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Addendum to the Final Quality Assurance Project Plan, Volume II, Appendix A

Munitions and Explosives of Concern Remedial Action Former Fort Ord, California

Prepared for:

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Acronyms and Abbreviations

AED	automated external defibrillator
AGC	advanced geophysical classification
Army	Department of the Army
Ahtna	Ahtna Global, LLC
ASCE	American Society of Civil Engineers
BLM	Bureau of Land Management
BRAC	Base Realignment and Closure
B.S.	Bachelor of Science
BSI	blind seed item
CAP	Corrective Action Plan
CAR	Corrective Action Request
CE	Civil Engineering
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHPPM	Center for Health Promotion and Preventative Medicine
cm	centimeter
CORS	Continuously Operating Reference Station
CPR	cardiopulmonary resuscitation
CQCS	Contractor Quality Control Supervisor
CQM	Construction Quality Management
CRLF	California red-legged frog
CSM	conceptual site model
CTS	California tiger salamander
DFW	Definable Feature of Work
DGM	digital geophysical mapping
DMM	discarded military munitions
DoD	United States Department of Defense
DOT	United States Department of Transportation
DQI	data quality indicator
DQO	data quality objective
EM	Engineer Manual
EOD	Explosive Ordnance Disposal
ESS	Explosives Safety Submission
FADL	Field Activity Daily Log
FCA	function check area
FFO	Former Ford Ord
FODIS	Fort Ord Data Integration System

FP	Follow-up phase
FS	Feasibility Study
FTP	File Transfer Protocol
FUDS	Formerly Used Defense Site
GIS	geographic information system
GPS	Global Positioning System
GSV	geophysical system verification
HARN	High Accuracy Ference Network
Hazmat	hazardous materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HHRA	human health risk assessment
HMP	Habitat Management Plan
HTW	hazardous and toxic waste
IDQTF	Intergovernmental Data Quality Task Force
IP	Initial Phase
IRP	Installation Restoration Program
ISO	industry standard object
IVS	instrument verification strip
LUC	Land Use Control
LUST	leaking underground storage tank
M.A.	Master of Arts
MD	munitions debris
MDAS	material documented as safe
MEC	munitions and explosives of concern
mm	millimeter
MMRP	Military Munitions Response Program
MPC	Measurement Performance Criteria
MPPEH	Material Potentially Presenting an Explosive Hazard
MRA	Munitions Response Area
MR-QAPP	Munitions Response Quality Assurance Project Plan
MRS	Munitions Response Site
M.S.	Master of Science
NA	not applicable
OESS	Ordnance Explosives Safety Specialist
O&M	operations and maintenance
OPUS	Online Positioning User Service
OPSEC	Operational Security

OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PP	Preparatory Phase
PPE	personal protective equipment
PWS	Performance Work Statement
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RA	Remedial Action
RCA	root cause analysis
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RRD	range-related debris
RTK	real-time kinematic
SLAM	Simultaneous Localization and Mapping
SOP	standard operating procedure
SSDM	Site-Specific Data Manager
SSWP	Site-Specific Work Plan
SUXOS	Senior Unexploded Ordnance Supervisor
TBD	to be determined
USACE	United States Army Corps of Engineers
USATCES	United States Army Technical Center for Explosives Safety
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer

EXECUTIVE SUMMARY

This document is an Addendum to the *Final Quality Assurance Project Plan (QAPP), Former Fort Ord, California, Volume II, Appendix A*, *Munitions and Explosives of Concern (MEC) Remedial Action* (referred to as the MEC QAPP; Kemron Environmental Services [KEMRON], 2016); this addendum is herein referred to as the MEC QAPP Addendum. This document has been prepared for the United States Department of the Army (Army), Fort Ord Base Realignment and Closure (BRAC), under a contract with the United States Army Corps of Engineers (USACE) number W9123824D0002 in support of the continuation of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial actions at the former Fort Ord, Monterey, California. This MEC QAPP Addendum addresses changes to the MEC QAPP Worksheets that apply to the Munitions and Explosives of Concern (MEC) remedial actions within the Impact Area Munitions Response Area (MRA) and the Bureau of Land Management (BLM) Area B.

The contents of this MEC QAPP addendum are in accordance with the requirements Formerly Used Defense Sites (FUDS) Interim Guidance Document – Engineer Manual (EM) 200-1-15 Technical Guidance for Military Munitions Response Actions (USACE, 2024) with deviations agreed upon by the BRAC Office and USACE. The EM 200-1-15 has undergone several revisions since the MEC QAPP (KEMRON, 2016) was finalized. The 2024 EM 200-1-15 includes Munitions Response Quality Assurance Project Plan (MR-QAPP) Toolkits to assist project teams to characterize and to remediate munitions response sites (MRSs) and states that the toolkits are not templates. The Intergovernmental Data Quality Task Force (IDQTF) *Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP), Munitions Response QAPP Toolkit, Module 2: Remedial Action* (MR-QAPP Toolkit Module 2; IDQTF, 2023) provides suggested tables for MEC remedial actions. The MR-QAPP Toolkit Module 2 provides a crosswalk showing that the Optimized UFP-QAPP Worksheets used in the MEC QAPP (KEMRON, 2016) and this MEC QAPP Addendum are consistent with the MR-QAPP Toolkit Module 2 worksheets. In addition, EM 200-1-15 (USACE, 2024) provides updated minimum performance criteria for MEC remedial actions. Ahtna evaluated the updated performance criteria and found that the project specific performance criteria established in the MEC QAPP (KEMRON, 2016) are appropriate to meet project specific data quality objectives therefore performance criteria were not revised.

