ahead Package	5 edays	Wed 3/24/21	Mon 3/29/21
109	No	Submittal of Final Read-Ahead Package	5 edays	Mon 3/29/21	Sat 4/3/21
110	Yes	SPP Meeting #4 (On Board Review)	1 day	Mon 4/5/21	Mon 4/5/21
111	No	Submittal of Draft SPP Memo #4	7 edays	Mon 4/5/21	Mon 4/12/21
112	No	Stakeholder Review of Draft SPP Memo #4	14 edays	Mon 4/12/21	Mon 4/26/21
113	No	Submittal of RTCs	7 edays	Mon 4/26/21	Mon 5/3/21
114	No	Back Check and Approval of RTCs	7 edays	Mon 5/3/21	Mon 5/10/21
115	No	Submittal of Final SPP Memo #4	7 edays	Mon 5/10/21	Mon 5/17/21
116	Yes	Milestone 2.4: Approval of Final SPP Memo #4	7 edays	Mon 5/17/21	Mon 5/24/21



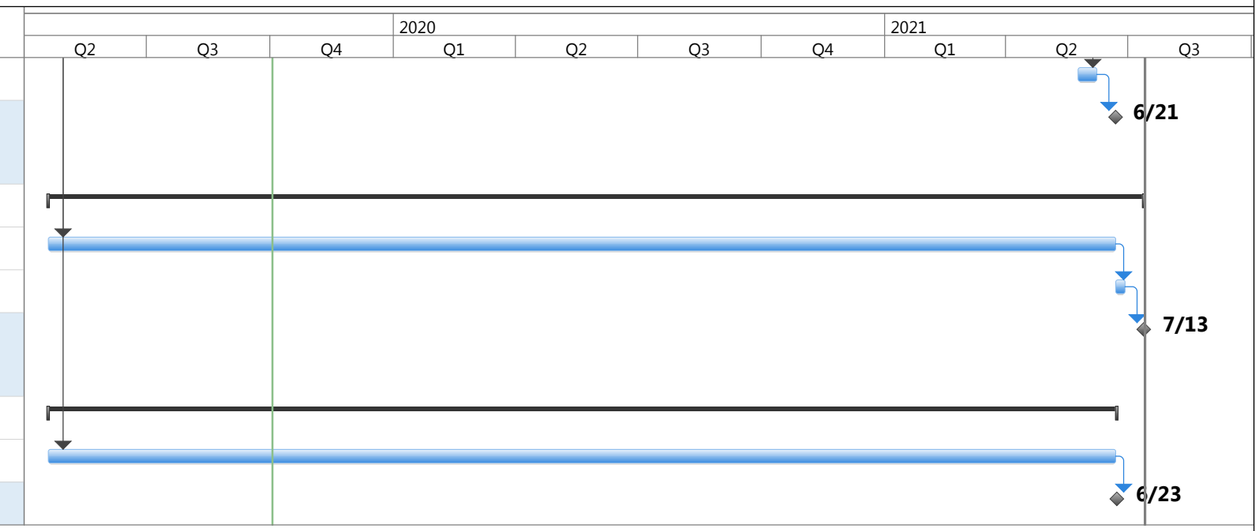
PROJECT SCHEDULE
Removal Action at Fort Jackson National Cemetery

Task Milestone Summary

Payment Milestones are highlighted in blue.

Project Schedule - Removal Action at Fort Jackson National Cemetery

ID	Milesto	Task Name	Duration	Start	Finish
117	No	Submittal of Final SSFR Report	14 edays	Mon 5/24/21	Mon 6/7/21
118	Yes	Milestone 6.2: USACE Approval and Regulator Concurrence of Final RA Report (50%)	14 edays	Mon 6/7/21	Mon 6/21/21
119	**No**	**GeoSpatial Data**	**582 days**	**Fri 4/19/19**	**Tue 7/13/21**
120	No	GeoSpatial Data Management	795 edays	Fri 4/19/19	Tue 6/22/21
121	No	Submittal of Final GeoSpatial Dataset on DVD	7 edays	Tue 6/22/21	Tue 6/29/21
122	Yes	Milestone 4.1: USACE Approval of Final GeoSpatial Dataset (100%)	14 edays	Tue 6/29/21	Tue 7/13/21
123	**No**	**Administrative Record**	**568 days**	**Fri 4/19/19**	**Wed 6/23/21**
124	No	Update throughout the life of the project	795 edays	Fri 4/19/19	Tue 6/22/21
125	Yes	Milestone 7.1: Admin Record Updated/USACE Approval (100%)	1 eday	Tue 6/22/21	Wed 6/23/21



PROJECT SCHEDULE
Removal Action at Fort Jackson National Cemetery

Task Milestone Summary

Payment Milestones are highlighted in blue.

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APPENDIX K

QUALITY ASSURANCE SURVEILLANCE PLAN

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Draft
Performance-Based Quality Assurance Surveillance Plan (QASP) for
Munitions and Explosives of Concern (MEC) Removal Action Fort Jackson National Cemetery

1. INTRODUCTION:

This Performance-Based Quality Assurance Surveillance Plan (QASP) has been developed pursuant to the requirements of the Performance Work Statement (PWS) for Contract No. W912DY-17-D-0004, Task Order No. W912DY19F0217. This plan sets forth procedures and guidelines that the U.S. Army Corps of Engineers (USACE) will use in evaluating the technical and safety performance of the Contractor. A copy of the Performance Metrics is furnished in the PWS so that the Contractor will be aware of the methods that the Government will employ in evaluating their performance on this contract.

2. PURPOSE OF THE QASP:

The QASP is intended to accomplish the following:

a. Define the roles and responsibilities of participating Government officials;
b. Define the types of work to be performed with required end results;
c. Document the evaluation methods that will be employed by the Government in assessing the Contractor's performance;
d. Provide the Surveillance Activity Checklists and Corrective Action Request (CAR) forms that will be used by the Government in documenting and evaluating the Contractor's performance; and
e. Describe the process of performance documentation.
f. Outline quality assurance procedures to be employed by the Government during performance of this task order to confirm that the site characterization is conducted utilizing proper procedures and in accordance with the approved work and safety plans.