MEC remedial actions in the Impact Area MRA are being conducted in accordance with the *Final Record of Decision* [ROD], *Impact Area Munitions Response Area, Track 3 Munitions Response Site* (Track 3 ROD; Army, 2008), the *Final Work Plan, Remedial Design (RD)/Remedial Action (RA), Track 3 Impact Area Munitions Response Ara (MRA), Munitions and Explosives of Concern (MEC) Removal* (Track 3 RD/RA Work Plan; USACE, 2009), and the *Remedial Design (RD)/Remedial Action (RA), Work Plan Update, Track 3 Impact Area Munitions Response Area (MRA) Munitions and Explosives of Concern (MEC) Removal* (Track 3 RD/RA Work Plan Update; KEMRON, 2018). MEC remedial actions in BLM Area B are being conducted in accordance with the *Final Record of Decision, Track 2, Bureau of Land Management Area B and Munitions Response Site 16* (Track 2 ROD; Army, 2017) and the *Final Work Plan, Remedial Design (RD)/Remedial Action (RA), Track 2 Bureau of Land Management Area B and Munitions Response Site 16* (Track 2 RD/RA Work Plan; KEMRON, 2017a). This MEC QAPP Addendum identifies the current project personnel, organizational structure, emergency contacts, forms and checklists, and standard operating procedures (SOPs). Ahtna Global, LLC, (Ahtna) will follow the MEC QAPP (KEMRON, 2016) supplemented by the updates contained in this MEC QAPP Addendum. This document is intended for use by field operators, supervisors, data managers, and other technical experts responsible for implementing and coordinating remedial action field activities conducted within BLM Area B and the Impact Area MRA.

The organizational structure shown on Figure 1-1 is applicable to the project organization discussed throughout this document. The points of contact listed in Attachment D are the appropriate contacts for the planned Impact Area MRA and BLM Area B remedial actions.

The Data Quality Objectives (DQOs) identified in the MEC QAPP (KEMRON, 2016) establishing the performance and acceptance criteria remain applicable to the MEC remedial actions to be conducted within the Impact Area MRA and BLM Area B. Procedures and personnel involved with data collection, transfer, analysis, verification, validation, and storage of field data have evolved since the publication of the MEC QAPP (KEMRON, 2016). Personnel involved with the performance of these activities in accordance with this MEC QAPP Addendum are shown on Figure 1-1.

This MEC QAPP Addendum in conjunction with the MEC QAPP (KERMRON, 2016) describes the planning, implementation, acquisition, and assessment of data using effective methodologies and thorough quality control (QC) activities that Ahtna will use during MEC remedial actions at the former Fort Ord, California. This MEC QAPP Addendum, in conjunction with the MEC QAPP (KEMRON, 2016) also includes information for data management data analysis and QC activities in support of the MEC response actions. All personnel involved in data collection, transfer, analysis, verification, validation, and storage activities will coordinate with the BRAC GIS Specialist/Military Munitions Response Program (MMRP) Database Administrator to ensure data quality and project objectives are met.

The MEC QAPP (KEMRON, 2016) continues to support past and future work at the former Fort Ord. Table 1 lists the MEC QAPP Addendum Worksheet updates.

Table 1 – MEC QAPP Worksheet Updates

MEC QAPP Section	MEC QAPP Addendum Section	QAPP Worksheet Update
Section 1.1 Title and Approval Page	Section 1.1 Title and Approval Page	QAPP Worksheets #1 and #2 Title and Approval Page updated with current MEC remedial actions
Plans and Reports from Previous Investigations Relevant to this Project	Section 1.1	Lists reports relevant to this project
Section 1.2 Project Organization and QAPP Distribution	Section 1.2 Project Organization and QAPP Distribution	QAPP Worksheets #3 and #5 Figure 1-1 Project Organization and QAPP Distribution chart updated with current MEC remedial action personnel
Section 1.3 Personnel Qualifications and Sign-off Sheet	Section 1.3 Personnel Qualifications and Sign-off Sheet	QAPP Worksheets #4, #7, and #8 Personnel Qualifications and Sign-off Sheet updated with current MEC remedial action personnel listed by supporting organization

MEC QAPP Section	MEC QAPP Addendum Section	QAPP Worksheet Update
Section 1.4 Communication Pathways	Section 1.4 Communication Pathways	QAPP Worksheet #6 updated with current MEC remedial action roles and personnel.
Section 1.5 Project Planning Session Summary	NA	No update to QAPP Worksheet #9.
Section 2.1 Conceptual Site Model	Section 2.1 Conceptual Site Model	QAPP Worksheet #10 updated Impact Area MRA and BLM Area B Background Information and inclusion of BLM Area B Potential Receptors and Exposure Pathways.
Section 2.2 Data Quality Objectives	Section 2.2 Data Quality Objectives	QAPP Worksheet #11 updated Impact Area MRA and BLM Area B Units that have undergone remedial action since the publication of the MEC QAPP (KEMRON, 2016).
Section 2.3 Measurement Performance Criteria	Section 2.3 Measurement Performance Criteria	QAPP Worksheet #12 updated to revise DFW: “MMRP Data Management (Post Migration)” “KEMRON DB” to a generic field database and DFW: “DGM Using a Person-Portable System” to include SLAM Positioning System. The MEC QAPP (KEMRON, 2016) Worksheet #12 remains applicable.
Section 2.4 Secondary Data Uses and Limitations Table	NA	No update to QAPP Worksheet #13.
Section 2.5 Project Tasks and Schedule	Section 2.5 Project Tasks and Schedule	QAPP Worksheets #14 and #16 updated to include references to Ahtna’s SOPs, provided as Attachment B of this MEC QAPP Addendum and revising DFW: DGM Using a Person-Portable System to include the use of the SLAM Positioning System. The MEC QAPP (KEMRON, 2016) Worksheets #14 and 16 remain applicable.
Section 2.6 Project Action Limits and Laboratory-Specific Limits	NA	QAPP Worksheet #15 is not applicable to surface or subsurface MEC removal or DGM.
Section 3.1 MEC Investigation Design and Rationale	3.1 MEC Investigation Design and Rationale	QAPP Worksheet #17 updated to include Track 3 RD/RA Work Plan

MEC QAPP Section	MEC QAPP Addendum Section	QAPP Worksheet Update
		Update, Track 2 ROD, Track 2 RD/RA Work Plan, and Ahtna's SOPs provided in this MEC QAPP Addendum.
Section 4.1 Sample Containers, Preservation, and Holding Times	NA	QAPP Worksheets #19 and #30 are not applicable to surface or subsurface MEC removal or DGM.
Section 4.2 Field Quality-Control Summary	4.2 Field Quality Control Summary	QAPP Worksheet #20 updated the DGM Data Collection Matrix to include the "Person-Portable DGM Survey using SLAM" Procedure; Sample Population Applicable to QC Inspection; Minimum number of BSIs; and Size of QC Sample. The MEC QAPP (KEMRON, 2016) Worksheets #14 and #16 remain applicable.
Section 4.3 Field SOPs/Methods	Section 4.3 Field SOPs/Methods	QAPP Worksheet #21 updated to current MEC remedial action contractor/subcontractor and SOPs. The MEC QAPP (KEMRON, 2016) Worksheet #21 remains applicable.
Section 4.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Table	Section 4.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Table	QAPP Worksheet #22 updated to current MEC remedial action field equipment calibration, maintenance, testing and inspections. The MEC QAPP (KEMRON, 2016) Worksheet #22 remains applicable.
Section 5.0	NA	QAPP Worksheets #23, #24, #25, #26, #27, and #28 are not applicable to surface or subsurface MEC removal or DGM.
Section 6.1 Project Documents and Records Table	Section 6.1 Project Documents and Records Table	QAPP Worksheet #29 updated to current MEC remedial action contractor/subcontractor project documents and records. The MEC QAPP (KEMRON, 2016) Worksheet #29 remains applicable.
Section 6.2 Assessments and Corrective Action	Section 6.2 Assessments and Corrective Action	QAPP Worksheet #31, #32, and #33 updated to current MEC remedial action contractors/subcontractor assessment and corrective action

MEC QAPP Section	MEC QAPP Addendum Section	QAPP Worksheet Update
		processes. The MEC QAPP (KEMRON, 2016) Worksheets #31, #32 and #33 remain applicable.
Section 6.3 Data Verification and Validation Inputs	NA	No update to QAPP Worksheet #34. Ahtna will utilize the SOPs provided as Attachment B of this MEC QAPP Addendum. SOP numbering and content provided in Attachment B of this MEC QAPP Addendum are consistent with SOPs included in the MEC QAPP (KERMRON, 2016).
Section 6.4 Data Verification Procedures	Section 6.2 Data Verification Procedures	QAPP Worksheet #35 updated to current MEC remedial action contractor/subcontractor data verification process. The MEC QAPP (KEMRON, 2016) Worksheet #35 remains applicable.
Section 6.5 Data Validation Procedures	Section 6.5 Validation Procedures	QAPP Worksheet #36 updated to current MEC remedial action contractor/subcontractor data validation procedures. The MEC QAPP (KEMRON, 2016) Worksheet #36 remains applicable.
Section 6.6 Data Usability Assessment	Section 6.6 Data Usability Assessment	QAPP Worksheet #37 updated to current MEC remedial action contractor/subcontractor data usability assessment procedures. The MEC QAPP (KEMRON, 2016) Worksheet # 37 remains applicable.
Attachment A Blind Seed Firewall Plan	Attachment A Blind Seed Firewall Plan	Attachment A updated to current MEC remedial action contractor/subcontractor.
Attachment B SOPs	Attachment B SOPs	Attachment B updated to current MEC remedial action contractor/subcontractor SOPs. SOP numbering and content provided in Attachment B of this MEC QAPP Addendum are consistent with SOPs included in the MEC QAPP (KERMRON, 2016). Ahtna will utilize the SOPs provided in this MEC QAPP Addendum.

MEC QAPP Section	MEC QAPP Addendum Section	QAPP Worksheet Update
Attachment C Forms	Attachment C Forms	Attachment C updated to current MEC remedial action contractor/subcontractor forms. Form numbering and content provided in Attachment C of this MEC QAPP Addendum are consistent with Forms included in the MEC QAPP (KEMRON, 2016). Ahtna will utilize the Forms provided in this MEC QAPP Addendum.
Attachment D Points of Contact	Attachment D Points of Contact	Attachment D updated to current Emergecy Services/Agency and Other Agencies Point of Contact and Telephone Numbers.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

1.0 Project Management

This section serves as an update to QAPP Worksheets #1 and 2; Figure 1-1 Organizational Structure; Worksheets #3 and #5; Worksheets #4, #7, and #8; and Worksheet #6 associated with this project. The MEC QAPP (KEMRON, 2016) remains applicable.

1.1 Title and Approval Page (QAPP Worksheets #1 and #2)

Site Name	Impact Area MRA and BLM Area B MEC Remedial Action Units
Site Location	Former Fort Ord, California
Document Title	Addendum to Final Quality Assurance Project Plan, Volume II, Appendix A, Munitions and Explosives of Concern Remedial Action, Former Fort Ord, California
USACE Contract Number	W9123824D0002

Remedial Action Organization

Author Signature

_____________________________________ ___________
Noel Handley Date
Ahtna Global, LLC Site Project Manager

Review Signatures

_____________________________________ ___________
Linda Temple Date
Ahtna Global, LLC MMRP Project Manager

_____________________________________ ___________
Bruce Moe Date
Ahtna Global, LLC Senior Unexploded
Ordnance Supervisor

Contracting Organization

_____________________________________ ___________
MC Kellett Date
USACE Senior Program Manager

The table below summarizes the plans and reports in addition to previous investigations listed in the MEC QAPP (KEMRON, 2016) relevant to this project.