3. ROLES AND RESPONSIBILITIES OF PARTICIPATING GOVERNMENT OFFICIALS

The USACE Contracting Officer Representative (COR) (Amy Doss):

- Responsible for overall project direction, including technical, contracting and customer-related issues.
- Reviews vouchers and make recommendations to the Contracting Officer for payment action based on completion of designated milestones.
- Reports problems or discrepancies to the Contracting Officer as soon as possible.
- Oversees the implementation of the QASP.
- Reviews contractor submittals.
- Schedules and provides labor codes and funding for all surveillance activities with the appropriate USACE Supervisor (OE Safety Group, Geotechnical Branch, etc.)
- Initiates periodic contractor evaluations in the Contractor Performance Assessment Reporting System (CPARS).
- Monitors contract performance.
- Maintains central repository for all QA tasks required for payment.
- Issues all acceptance/rejection statements.

The USACE Technical Manager (Heather McDonald):

- Participates in preparation of Statement of Work (SOW)/PWS to ensure that Technical requirements are adequately addressed.
- Participates in proposal review.
- Coordinates reviews of contractor submittals for compliance with contract requirements.
- Coordinates reviews of contractor submittals for compliance with U.S. Department of Defense (DoD), Department of the Army (DA) and USACE explosives safety requirements.

- Coordinates Periodic Inspections of contractor compliance with DoD, DA, and USACE explosives safety requirements and explosives related procedures described in the Quality Assurance Project Plan (QAPP).
- Conducts or Supports other surveillance activities as required by the project team.
- Supports all on-site quality assurance (QA) activities.
- Develops the final Quality Assurance Report.

The USACE OE Safety Specialist (to be determined [TBD]):

- Participates in preparation of SOW/PWS to ensure that Occupational Health and Safety requirements are adequately addressed.
- Participates in preparation of SOW/PWS to ensure that Explosive Safety guidance requirements are adequately addressed.
- Conducts reviews of contractor submittals for compliance with DoD, DA and USACE explosives safety requirements.
- Performs periodic inspections of contractor compliance with DoD, DA, and USACE explosives safety requirements and explosives-related procedures described in the QAPP.
- Makes unscheduled, periodic site visits as part of the Government surveillance.
- Conducts other quality assurance as defined in the QASP to ensure that the contractor is complying with the Uniform Federal Policy (UFP)- QAPP and the Site Safety and Health Plan (SSHP).
- Supports all on-site QA activities.
- Reviews contractor Unexploded Ordnance personnel to ensure they meet the minimum qualifications for the positions and duties being performed.
- Participates in preparation of SOW/PWS to ensure that Safety requirements are adequately addressed.
- Conducts reviews of contractor submittals for compliance with DOD, DA and USACE, and Occupation Safety and Health Administration safety and health requirements.
- Coordinates with USACE team members to perform periodic inspections of contractor compliance with accepted Accident Prevention Plan, Engineer Manual 385-1-1, and other DA requirements.
- Makes unscheduled, periodic site visits as part of the Government surveillance.

The USACE Geophysicist (Daryl Donatelli):

- Participates in preparation of SOW/PWS to ensure that Geophysical Investigation requirements are adequately addressed.
- Participates in proposal review to evaluate geophysical tasks.
- Reviews contractor submittals (documents and data) for compliance with contract requirements and proper application of Military Munitions Response Program guidance.
- Coordinates with USACE team members to perform periodic inspections of contractor's compliance with approved plans and performance requirements.
- Reviews Contractor’s QC documentation to ensure accuracy and final Government acceptance.
- Conducts surveillance activities as described in Attachment A and others as required by the project team.
- Verification of anomaly selection criteria and /or existing site condition assumptions.

The USACE Geographical Information System (GIS) team member (TBD):

- Participates in preparation of SOW/PWS to ensure that GIS requirements are adequately addressed.
- Reviews contractor's Geospatial Information and Electronic submittals.
- Reviews Quality Control Plan (QCP) reporting requirements and accepts reported QC measures.

The USACE Environmental and Munitions Center of Expertise (EM-CX):

- Reviews Explosives Safety Submission (ESS).
- Submits ESS to US Army Technical Center for Explosives Safety (USATCES) for review, DA approval, and submission to the DoD Explosives Safety Board (DDESB) for their review and approval.

- Coordinates resolution of USATCES and DDESB comments on ESS.

4. METHODOLOGIES TO BE USED TO MONITOR THE CONTRACTOR'S PERFORMANCE

Even though the Government, through its COR, will be monitoring the contractor's performance on a continuing basis, the volume of tasks performed by the contractor makes technical inspections of every task and step impractical. Accordingly, USACE will use the Surveillance Activity Table (Attachment A) as the basis for monitoring the contractor's performance under this contract. The contractor's performance will be evaluated by the Contracting Officer using the Performance Metrics for CPARS provided as in this PWS.

Quality Assurance Surveillance Activities:

In general, the work will be evaluated in terms of how well the requirements of the task order are satisfied, the extent to which the work performed follows the approach found in the contractor's technical proposal, clarity of documentation, and timeliness of scheduled task accomplishment. At the discretion of the COR or the Contracting Officer or Specialist, other government officials approved by the Contracting Officer or Specialist may be asked to evaluate a particular deliverable or set of deliverables. QA includes but is not limited to the following:

QC documentation must be generated IAW a documented QAPP and the Performance Requirements Tables, as specified in the PWS. All such documentation will be reviewed as part of this QASP.

In the event a requirement is not met and the contractor submits the data to the Government, the contractor shall provide rationales for accepting them. All such rationales will be reviewed as part of this QASP. If the rationales are either insufficient or technically unfeasible, or are attempts to justify non-conformances that should be corrected to meet project needs, the submittal(s) will be rejected. Non-conformances identified as part of this QASP will result in the entire lot being returned to the Contractor and require all necessary correction(s) be performed to meet requirements. The Government will issue a CAR to the contractor to document this action.

Quality Assurance for Technical Management:

The QA Surveillance Activities for Technical Management are based on the following:

1) Data packages, including all associated QC documentation, e.g. Checklists, QC Checks, Field notes, Daily reports, Field Work Record Forms provided to the Government periodically upon request.
2) Periodic on-site inspections.

Quality Assurance for Geophysics:

The Quality Assurance Surveillance Activities for Geophysics are based on the following:

1) Data packages, including all associated QC documentation, are submitted to the Government in lots and IAW Data Item Description (DID) HNC-003.02. The Contractor shall propose the lot size and criteria for designation (i.e. woods vs. open, GPS vs Robotic Total Station vs line and fiducial, array vs man-portable, etc.) for Government concurrence.
2) Periodic site visits to assess field work compliance with the QAPP.

Quality Assurance for Geospatial Data:

The Quality Assurance Surveillance Activities for Geospatial Data are based on the following:

1) Data packages, including all associated QC documentation, are submitted to the Government in lots and IAW DID HNC-006.02.