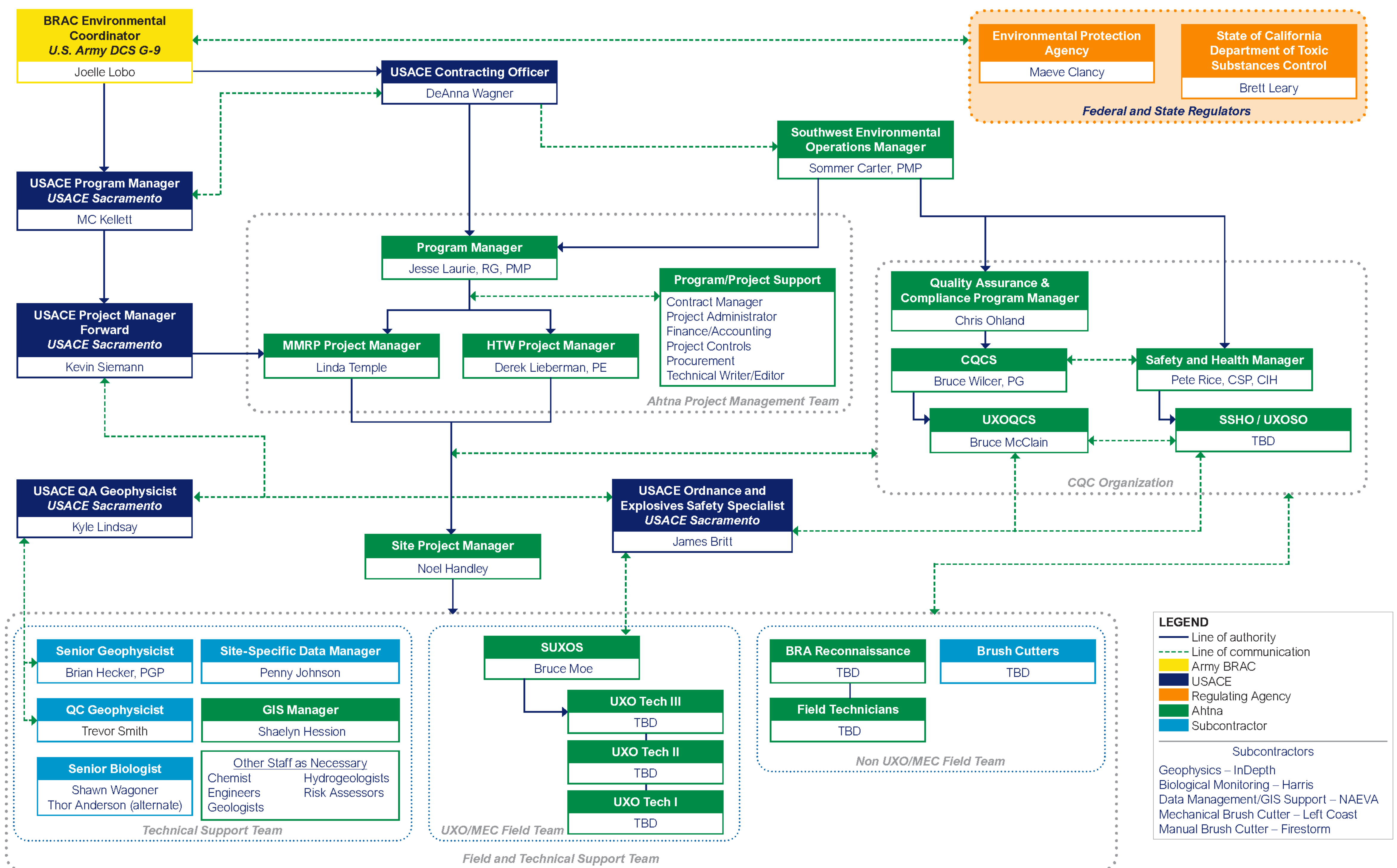
Title	Company / Organization	Plan / Report Year	Fort Ord Cleanup Document Library, Document Number
Remedial Design (RD)/Remedial Action (RA), Work Plan Update, Track 3 Impact Area Munitions Response Area (MRA) Munitions and Explosives of Concern (MEC) Removal	KEMRON	2018	OE-0929B
Final After Action Report 100 Percent Grid Sampling, Inland Range Contract, Former Fort Ord, California	USA Environmental, Inc.	2000	OE-0287A
Draft Final MOUT Site Buffer, Munitions and Explosives of Concern, Remedial Action Technical Information Paper	ITSI Gilbane	2014	OE-0801A
Final (Revised) Remedial Action Completion Report, Site 39 Inland Ranges Habitat Reserve, Former Fort Ord, California	ITSI Gilbane	Updated 2014	RI-047C
After Action Report, Time Critical Removal Action, and Military Munitions Reconnaissance, Eucalyptus Fire Area, Fort Ord, California	Shaw	2005	OE-0499G
Draft Final Volume 1 Technical Information Paper, Fuel Breaks, Impact Area Munitions Response Area, Former Fort Ord, California	KEMRON	2021	OE-0985B
Munitions and Explosives of Concern, Area Monitoring Reports, Fort Ord California, 2009	Army	2009	OE-0847
Munitions and Explosives of Concern, Track 3 Area Monitoring Reports, Former Fort Ord California, 2010	Army	2010	OE-0847A
Final Track 3 Surface Removal Area Munitions and Explosives of Concern, Monitoring Reports, Former Fort Ord, California, 2011	Army	2011	OE-0847B
Munitions and Explosives of Concern, Track 3 Surface Area Monitoring Reports, Former Fort Ord California, 2012	Army	2012	OE-0847C
Munitions and Explosives of Concern, Track 3 Surface Area Monitoring Reports, Former Fort Ord California, 2013	Army	2013	OE-0847D
Munitions and Explosives of Concern, Track 3 Surface Area Monitoring Reports, Former Fort Ord California, 2014	Army	2014	OE-0847E

Title	Company / Organization	Plan / Report Year	Fort Ord Cleanup Document Library, Document Number
Munitions and Explosives of Concern, Track 3 Surface Area Monitoring Reports, Former Fort Ord California, 2015	Army	2016	OE-0847F
Munitions and Explosives of Concern, Track 3 Surface Area Monitoring Reports, Former Fort Ord California, 2016	KEMRON	2017	OE-0847G
Munitions and Explosives of Concern, Track 3 Surface Area Monitoring Reports, Former Fort Ord California, 2017	KEMRON	2017	OE-0847H
Munitions and Explosives of Concern, Track 3 Surface Area Monitoring Reports, Former Fort Ord California, 2018	KEMRON	2019	OE-0847I
Munitions and Explosives of Concern, Track 3 Surface Area Monitoring Reports, Former Fort Ord California, 2019	KEMRON	2020	OE-0847J.5
Final Field Evaluation Work Plan, Munitions Response, MRS-BLM Units 13 17, and 20, Former Fort Ord, California	KEMRON	2017	OE-0891B
Technical Memorandum, Phase I Field Evaluation, MRS-BLM Units 13/17/20, Former Fort Ord, California	KEMRON	2017	OE-0909A
Field Evaluation Report, Munitions Response MRS-BLM Unites 13/17/20	KEMRON	2019	OE-0956A
MRS-BLM Unit 31 MEC Remedial Action Technical Information Paper, Former Fort Ord, California	KEMRON	2020	OE-0975A
Final, Revision 2, Track 2 Remedial Investigation/Feasibility Study, BLM Area B and MRS-16.	Gilbane	2015	OE-0802D
Final Record of Decision, Track 2, Bureau of Land Management Area B and Munitions Response Site 16, Former Fort Ord, California.	Army	2017	OE-0897
BLM Area B Track 2 Ponds, Geophysical Anomaly Investigation, Technical Information Paper.	KERMON	2020	OE-0966B
Bureau of Land Management Area B, Unit A, Munitions and Explosives of Concern Remedial Action, Technical Information Paper	KEMRON	2020	OE-0974A
BLM area B, Remedial Action Report (2019-2019), Former Fort Ord, California	KEMRON	2020	OE-0982A