Quality Assurance for On-Site Safety/Operations QA:

The Quality Assurance Surveillance Activities for On-Site Safety/Operations QA are based on the following:

1) Occupational health and safety guidance.
2) Explosive safety guidance.
3) On-Site Safety Inspections.
4) Review of QC documents retained on site during field activities.
5) On-Site operations inspections to assess field work compliance with the QAPP/Accident Prevention Plan.
6) QA checks as requested by PM or government Project Delivery Team members.

5. QUALITY ASSURANCE REPORTING FORMS

The forms used to document surveillance activities include Daily Quality Assurance Report (Attachment B), Engineering Form 6048, Form 7, Memorandum for Record, and Quality Assurance Forms (Attachment D).

Nonconformance will be documented on a CAR, see Attachment C. Non-conformances are documented at the discretion of the person conducting the surveillance activity, but should be fair and reasonable. Each CAR will be annotated as a Critical nonconformance, Major nonconformance, or Minor nonconformance. CARs will be provided to the Contracting Officer for distribution to the contractor. The contractor will be required to correct explosives safety issues immediately. All other CARs will provide a reasonable suspense date for the contractor to review and take appropriate action, usually 15 calendar days. The contractor is required to provide written responses to all CARs.

Completed forms will be consolidated and provided to the Contracting Officer at the end of each month for that month's surveillance activities. These forms, when completed, will document the contractor's compliance with contract requirements and completion of milestone activities. The Contracting Officer will evaluate contractor performance using the definitions contained in the CPARS and the metrics identified in this PWS.

6. ATTACHMENTS:

Attachment A - Surveillance Activity Table (Provided separately)

Attachment B - Daily QA Report

Attachment C - Corrective Action Request

Attachment D - Quality Assurance Forms (Provided separately)

D-1 Digital Geophysical Mapping Quality Assurance Form (Data Submittal)

D-2 Digital Geophysical Mapping Quality Assurance Form

D-3 Digital Geospatial Data/Electronic Submittal Quality Assurance Form

D-4 Geospatial Quality Assurance Form (Data Submittal)

D-5 On-Site Safety/Operations QA

D-6 Analog Geophysics Quality Assurance Form (Anomaly Resolution)

D-7 Analog Geophysics Quality Assurance Form (Data Submittal)

D-8 Intrusive QA Form

Attachment E - Final Quality Assurance Report

Attachment A
SURVEILLANCE ACTIVITY TABLE

(1) Definable Feature of Work	(2) Reference	(3) Performance Indicators	(4) Surveillance Method	(5) Performance Documentation & QA Surveillance Record File	(6) Performance Assessment Record (PAR) Category	(7) Responsible QA Team Member
Document Reviews						
Table 1.1 in the PMP	Table A-1 Performance Requirements Summary of the PWS	Table B.1 Performance Metrics for Performance Assessment Record from the PWS (also Table 1.2 in the PMP)	100% review of submitted documents.	Corrective Action Requests (CAR), CEHNC Form 7, Contracting Officer Transmittal Memo; kept in official contract file.	Quality of Product or Service	PDT
Project Execution						
QAPP Execution	Assigned field tasks of the PWS.	Work done in compliance with approved plans and data submittals accepted by government IAW performance documentation	Periodic Inspection	Corrective Action Requests (CAR), Geophysical QA Forms, GIS QA Forms, Chemisty QA Forms, QAR, Engineering Form 6048, Memorandum for Record, Trip Reports; Kept in official project file	Quality Of Product or Service	PDT
Schedule						
Project Management: Schedule Control/Reporting	Final Plans and Reports, project milestones, T.O. invoices and Project Status Reports	All document submittals and task order milestones and invoices complete and accepted by T.O date, project closed out/final invoice approved ahead of schedule.	100% of project status reports including weekly and monthly as applicable.	PM checklist; kept in PM file	Schedule	Government PM
Cost (Not Applicable for Firm Fixed Price)						
Project Management: Cost Control/Reporting	Contract invoices meeting PWS requirements (Per PWS Table B.1)	Number of instances of contractor impacts on cost attributable to the contractor and unauthorized cost overruns.	100% of project status reports including weekly and monthly as applicable.	PM checklist; kept in PM file	Cost Control	Government PM
Business Relations						
Meeting preparation and professional conduct	PWS Par 3.3, Par 3.8	Number of customer/Stakeholder/PDT complaints regarding: 1. Personnel prepared and knowledgeable in areas of expertise. 2. Professional and ethical conduct.	Feedback	Trip report, Email, letters, Stakeholder/customer survey forms; kept in PM file	Business Relations	Government PM/PDT
Management of Key Personnel						
Project Management: Personnel	All personnel proposed by Contractor were assigned to project, some personnel were substituted by higher qualified individuals.	Number of instances regarding contractor Personnel and their qualifications for filling key positions/functions.	Periodic Inspection	Trip report, QARs, CARs Engineering Form 6048; kept in official project file	Management of Key Personnel and Resources	PDT

Attachment A
SURVEILLANCE ACTIVITY TABLE

Safety						
QAPP Execution, including Execution of Explosives Management Plan & Explosives Siting Plan (if required)	Performance Indicator for Accidents and Violations per Table B.1 of the PWS.	Number and type of violations and/or accidents regarding compliance with explosives safety & OSHA requirements.	Periodic Inspection	QARs, CARs, Engineering Form 6048, Trip Reports; Kept in Project Safety Specialist file	Safety	Government Safety Specialist
Other (List other QA as required by T.O. or Guidance)						

Attachment B
Daily QA Report

USACE ORDNANCE AND EXPLOSIVE PROJECT DAILY QUALITY ASSURANCE REPORT

CONTRACT WITH DELIVERY ORDER: W912DY-17-D-0004, Task Order # W912DY17F0221, HydroGeoLogic, Inc.

SITE: Fort Jackson National Cemetery

DATE: TELEPHONE NUMBER:
FAX NUMBER:

WEATHER:

USACE PROJECT TEAM MEMBER & TITLE: i.e., Joe Smith OE Safety Specialist, Jill Jones, USACE Project geophysicist, etc.