These documents provide background information on the MEC-related investigations and removal activities conducted in both the Impact Area MRA and BLM Area B.

1.2 Project Organization and Distribution (QAPP Worksheets #3 and #5)

Figure 1-1 Project Organization Chart



1.3 Personnel Qualifications and Sign-Off Sheet (QAPP Worksheets #4, #7, and #8)

Name	Project Title/Role	Education/Experience	Specialized Training	Signature/Date
Ahtna Global, LLC				
Bruce Wilcer	CQCS	M.S., Geology B.S., Geology 39+ years of professional experience in environmental investigation and remediation programs for government/DoD, state, and commercial clients; eight years of experience with QA/QC for USACE environmental investigation and remediation projects leveraging technical expertise in drilling methods; well design, construction, and abandonment; geophysical logging and interpretation techniques; construction and operation of groundwater and soil remediation systems; UST investigations; air, vadose zone, and groundwater monitoring	USACE CQM for Contractors; 40-Hour HAZWOPER and current 8-Hour HAZWOPER Refresher; Supervisory Hazardous Substances/Waste Health and Safety; Materials Handling; Confined Spaces; Anti-Terrorism Level 1; OPSEC Training; OSHA 30-Hour Construction Safety; EM-385-1-1 8-Hour for Construction; DOT Hazmat Employee	
Jesse Laurie	Program Manager	B.S., Geology Eight years directing performance-based MMRP projects for USACE ranging from $200K to $10M that included all CERCLA phases for MEC across 11 MRAs and 26 MRSs in CA, AZ, and NM; 24 years of environmental project experience (14 years of project management/program management experience) with all phases of RCRA/CERCLA investigation, remediation, removal,	40-Hour HAZWOPER and 8-Hour Refresher; Confined Spaces OSHA; 30-Hour Construction Safety; Slope Stability and Stabilization Methods (ASCE); CE Contract Law (USACE Prospect); FUDS Program and Policy (USACE Prospect), FUDS MMRP (USACE Prospect), Military Project Management (USACE Prospect), USACE CQM	

Name	Project Title/Role	Education/Experience	Specialized Training	Signature/Date
		corrective/preventative action, restoration, and short- and long-term O&M of HTW-contaminated media at FUDS/IRP/BRAC/LUST sites in CA, AZ, NV, NM, and WA		
Linda Temple	MMRP Project Manager	B.S., Mechanical Engineering 25 years of experience managing munitions-related projects including 12 years as Project/Technical Manager for the Fort Ord Reuse Authority munitions response on FFO	MMRP project engineering and project management training provided by the USACE Huntsville USATCES while working as a Senior Planner in the Fort Ord BRAC Environmental Office, including multiple USACE Huntsville trainings, USATCES Land Disposal Site Plan (renamed ESS) development training, USATCES 40-hour conventional munitions training, and HTW training including environmental law and groundwater investigation and remediation; USACE CQM for Contractors; MMRP QAPP for Remedial Investigation and Removal Actions; 40-hour HAZWOPER; Visual Sampling Plan; 32-Hours Project Management Professional; CPR and AED	
Derek Lieberman	HTW Project Manager	M.A., Science Technology and Public Policy M.S., Environmental Management B.S., Geological Engineering	40-hour HAZWOPER and current refresher; OSHA 30-hour Construction Safety; DOT Hazmat Employee; OSHA	

Name	Project Title/Role	Education/Experience	Specialized Training	Signature/Date
		32 years of PWS-related experience, including environmental investigation/remediation services spanning the entire CERCLA process, including PA/SI, RI/FS with HHRA and CSM development, Proposed Plan/Decision Document/ RD/RA, Five-Year Review, Site Closeout, and property transfer; experience includes managing and performing environmental investigations, studies, and remedial actions that address a variety of contaminants, including emerging contaminants, in soil, soil gas, surface water, groundwater, and air	COVID-19 Training; Bloodborne Pathogens for Construction; Supervisory Hazardous Substances/Waste Health and Safety; Health and Safety Training and Field Experience for Hazardous Materials Operations; U.S. Army CHPPM Advanced Health Risk Communication Training; Confined Spaces; USACE CQM for Contractors	
Pete Rice	Safety and Health Manager	M.S., Environmental and Occupational Health and Safety B.S., Environmental Health and Biology 40 years of experience in developing, implementing, and supervising environmental and occupational safety and industrial hygiene programs for environmental investigation and remediation projects. Responsible for developing, maintaining, and overseeing the implementation of the APP/SSHP. modifications to the APP/SSHP if needed.	40-hour HAZWOPER and current refresher; OSHA 10 and OSHA 30 Authorized Instructor; USACE 40 Hour 385-1-1 “Construction Hazard Awareness Safety Training”; Certified Industrial Hygienist, American Board of Industrial Hygiene; Registered Environmental Health Specialist – California; Certified Safety Professional, Board of Certified Safety Professionals; California Community College Instructor Credential in Public Services and Administration;	

Name	Project Title/Role	Education/Experience	Specialized Training	Signature/Date
			Behavior Based Safety – Loss Prevention Systems Construction Quality Control Certification	
Noel Handley	Site Project Manager	20 years of experience supporting DoD MMRP and HTW environmental projects at installations across the United States, including FFO; experienced in project management support and technical expertise in document management, data management, QA/QC, health and safety development and implementation, proposal administration, costing, budget, client and program coordination, operations management, field oversight, client relations, and community support	40-hour HAZWOPER and current refresher	
Bruce Moe	SUXOS	Graduate, Basic EOD/UXO School (1984) 39 years of experience in military EOD and civilian UXO including various civilian UXO roles (i.e., SUXOS, UXOSO, UXOQCS, UXO Tech III, and UXO Tech II)	USACE CQM Certified #1065; 40-hour HAZWOPER and current refresher; 30-hour Construction Safety; 8-hour Supervisor; 10-hour Construction Safety	
Bruce McClain	UXOQCS	Graduate, Naval EOD School, Indian Head, Maryland (1982) 39 years of experience in military EOD and civilian UXO including various civilian UXO roles (i.e., SUXOS, UXOSO, UXOQCS, UXO Tech III, and UXO Tech II)	USACE CQM; OSHA 40-Hour HAZWOPER and current refresher; OSHA 8-Hour Site Supervisor; OSHA 30-Hour Construction Site Safety	
TBD	UXOSO	TBD	TBD	

Name	Project Title/Role	Education/Experience	Specialized Training	Signature/Date
Shaelyn Hession	GIS Manager	M.S., Coastal and Watershed Science and Policy B.S., Environmental Science Technology and Policy 10 years of experience in government and private-sector environmental consulting and remediation, including MMRP. Experience includes data analysis, technical writing and GIS.	40-Hour HAZWOPER; 8-Hour HAZWOPER Refresher; 30-Hour OSHA Construction Safety and Health; 8-Hour HAZWOPER Site Supervisor Hazardous Materials and Waste Transportation (DOT); First Aid/CPR; GIS/GPS Certification	
NAEVA Geophysics, Inc.				
Penny Johnson	SSDM	B.S., Geology 24 years of MMRP geophysics experience 20 years of database management experience on MMRP projects	OSHA 40-Hour HAZWOPER and current refresher Senior Geologist DBA/Microsoft Access/VBA, SQL; field Forms Design/Admin/Geosoft/VSP	
InDepth Corporation				
Brian Hecker	Senior Geophysicist	M.S., Geology B.S., Geology 34 years of experience in geophysics, 22 years of experience in munitions response geophysics, and eight years of experience in AGC geophysics; expertise in munitions response geophysical data acquisition, processing, and QC for sensors including EM61- MK2 data, MetalMapper, MetalMapper 2x2, UltraTEM Classifier, UltraTEM Screener,	40-Hour OSHA HAZWOPER and current refresher; 8-Hour OSHA Site Supervisor Training; Oasis Montaj DoD UXO QA/QC Systems; Oasis Montaj DoD UX-Analyze Process Training; Practical Magnetometer Surveying/Interpretation; Principles/Techniques of Underground Utility Location	

Name	Project Title/Role	Education/Experience	Specialized Training	Signature/Date
		MPV, TEMTADS 2x2, G-858 magnetometer data, and EM31		
Trevor Smith	QC Geophysicist	M.S., Geophysics B.S., Geophysics Six years of geophysical data acquisition, processing and interpretation; experience in surface geophysical methods including magnetics and electromagnetics for MEC, UXO, and environmental applications	40-Hour OSHA HAZWOPER and current refresher; Oasis Montaj, UX-Analyze Training; Oasis Montaj; UXO-Land Training; Black Tusk Geophysics; BTField Acquisition and Processing Training; MR-QAPP Toolkit 1 & 2 Training	
Harris Environmental Group, Inc.				
Shawn Wagoner	Senior Biologist	B.S., Biology – California State University Monterey Bay Certificate in Field Ornithology – University of California Riverside 12 years of experience specializing in reconnaissance and focused wildlife surveys, biological assessments, compliance monitoring, permitting, onsite worker training, habitat restoration, and reporting. 12 years performing biological monitoring at FFO. Authorized by USFWS to conduct surveys and handle the federally listed California Tiger Salamander and other special status species on FFO.	40-hour OSHA HAZWOPER and current refresher; 8-hour HAZWOPER Supervisor Training; OSHA 30-hour Outreach Training for the Construction Industry; Rare Pond Species Survey Techniques Workshop, Laguna de Santa Rosa Foundation; California Tiger Salamander Terrestrial Ecology Workshop, Laguna de Santa Rosa Foundation; California Tiger Salamander Ecology Workshop, Elkhorn Coastal Training Program; California Red-legged Frog Levels I & II Workshops, The Wildlife Project; Master-level Foothill Yellow-legged Frog Ecology Workshop,	

Name	Project Title/Role	Education/Experience	Specialized Training	Signature/Date
			Elkhorn Coastal Training Program USFWS-approved to independently survey, monitor, handle, and relocate California tiger salamander (CTS) and California red-legged frog (CRLF) on various projects.	
Thor Anderson	Alternate Senior Biologist	M.S., Watershed and Coastal Science and Policy – California State University Monterey Bay B.S., Earth Systems Science and Policy – California State University Monterey Bay Basic Wetland Delineation Certification (2015) – The Wetland Training Institute 23 years of experience conducting habitat restoration, biological assessments, landscape ecology, wildlife research, water quality monitoring, regulatory agency permitting, and environmental compliance for a wide variety of projects in California and specifically at FFO. 12 years performing biological monitoring at FFO. Authorized by USFWS to conduct surveys and handle the federally listed California Tiger Salamander and other special status species on FFO.	24-hour OSHA HAZWOPER certification and current 8-hour refresher; 40-hour OSHA HAZWOPER certification and current 8-hour refresher; 8-Hour OSHA HAZWOPER Supervisor Initial Training certification; CPR AED and First Aid with bi-annual refreshers Rare Pond Species Survey Techniques Workshop, Laguna de Santa Rosa Foundation; California Tiger Salamander Terrestrial Ecology Workshop, Laguna de Santa Rosa Foundation; California Red-legged Frog Level II Workshop, The Wildlife Project; Master-level Foothill Yellow-legged Frog Ecology Workshop, Elkhorn Coastal Training Program USFWS-approved to independently survey, monitor,	

Name	Project Title/Role	Education/Experience	Specialized Training	Signature/Date
			handle, and relocate CTS and CRLF on various projects.	