GRIDS COMPLETED BY CONTRACTOR:

SURVEILLANCE ACTIVITY or ACTIVITIES:

GRIDS THAT PASSED GOVERNMENT QA:

CORRECTIVE ACTION REQUESTS (CAR) and/or Engineering Form 6048 ISSUED:

CONTRACTOR KEY PERSONNEL ON-SITE:

GENERAL OBSERVATIONS:

LESSONS LEARNED:

DISTRIBUTION:
1-CEHNC-OE-DC (Project Manager)
1-CEHNC-OE-S (FILE)
1-CEHNC-ED (Project Engineer)
1-CEHNC-CT (Contract Specialist)

Attachment C
Corrective Action Request

CORRECTIVE ACTION REQUEST	NO. *(1,2,3, etc. for the T.O.)*
USACE Representative: Date Issued: Issued to: Response Due: (*Based on type of nonconformance*) Contract# and T.O.: W912DY-17-D-0004, T.O. W912DY19F0217 Project Name/Location: Fort Jackson National Cemetery, Columbia, South Carolina	
Nonconformance Type (circle one): Critical Major Minor	
Description of Condition Found:	
Contractor Representative Signature (Noting that CAR Received):	
(The Contractor will provide the following information to the Contracting Officer and USACE PM by the "Response Due" date above. Please contact the USACE Representative listed above if you have any questions)	
Actual Cause: (Contractor will investigate and determine cause of condition reported above. Actual cause should be stated as specifically as possible)	
Action Taken to Correct Condition: (Corrective Action should address root cause, not the symptom)	
Action Taken to Prevent Recurrence:	
Action Taken to Monitor Effectiveness of Corrective Action: (Generate data as proof. State the monitoring method put in place and who is responsible for reviewing data.)	
Contractor Representative Signature/Title/Date Signed: (Form must be signed before returning)	
(USACE Project Team Use Only) Review of Corrective Action: 1) Has condition improved? ___ Yes ___ No 2) Additional corrective action required? ___ Yes ___ No Comments: Completed form provided to Contracting Officer: (Date)	

Attachment D
Quality Assurance Forms

D-1 Draft DIGITAL GEOPHYSICAL MAPPING QUALITY ASSURANCE FORM *(DATA SUBMITTAL)*

U.S. Army Engineering & Support Center, Huntsville
Fort Jackson National Cemetery, Richland County, SC, RA

Recommend Payment: Yes ☐ No ☐

QA Reviewer: _____

Lot ID:

Date: _____

	Pass	*Fail*	*See Comments*	*Field Observation*	*N/A*
1) Submittal Ontime	☐	☐	☐	☐	☐
2) Submittal Complete (raw/processed data files (mapping & QC), maps, field data sheets, updated Access DB (includes QC results, target selection tables, etc.)	☐	☐	☐	☐	☐
3) Performance Requirements Results (all results documented & failures have RCAs: Static Repeatability, Along line measurement spacing, Speed, Coverage, Dynamic Detection & Positioning Repeatability, Geodetic Equipment Functionality/internal consistency/accuracy)	☐	☐	☐	☐	☐
4) Periodic Recalculation of Performance Requirements (include details in comments section)					
(a) Static Repeatability	☐	☐	☐	☐	☐
(b) Along Line Measurement Spacing	☐	☐	☐	☐	☐
(c) Speed	☐	☐	☐	☐	☐
(d) Coverage	☐	☐	☐	☐	☐
(e) Dynamic Detection Repeatability	☐	☐	☐	☐	☐
(f) Dynamic Positioning Repeatability	☐	☐	☐	☐	☐
(g) Geodetic Functionality	☐	☐	☐	☐	☐
(h) Geodetic Internal Consistency	☐	☐	☐	☐	☐
5) Review of Maps/Gridded data (Assess Potential Field) (visual check: background levelling, striping, latency, noise, in particular view seed items for dynamic detection repeatability)	☐	☐	☐	☐	☐
6) Target Selection (following selection criteria for anomaly & dig lists, each single anomaly has one unique ID, cultural features noted/not selected to dig, no gridding artifacts, reporting of anomaly characteristics accurate)	☐	☐	☐	☐	☐
7) Root Cause Analyses/Non-conformances Reported & Accepted	☐	☐	☐	☐	☐
8) Any additional field observations/QA (add notes below)	☐	☐	☐	☐	☐

Quality Assurance Comments:

Attachment D
Quality Assurance Forms

D-2 Draft DIGITAL GEOPHYSICAL MAPPING QUALITY ASSURANCE FORM *(Anomaly Resolution)*

U.S. Army Engineering & Support Center, Huntsville
Fort Jackson National Cemetery, Richland County, SC, RA

Lot ID:

Recommend Payment: Yes ☐ No ☐

QA Reviewer: _____

Date: _____

	Pass	*Fail*	*See Comments*	*Field Observation*	*N/A*
1) Submittal Ontime/Complete (updated Access Tables)	☐	☐	☐	☐	☐
2) Reacquisition Results (offset within allowable distance, reacquisition amplitude >= 80% original, No contacts with original values >x, etc.)	☐	☐	☐	☐	☐
3) Acceptance Sampling (no unresolved anomalies in sample) (post-dig amplitude < criteria or fully documented rationale)	☐	☐	☐	☐	☐
4) Root Cause Analyses/Non-conformances Reported & Accepted	☐	☐	☐	☐	☐
5) Any additional field observations/QA (add notes below)	☐	☐	☐	☐	☐

Quality Assurance Comments:

Attachment D
Quality Assurance Forms

D-3 Draft DIGITAL GEOSPATIAL DATA/ELECTRONIC SUBMITTAL QUALITY ASSURANCE FORM

U.S. Army Engineering & Support Center, Huntsville
Fort Jackson National Cemetery, Richland County, SC, RA

Recommend Payment: Yes ☐ No ☐

QA Reviewer: _____
Date: _____

Submittal Phase: (Circle One)
Recon SI RI/FS NTCRA NCRA OTHER ESS ESP

	Pass	*Fail*	*See Comments*	*Field Observation*	*N/A*
1) Submittal Ontime/Complete Submittal	☐	☐	☐	☐	☐
2) All required data submittals (feature classes and tables) provided (SDSFIE Data Checker used for features, attributes, and domains)	☐	☐	☐	☐	☐
3) All data submitted geospatially correct and projected within correct coordinate system as per Project Requirements	☐	☐	☐	☐	☐
4) Root Cause Analyses/Non-conformances Reported & Accepted (Insurance that all data sets, digital pictures, and supporting document files are supplied to completely support all finding and conclusions of the Final Report.)	☐	☐	☐	☐	☐
5) Any additional field observations/QA (add notes below)	☐	☐	☐	☐	☐

Quality Assurance Comments:

Attachment D
Quality Assurance Forms

D-4 Draft GEOSPATIAL QUALITY ASSURANCE FORM *(DATA SUBMITTAL)*

U.S. Army Engineering & Support Center, Huntsville
Fort Jackson National Cemetery, Richland County, SC, RA

Recommend Payment: Yes ☐ No ☐

QA Reviewer: _____
Date: _____

Submittal Phase: (Circle One)
Recon SI RI/FS NTCRA NCRA OTHER ESS ESP

	Pass	*Fail*	*See Comments*	*Field Observation*	*N/A*
1) Submittal Ontime	☐	☐	☐	☐	☐
2) Submittal Complete (Are all corresponding sections of the written report, conveyed within the electronic submittal CD/DVD? Ie. field data sheets, digital pictures, chemical data and analysis, GIS Feature Classes, other Report Appendices)	☐	☐	☐	☐	☐
3) Performance Requirements Results (Do all of the supplied GIS files have correct spatial reference? Is Meta Data provided for all data sets created by the Contractor? Do the supplied electronic files, match the Final written report in content and revision? Can the Final Written Report be produced in whole from the electronic submittal?)	☐	☐	☐	☐	☐
4) Geospatial Data (shape file or personal geodatabase) for GIS, MicroStation for CADD, must conform to the SDSFIE for GIS or A/E CADD Standard for CADD.					
(a) Data Format					
i. ASCII text comma delimited file (table with column headings and point data only)	☐	☐	☐	☐	☐
ii. ESRI shape file	☐	☐	☐	☐	☐
iii. ESRI Coverage	☐	☐	☐	☐	☐
iv. ESRI personal geodatabase	☐	☐	☐	☐	☐
v. ESRI SDE geodatabase	☐	☐	☐	☐	☐
vi. MicroStation/AutoCAD	☐	☐	☐	☐	☐
vii. Other (Specify Type): _____	☐	☐	☐	☐	☐
(b) Horizontal Datum:					
i. WGS 84	☐	☐	☐	☐	☐
ii. NAD 83 (Preferred)	☐	☐	☐	☐	☐
iii. NAD 27	☐	☐	☐	☐	☐
iv. Other (Specify Type): _____	☐	☐	☐	☐	☐
(c) Veritcal Datum:					
i. NAVD 88 (Preferred)	☐	☐	☐	☐	☐
ii. NAVD 29	☐	☐	☐	☐	☐
iii. Other (Specify Type): _____	☐	☐	☐	☐	☐
(d) Coordinate System/Zone:					
i. State of project Location: _____	☐	☐	☐	☐	☐
ii. State Plane Zone (ie. East, West, North, South, Number)	☐	☐	☐	☐	☐
iii. UTM Zone No. _____ Circle One: South North	☐	☐	☐	☐	☐
(e) Project:					
i. Geographic	☐	☐	☐	☐	☐
ii. Transverse Mercatur	☐	☐	☐	☐	☐
iii. Lambert Conformal Conic	☐	☐	☐	☐	☐
iv. Albers	☐	☐	☐	☐	☐
v. Other (Specify Type): _____	☐	☐	☐	☐	☐
(f) Horizontal Measure:					
i. Feet	☐	☐	☐	☐	☐
ii. Meters	☐	☐	☐	☐	☐
iii. Latitude/Longitude	☐	☐	☐	☐	☐
iv. Other (Specify Type): _____	☐	☐	☐	☐	☐
(g) Vertical Measure:					
i. Feet	☐	☐	☐	☐	☐
ii. Meters	☐	☐	☐	☐	☐
iii. Other (Specify Type): _____	☐	☐	☐	☐	☐
5) Actual Submittal Date, Contractor, Project Name, and Location, and Phase of Project, shown on CD or DVD of electronic submittal	☐	☐	☐	☐	☐

Quality Assurance Comments:

Attachment D
Quality Assurance Forms

D-5 Draft On-Site Safety/Operations QA
Project Name/Contract No: Ellsworth AFB, RW028 / W912DY-17-D-0004

Fort Jackson National Cemetery, Richland County, SC, RA
To include in part or whole, but not limited to the following checkpoints.
CHECKPOINTS:

1. Documentation Requirements	**YES**	**NO**	**N/A**	**COMMENTS**
a. Notice to Proceed from KO	☐	☐	☐	
b. Approval Letter for QAPP/SSHP	☐	☐	☐	
c. Approval Letter for UXO Personnel Identified by Name & Position	☐	☐	☐	
d. Approval Letter, FAA (If Required)	☐	☐	☐	
e. Certificate of Grounding, Lightning Protection (if Required)	☐	☐	☐	
f. Explosive Permits/License (If Required)	☐	☐	☐	
g. GFE Transfer Documentation (If Required)	☐	☐	☐	
h. Approval Letter, Public/Personnel Withdraw Distance 1 Frag in 600 sq. ft.	☐	☐	☐	
i. Dig Permits for Utilities (If Required).	☐	☐	☐	
2. Site-Specific Safety & Health Plan (SSHP)	**YES**	**NO**	**N/A**	**COMMENTS**
a. Emergency Notification List Posted & Available	☐	☐	☐	
b. Emergency Routes/Maps Available & Issued to Each Team	☐	☐	☐	
c. Work Task Identified in Hazard Analysis. Approved SSHP	☐	☐	☐	
d. MSDS(s) On-Site. Approved SSHP	☐	☐	☐	
e. Visitors/Safety Briefing Log Current and Updated	☐	☐	☐	
f. All Personnel On-Site in the Proper PPE.	☐	☐	☐	
g. Minimum of Two Personnel On-Site First Aid/CPR Trained, EM 385-1-1, Section 3, Page 19. Paragraph 03.A.02	☐	☐	☐	
h. 16-Unit First Aid Kits or Kits Approved by a Licensed Physician in the Ratio of one for every 25 persons or less. EM 385-1-1, Section 3, Page 19. Paragraph 03.A.03	☐	☐	☐	
3. Technical Management Reference DID OE-005-02.01	**YES**	**NO**	**N/A**	**COMMENTS**
a. Procedures Established for the Discovery of RCWM	☐	☐	☐	
b. Procedures Developed for Discovery of MEC Which Cannot Be Destroyed in Place	☐	☐	☐	
c. Project Grid Size, Layout, Lane Width(5' or Less) Established	☐	☐	☐	
d. Established Procedures for Chanded Site Conditions	☐	☐	☐	
e. Organizational chart Current and Indicates Assignment, Duties, Responsibilities to Include Geophysical Teams	☐	☐	☐	
f. Procedured for Reporting and Disposition of MPPEH	☐	☐	☐	
g. Procedures Established for Disposal of MEC in Populated/Sensitive Areas	☐	☐	☐	
h. Procedures Established for Managing, reporting, Venting and Disposing of MD and RRD	☐	☐	☐	
i. Additional Task and Procedures being Followed (e.g. PAO, Community Relations, Weekly & Monthly Project Status reports)	☐	☐	☐	
j. Procedured Established for Recording, reporting and implementing Lessons Learned	☐	☐	☐	
k. Limitations Posed and Ability of Detection System(s) Chosen.	☐	☐	☐	
l. Proper use of Geophysical Detections Systems used	☐	☐	☐	
4. Facilities. Reference EM 385-1-1	**YES**	**NO**	**N/A**	**COMMENTS**
a. Adequate Work Space & Facilities (Restrooms etc.)	☐	☐	☐	
b. Good Housekeeping (No Fire Hazards, Tripping Hazards etc.)	☐	☐	☐	
c. Approved and Suitable Containers for Flammable Toxic or Explosive Materials	☐	☐	☐	
d. Approved/Adequate Explosive Storage Facilities	☐	☐	☐	
e. Fire/Emergency Exits Clear & Unbarred	☐	☐	☐	
f. Personnel Limits Maintained	☐	☐	☐	
g. Site Security Adequate	☐	☐	☐	
h. Toilets. EM 385-1-1, Section 2, page 14, Paragraph 02.B Toilets.	☐	☐	☐	
i. Washing Facilities. EM 385-1-1, Section 2, Page 16. Paragraph 02.C Washing Facilities	☐	☐	☐	