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

1.4 Communications Pathways (QAPP Worksheet #6)

Communication Drivers	Organization	Name	Procedure (Timing, Pathways, Documentation, etc.)
Regulatory agency interface	USACE	Kevin Siemann	The USACE Project Manager Forward provides routine project updates to the BRAC Office, BRAC Cleanup Team, and stakeholders as appropriate.
Progress reports	Ahtna NAEVA	Linda Temple Penny Johnson	The Ahtna MMRP Project Manager emails weekly progress reports to the USACE Program Manager and Fort Ord BRAC Office. The SSDM delivers daily progress reports (update maps) to the USACE Project Manager Forward for distribution to the Fort Ord BRAC Office while field activities are ongoing.
Stop work due to safety	Ahtna	UXOSO (TBD)	The UXOSO informs the MMRP Project Manager, Site Project Manager and Safety and Health Manager of critical safety issues and develops a report. The USACE OESS and USACE Project Manager Forward are informed of the issue and receive the report. Anyone can stop work if they observe an unsafe act or unsafe condition.
Emergencies and Unexpected Events	Ahtna	UXOSO (TBD)	The UXOSO informs the MMRP Project Manager, Site Project Manager and Safety and Health Manager of emergencies and unexpected events and develops a report. The USACE OESS and USACE Project Manager Forward are informed of the issue and receive the report.
MEC QAPP and work plan variances during project execution	Ahtna	Noel Handley	The Site Project Manager submits the MEC QAPP and work plan variance to the MMRP Project Manager for review and approval within 72 hours of the required change being identified. The Site Project Manager will submit the variance to the USACE Project Manager Forward for Fort Ord BRAC Office coordination and review. The variance will be approved by USACE Project Manager Forward following coordination with the Fort Ord BRAC Office. Signed variances will be provided to the Fort Ord BRAC Office, regulatory

Communication Drivers	Organization	Name	Procedure (Timing, Pathways, Documentation, etc.)
			agencies, and interested stakeholders, regardless of whether the change is procedural or material.
Field Corrective Actions	Ahtna InDepth	Bruce McClain Trevor Smith	The UXOQCS and QC Geophysicist (as applicable) prepare an RCA, a CAR, and a CAP. Forms are provided to the CQCS for review and approval. The CQCS then provides forms to the USACE Project Manager Forward for review and approval.
EM61MK2 data and anomaly selection	InDepth	Trevor Smith	The QC Geophysicist reviews DGM data and anomalies generated by an InDepth data processer and provides the data/target list to the USACE QA Geophysicist for review and approval.
Blind Seeding	Ahtna InDepth	Bruce McClain Trevor Smith	The UXOQCS and QC Geophysicist communicate directly with the USACE QA Geophysicist and USACE OESS regarding blind seeding information in accordance with the Blind Seed Firewall Plan (Attachment A to this MEC QAPP Addendum).
QC variances	Ahtna InDepth	Bruce McClain Trevor Smith	The UXOQCS and QC Geophysicist prepare (as applicable) an RCA, a CAR, and a CAP. Forms are provided to the USACE QA Geophysicist, USACE OESS, and USACE Project Manager Forward for review and approval.
Data verification Issues (e.g., incomplete records)	InDepth	Trevor Smith	The QC Geophysicist prepares (as applicable) an RCA, a CAR, and a CAP. Forms are provided to the USACE QA Geophysicist, USACE OESS, and USACE Project Manager Forward for review and approval.
DGM data review corrective actions	InDepth	Trevor Smith	The QC Geophysicist prepares (as applicable) an RCA, a CAR, and a CAP. Forms are provided to USACE QA Geophysicist, USACE OESS, and USACE Project Manager Forward for review and approval.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

PROJECT MEETINGS

Project meetings will be held on an as-needed basis to discuss planning, scheduling, and logistics and may include operational discussions as they relate to project decisions, deliverables, quality-control issues or concerns, corrective actions, and data presentation to support decision making. Meeting attendees will be based on the topics of discussion and may include subject matter experts. Project meeting agendas will be developed based on topics of discussion and meeting minutes will be generated by Ahtna.

2.0 Project Quality Objectives

This section serves as an update to the MEC QAPP Section 2.1 Conceptual Site Model (QAPP Worksheet #10), Section 2.2 Data Quality Objectives (QAPP Worksheet #11), Section 2.3 Measurement Performance Criteria (QAPP Worksheet #12), and Section 2.5 Project Tasks and Schedule (QAPP Worksheets #14, and #16.

2.1 Conceptual Site Model (QAPP Worksheet #10)

Background Information

The former Fort Ord is adjacent to Monterey Bay in northwestern Monterey County, California, approximately 80 miles south of San Francisco (Figure 2-1). The former Army post consists of approximately 28,000 acres adjacent to the cities of Seaside, Sand City, Monterey, and Del Rey Oaks to the south and Marina to the north. Laguna Seca Recreation Area and Toro Regional Park border the former Fort Ord to the south and southeast, respectively. Land use east of the former Fort Ord is primarily agricultural.

The military conducted munitions-related activities (e.g., live-fire training) on the facility and as a result, MEC including unexploded ordnance (UXO) and discarded military munitions (DMM) may be present in parts of the former Fort Ord. The Track 3 ROD (Army, 2008) addresses MEC that are known or suspected to be present in the Impact Area MRA. The Impact Area MRA is undeveloped, contains several rare, threatened, and endangered species, and is designated as a habitat reserve. The Impact Area MRA is part of the Fort Ord National Monument and will be managed by BLM once the remedial actions are completed. The Impact Area MRA is a complex of numerous former military ranges (Figure 2-2) with a variety of historical uses, designs, and characteristics. The selected remedy includes vegetation clearance (including prescribed burns); technology-aided surface MEC remediation; digital geophysical surveys; subsurface MEC removal in selected areas; and Land Use Controls (LUCs).