5. Equipment. Reference Approved QAPP/Manufacture Operators Manual	YES	NO	N/A	COMMENTS
a. Tools Appropriate and Serviceable	☐	☐	☐	
b. Proper Personnel Protective Equipment (PPE) Present, Serviceable & Utilized	☐	☐	☐	
c. Equipment Calibrated (Last cal Date_____ Next cal Date_____)	☐	☐	☐	
d. Survey Equipment Inspected & Serviceable	☐	☐	☐	
e. Heavy Equipment Inspected & Serviceable IAW EM 385-1-1, Section 16	☐	☐	☐	
1. Are Equipped with at Least One Dry Chemical or CO2 Fire Extinguisher - Minimum rating of 5-BC - IAW EM 385-1-1, Section 16.	☐	☐	☐	
f. Two Separate Means of Communications, Radio(s)/Cell Phone, Land Line(s).	☐	☐	☐	
g. Geophysical Equipment On-Hand & Serviceable	☐	☐	☐	
6. Explosive Storage Requirements. Reference EP 1110-1-18	**YES**	**NO**	**N/A**	**COMMENTS**
a. Proper Storage Containers Type 2 Magazines conforming to standards set forth in Section 55.206 of ATFP 5400.7, ATF Explosives Law and Regulations	☐	☐	☐	
b. Placards. Each magazine will display the placards required by DOT regulations in accordance with DOD 6055.9-STD and DA Pam 385-64 for Hazard division of OE stored in the magazine.	☐	☐	☐	
c. Explosive Compatibility Groups. Segregated into the appropriate hazard divisions criteria listed in Chapter 3, DOD 6055.9-STD.	☐	☐	☐	
d. Physical Security. Contractor shall conduct and document physical security survey, the survey is to determined if fencing or guards are required.	☐	☐	☐	
e. Locks. Shall meet the standards listed in Section 55.208 (a) (4), ATFP 5400.7.	☐	☐	☐	
f. A key control system will be documented in the QAPP, EP 1110-1-18	☐	☐	☐	
g. Lightning Protection. Magazine constructed of metal that has 3/16 inch steel or longer in accordance with National Fire Protection Association (NFPA) 780.	☐	☐	☐	
h. Lightning Protection. Magazine grounded in accordance with NFPA.	☐	☐	☐	
i. Lightning Protection. Magazine is located at least 6.5 feet from the nearest fence.	☑	☐	☐	
j. Lightning Protection. BRAC, IRP and Active Installation will meet the provisions of DOD 6055.9-STD. Army installations will also meet the provisions of DA Pamphlet 385-64.	☐	☐	☐	
k. Fire Protection. Extinguishers of appropriate size (minimum 10 BC) and type will be located in all explosives storage facilities.	☐	☐	☐	
l. Explosive Limits Maintained, 100 lbs. NEW or less	☐	☐	☐	
m. Waiver. MACOM approval for storage of commercial of explosives on-site (if required).	☐	☐	☐	
7. Explosive Management Plan. Reference Approved QAPP/49 CFR	**YES**	**NO**	**N/A**	**COMMENTS**
a. Signature Authority On-Hand	☐	☐	☐	
b. Periodic Inventories Conducted On-Schedule	☐	☐	☐	
c. Accountability Records Maintained	☐	☐	☐	
d. Lost/Stolen Reporting Procedures In Place	☐	☐	☐	
e. Final Disposition Procedures Documented	☐	☐	☐	
f. Key Control/Security	☐	☐	☐	
8. Transportation of OE. Reference EP 1110-1-18, Chapter 15/49 CFR	**YES**	**NO**	**N/A**	**COMMENTS**
a. Hazardous Waste Manifest (EPA Form 8700-22) (if required)	☐	☐	☐	
b. Hazard Classification of OE IAW TB 700-2	☐	☐	☐	
c. Training of Transporting OE IAW 49 CFR, Part 172 & State Applicable State Requirements	☐	☐	☐	
d. Documented Organizational Responsibilities for Transportation of OE	☐	☐	☐	
e. Approved Transportation Plan	☐	☐	☐	
f. Pre-operational Checks of Vehicles Being Conducted	☐	☐	☐	
g. All Operators Licensed For Vehicle	☐	☐	☐	
h. Fire Fighting & First Aid Equipment On Board	☐	☐	☐	
i. Cargo Properly Segregated/Blocked And Braced and in Proper Container	☐	☐	☐	
j. Proper DOT Placards/Fire Fighting Symbols Used	☐	☐	☐	
9. UXO Operational Plan. Reference Approved QAPP & EP 1110-1-18	**YES**	**NO**	**N/A**	**COMMENTS**
a. Contractor Following Methodology Defined in QAPP	☐	☐	☐	
1. SUXO Conducted Physical Check Prior to Sweep Operations	☐	☐	☐	
2. Daily Safety Meeting Conducted by SUXO/SSHO	☐	☐	☐	
b. Geophysical Detection Magnetometer Used	☐	☐	☐	
1. Pre-Operational Checks Performed Prior to Sweep Operations	☐	☐	☐	
2. Operational Condition Annotated in Log Book	☐	☐	☐	
3. UXO Teams	☐	☐	☐	

4. Quality Control	☐	☐	☐	
5. Quality Assurance	☐	☐	☐	
c. Operational Teams Operating IAW QAPP	☐	☐	☐	
1. UXO Supervisor Conducted Physical Check Prior to Sweep Operation	☐	☐	☐	
2. Pre-Sweep Operational/Safety Brief Conducted	☐	☐	☐	
3. Individual Sweep Lanes/Transects Marked IAW QAPP	☐	☐	☐	
4. Contacts Marked & Investigated Properly	☐	☐	☐	
5. Results of Sweep Operation Recorded	☐	☐	☐	
6. All OE, Inert Items & Scrap Examined by at Least Two UXO Personnel	☐	☐	☐	
(a.) AEDA (Range Residue) IAW SOW and Properly Addressed in QAPP	☐	☐	☐	
7. All UXO's Clearly Marked	☐	☐	☐	
d. QC Operations IAW QAPP	☐	☐	☐	
e. Non-OE Scrap Being Collected (as Required)	☐	☐	☐	
f. OE Scrap Inspected/Vented/Segregated	☐	☐	☐	
g. Geophysical Test Grids Appropriate and IAW SOW	☐	☐	☐	
10. Disposal Operations Planned On-Site IAW the Approved QAPP and 60A-1-1-31/1-1-22	**YES**	**NO**	**N/A**	**COMMENTS**
a. Disposal Method IAW QAPP	☐	☐	☐	
b. Adequate Security For Disposal Operation	☐	☐	☐	
c. Disposal Notification List Available	☐	☐	☐	
d. All Necessary Notifications Made	☐	☐	☐	
e. Movement of OE Items, Or is OE Consolidation Feasible	☐	☐	☐	
f. Protective Measures/Tamping Being Used/Appropriate for OE Being Destroyed	☐	☐	☐	
g. Limits of the Exclusion Zone Established and Are All Personnel Aware of Limits	☐	☐	☐	
h. Disposal Procedures	☐	☐	☐	
1. Misfire Procedures Properly Performed (Electric)	☐	☐	☐	
2. Misfire Procedures Properly Performed (Non-Electric)	☐	☐	☐	
11. Quality Control Plan. Reference SOW/DID(s)	**YES**	**NO**	**N/A**	**COMMENTS**
a. QC Operational/Checks Being Conducted IAW QAPP	☐	☐	☐	
b. QC Grid/Transect Established IAW QAPP	☐	☐	☐	
c. Results of QC Checks Being Recorded	☐	☐	☐	
d. Pass/Fail Criteria Clearly defined IAW SOW/DID OE-005-05.01	☐	☐	☐	
12. Vegetation Removal Reference QAPP/SSHP & OSHA Req.	**YES**	**NO**	**N/A**	**COMMENTS**
a. Vegetation Removal & Localized, if Required	☐	☐	☐	
b. Equipment Operated To Prevent Impact With Possible Surface UXO	☐	☐	☐	
c. Cutting Does Not Present Impalement Hazard	☐	☐	☐	
d. UXO Personnel Monitoring Cutting Operation	☐	☐	☐	
e. UXO Discovered Marked/Handled Appropriately	☐	☐	☐	
f. Equipment Being Operated Safely & IAW Equipment Operators Manual/QAPP	☐	☐	☐	
13. OTHER	**YES**	**NO**	**N/A**	**COMMENTS**
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

Attachment D
Quality Assurance Forms

D-6 Draft CHEMISTRY QUALITY ASSURANCE FORM (DATA SUBMITTAL)

U.S. Army Engineering & Support Center, Huntsville
Fort Jackson National Cemetery, Richland County, SC, RA

Recommend Payment: Yes ☐ No ☐

QA Reviewer: _____

Lot ID:

Date: _____

	Pass	*Fail*	*See Comments*	*Field Observation*	*N/A*
1) Submittal Ontime	☐	☐	☐	☐	☐
2) Submittal Complete (Electronic Data Deliverables, Daily Quality Control Reports, ERIS Data Uploaded to Database, Data Validation Report, Chemistry related project communication)	☐	☐	☐	☐	☐
3) Daily Quality Control Reports					
a) Submittal on-time (daily during field work)	☐	☐	☐	☐	☐
b) Sampling effort in agreement with approved QAPP.	☐	☐	☐	☐	☐
c) Any deviation from approved QAPP documented	☐	☐	☐	☐	☐
d) Required attachments included (sample tables, COC, additional environmental sampling related project forms)	☐	☐	☐	☐	☐
4) Electronic Data Deliverables (Project Specific library file, DTD file, SEDD stage 2A or 2B XML file, Post-review file, Annotated error log)					
a) Library and Laboratory data correspond	☐	☐	☐	☐	☐
b) Error Reports in agreement	☐	☐	☐	☐	☐
c) Post validation files in agreement with flagged data	☐	☐	☐	☐	☐
5) ERIS Data (Data Upload accurate and complete)	☐	☐	☐	☐	☐
6) Data Validation Report					
a) Validation Report addresses all data packages	☐	☐	☐	☐	☐
b) Identifies analytical problems	☐	☐	☐	☐	☐
c) Identifies Impact on Data Usability	☐	☐	☐	☐	☐
7) Chemistry Related Project Communication (holding times/temperature exceedances, lost or damaged samples, other chemistry related issues)	☐	☐	☐	☐	☐

Quality Assurance Comments:

Attachment D
Quality Assurance Forms

D-7 Draft ANALOG GEOPHYSICS QUALITY ASSURANCE FORM *(Anomaly Resolution)*

U.S. Army Engineering & Support Center, Huntsville
Fort Jackson National Cemetery, Richland County, SC, RA

Lot ID:

Recommend Payment: Yes ☐ No ☐

QA Reviewer: _____

Date: _____

	Pass	*Fail*	*See Comments*	*Field Observation*	*N/A*
1) Submittal Ontime/Complete (updated Access Tables)	☐	☐	☐	☐	☐
3) Acceptance Sampling (no unresolved anomalies in sample) (Verification of excavated locations, DGM remapping)	☐	☐	☐	☐	☐
4) Root Cause Analyses/Non-conformances Reported & Accepted	☐	☐	☐	☐	☐
5) Any additional field observations/QA (add notes below)	☐	☐	☐	☐	☐

Quality Assurance Comments:

Attachment D
Quality Assurance Forms

D-8 Draft ANALOG GEOPHYSICS QUALITY ASSURANCE FORM *(DATA SUBMITTAL)*

U.S. Army Engineering & Support Center, Huntsville
Fort Jackson National Cemetery, Richland County, SC, RA

Recommend Payment: Yes ☐ No ☐

QA Reviewer: _____

Lot ID:

Date: _____

	Pass	*Fail*	*See Comments*	*Field Observation*	*N/A*
1) Submittals Ontime (Data submitted periodically throughout the progression of field work)	☐	☐	☐	☐	☐
2) Submittal Complete (field data sheets, updated Access DB (includes QC results, dig results, etc.))	☐	☐	☐	☐	☐
3) Performance Requirements Results (all results documented & failures have RCAs: Repeatability (Instrument Functionality), Dynamic Repeatability, Coverage, Detection & Recovery, Anomaly Resolution, Geodetic Equipment Functionality/internal consistency/accuracy)	☐	☐	☐	☐	☐
4) Periodic Recalculation of Performance Requirements (include details in comments section)					
(a) Repeatability (Instrument Functionality)	☐	☐	☐	☐	☐
(b) Dynamic Repeatability	☐	☐	☐	☐	☐
(c) Coverage	☐	☐	☐	☐	☐
(d) Detection and Recovery	☐	☐	☐	☐	☐
(e) Anomaly Resolution	☐	☐	☐	☐	☐
(f) Geodetic Equipment Functionality	☐	☐	☐	☐	☐
(g) Geodetic Accuracy	☐	☐	☐	☐	☐
5) Root Cause Analyses/Non-conformances Reported & Accepted	☐	☐	☐	☐	☐
6) Any additional field observations/QA (add notes below)	☐	☐	☐	☐	☐

Quality Assurance Comments:

Attachment D
Quality Assurance Forms

D-11 CLASSIFICATION INTRUSIVE QUALITY ASSURANCE FORM

U.S. Army Engineering & Support Center, Huntsville Recommend Payment: Yes ☐ No ☐

Fort Jackson National Cemetery, Richland County, SC, RA

QA Reviewer: _____

Lot ID: Date: _____

	Pass	*Fail*	*See Comments*	*Field Observation*	*N/A*
1) Submittal Ontime/Complete (per QAPP Table 14.1 & SOPs) (Access Tables, pictures, SOP checklists)	☐	☐	☐	☐	☐
2) Reacquisiton/Anomaly Resolution equipment functional (detectors pass IVS/function test, GPS/RTS <10cm offset from known point)	☐	☐	☐	☐	☐
3) Measurement Performance Criteria Results (QAPP WS #12 & 22)					
(a) Confirm Derived Features match ground truth (fit location for 'digs' ≤0.3m from recovered item positions)	☐	☐	☐	☐	☐
(b) Confirm Derived Features match ground truth (predicted size estimates for 'digs' qualitatively match recovered size)	☐	☐	☐	☐	☐
(c) 100% of predicted Non-TOI are Non-TOI	☐	☐	☐	☐	☐
(d) Predicted Non-TOI qualitatively match predictions (USACE-selected subset of 50)	☐	☐	☐	☐	☐
4) Root Cause Analyses/Non-conformances Reported & Accepted	☐	☐	☐	☐	☐
5) Any additional field observations/QA (add notes below)	☐	☐	☐	☐	☐

Quality Assurance Comments:

US ARMY CORPS OF ENGINEERS (USACE)
MUNITIONS RESPONSE
QUALITY ASSURANCE REPORT (QAR) FORM
The proponent agency is CESO. *See instructions on page 2.*

1. REPORT NO. *(1,2,3, etc., for the Task Order (T.O.))*
2

2. USACE REPRESENTATIVE'S NAME

3. DATE ACTIVITY COMPLETED

4. PROJECT NAME

5. PROJECT LOCATION

6. WEATHER CONDITIONS
clear / sunny

7. CONTRACTOR

8. CONTRACT NUMBER

9. T.O. NUMBER

10. DISTRIBUTED TO (*check boxes and insert individual's name*)

☐ a. District Program/Project Manager
☐ b. Design Center
☐ c. Remedial Action District TM
☐ d. Contractor

11. RESPONSE DUE DATE (*Based on type of nonconformance, IF REQUIRED)*

12. TYPE OF ACTIVITY CONDUCTED (*Include types of inspections/audits conducted, operations observed, etc.)*

13. RESULTS AND OBSERVATIONS

14. DEFICIENCY TYPE (*select one*) ☐ a. Not Applicable ☐ b. Critical ☐ c. Major ☐ d. Minor

☐ e. Other, *Specify*

15. DATE

16. USACE REPRESENTATIVE'S SIGNATURE

17. CONTRACTOR REPRESENTATIVE'S NAME

18. DATE

19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (*indicating receipt of the QAR*)

20. **The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.**

a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (*cite applicable quality control procedures or changes in plans, procedures, or practices*).

b. Contractor Representative's Authentication (*form must be signed before returning*)

(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature

c. Government Evaluation (*acceptance, partial acceptance, etc.*)

d. Government Actions (*reduced payment, cure notice, show cause, other*)

e. Close Out	Name	Title	Date (*YYYY-MM-DD*)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., “Camp Swampy (MRS-02).

Block 5. Project Location, i.e., “Smithville, Alaska”.

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: “Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS).”

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: “Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013.”

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

a. Check the appropriate box.

b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.

c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.

d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative’s signature.

Block 17. Contractor Representative’s printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative’s printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor’s actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.

Attachment E
Final Quality Assurance Report

Final Quality Assurance Report
For
Removal Action at
Fort Jackson National Cemetery Contract Number: W912DY-17-D-0004
Task Order: *W912DY19F0217*

1. Describe QA methods used (or reference where they are documented) and pass/fail criteria.

2. Summarize field QA activities performed and describe any special conditions encountered or special circumstances.

3. Describe any constraints or problems encountered.

4. Summarize data quality assurance activities performed and describe any special conditions encountered or special circumstances.

5. Provide list of all Engineering Form 6048's issued for QA failures and describe corrective actions taken.

6. List/describe lessons learned.

7. Include a final statement that contract requirements were met regarding quality of services provided.

8. Signature of Project Engineer preparing the report.

9. List supporting data/references and where they are filed.