As described in the *Memorandum for Record – Minor change to the Selected Remedy, Fort Ord Track 3 Impact Area Munitions Response Area* (Army, 2011), in locations where prescribed burning cannot be accomplished safely, the vegetation will be cut. Vegetation cutting required to establish containment lines for prescribed burns and to conduct MEC removals has been coordinated with the United States Fish and Wildlife Services (USFWS) (USFWS, 2017). A Prescribed Burn Evaluation of the Impossible Canyon Complex was completed in March 2018 as part of the *Field Evaluation Report Munitions Response MRS-BLM Units 13/17/20* (KEMRON, 2019). The evaluation presented the feasibility of conducting prescribed burns in the Impossible Canyon Complex. Topography, wind behavior, fire behavior, proximity to homes/structures, and prescribed burn equipment resources were evaluated to determine the feasibility of safely conducting prescribed burns within the Impossible Canyon Complex. The evaluation recommended that prescribed burning not be performed in Units 13/17/20 due to a combination of topography, wind, and fire behavior. Based on the feasibility of conducting prescribed burns in Units located in the eastern portion of the Impact Area MRA the Army requested formal consultation with the USFWS (Army, 2018) to address changes to affect the Army cleanup actions described in the *Reinitiation of Formal Consultation for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord* (Programmatic Biological Opinion [PBO]) (USFWS, 2017*).* USFWS concurred with the recommendation of not conducting prescribed burning in a follow-up letter, *Changes to Vegetation Clearance*

Activities Under the Programmatic Biological Opinion for Cleanup and Property Transfer Action Conducted at Former Fort Ord, Monterey County, California (USFWS, 2019) that constitutes an amendment to the 2017 PBO. Access to the Impact Area MRA is currently restricted to authorized personnel only. Remedial action activities have been ongoing in the Impact Area MRA since 2008.

The MEC remedial action is complete in the Track 3 ROD Impact Area MRA Units 1, 2, 3, 4, 5A, 6, 7, 9, 10, 11, 12, 14, 14A, 15, 18, 19, 21, 22, 23, 25, 28, 32, 33, and 34; Watkins Gate Burn Area; and Ranges 43–48 South. MEC remedial action field work is complete for Unit 5. The MRS BLM Unit 5 Remedial Action Report is in progress. Subsurface MEC removals in the regularly maintained fuel breaks and access roads, and 100 foot buffers along the habitat-development border have been completed. The Impact Area MRA Non-Burn Fuelbreaks Remedial Action Report is in progress. Remedial action is incomplete in Units 13, 17, 20, and 31.

BLM Area B is undeveloped, contains several rare, threatened and endangered species, and is designated as a habitat reserve. BLM Area B is a part of the Fort Ord National Monument and is currently open to public recreation. The Track 2 ROD for BLM Area B and MRS-16 (Army, 2017) selected *Technology-Aided Surface MEC Removal, with Subsurface Removal in Selected Areas, and LUCs* for approximately 800 acres of the area (sub-areas B-2A and B-3), and LUCs for the other portions of the site. The two remedial action sub-areas, B-2A and B-3, were divided into seven remedial work area units in the *Final Site-specific Work Plan Munitions and Explosives of Concern Remedial Action BLM Area B* (KEMRON, 2017b). The seven remedial work area units include the following:

- Unit A
- Unit B
- Unit B-2A
- Unit B-3E
- Unit B-3E-NE
- Unit B-3W
- Unit C

The MEC remedial action is complete in Track 2 ROD BLM Area B Units B, B-2A, B-3E, B-3E-NE, B-3W, and C. Subsurface MEC removals in portions of BLM Area to address the risk associated with specific reuse, such as planned or existing fuel breaks, proposed or existing trails in the BLM trail network, and BLM Area B vernal ponds have been completed (KEMRON, 2020b). Remedial action is incomplete in BLM Area B Unit A.

Source of Known or Suspected MEC

Since 1917 portions of the former Fort Ord were used by cavalry, field artillery, and infantry units for maneuvers, target ranges, and other purposes. From 1947 to 1974, Fort Ord was a basic training center. After 1975, the 7th Infantry Division occupied Fort Ord. Fort Ord was selected in 1991 for decommissioning, but troop reallocation was not completed until 1993, and the base was not officially closed until September 1994.

The purpose of this document is to provide standard procedures and methodologies for conducting munitions response field work at the former Fort Ord. More detailed information is included in previous documents such as *Draft Final Literature Review Report, Ordnance and Explosives Remedial Investigation/Feasibility Study,* *Former Fort Ord, California* (Harding Lawson Associates, 2000). The paragraphs that follow provide information regarding the Impact Area MRA and BLM Area B.

The Impact Area MRA is a complex of numerous former military ranges with a variety of historical uses, designs, and characteristics (Figure 2-2). Various types of munitions have been used during the training activities historically conducted within the Impact Area MRA including artillery and mortar projectiles, rockets and guided missiles, rifle and hand grenades, practice land mines, pyrotechnics, bombs, and demolition materials. Select ranges were used for small arms training activities only, while other ranges are characterized as multiuse. In general, the firing points of the ranges were located near the perimeter of the MRA, and firing was directed toward the interior portion of the range complex. Training activities at the Impact Area MRA ceased after the closure of Fort Ord in 1994. The Impact Area MRA is fenced, warning signs are posted, and access is controlled by the Army.

BLM Area B is generally located north-northeast of the Impact Area MRA (Figure 2-1) and is comprised of eight different sub-areas based on historic training uses and the quality, types, and depth of previous munitions responses conducted in the respective areas. Investigations and MEC removal actions performed to date have identified historical use of BLM Area B and MRS-16 for various close combat and weapons training purposes, including use of machine gun, hand grenade, rifle grenade, smoke grenade, flares, 2.36 inch rocket, 37mm projectile and mortars (60mm, 81mm, 3 inch Stokes, and 4.2 inch).

For each unit (or a group of units) where remedial action will be performed, a Site-Specific Work Plan (SSWP) will be developed. The SSWP will describe the current understanding of the nature and extent of MEC based on available information such as the military training history and data from previous munitions responses.

Fate and Transport Considerations for MEC

The fate and transport of MEC items within the Impact Area MRA and BLM Area B is governed by various physical factors/transport processes. Natural erosion of soil over time (wind, water, etc.) can result in the exposure (or reburial) and transport of MEC.

Potential Receptors and Exposure Pathways

Impact Area MRA

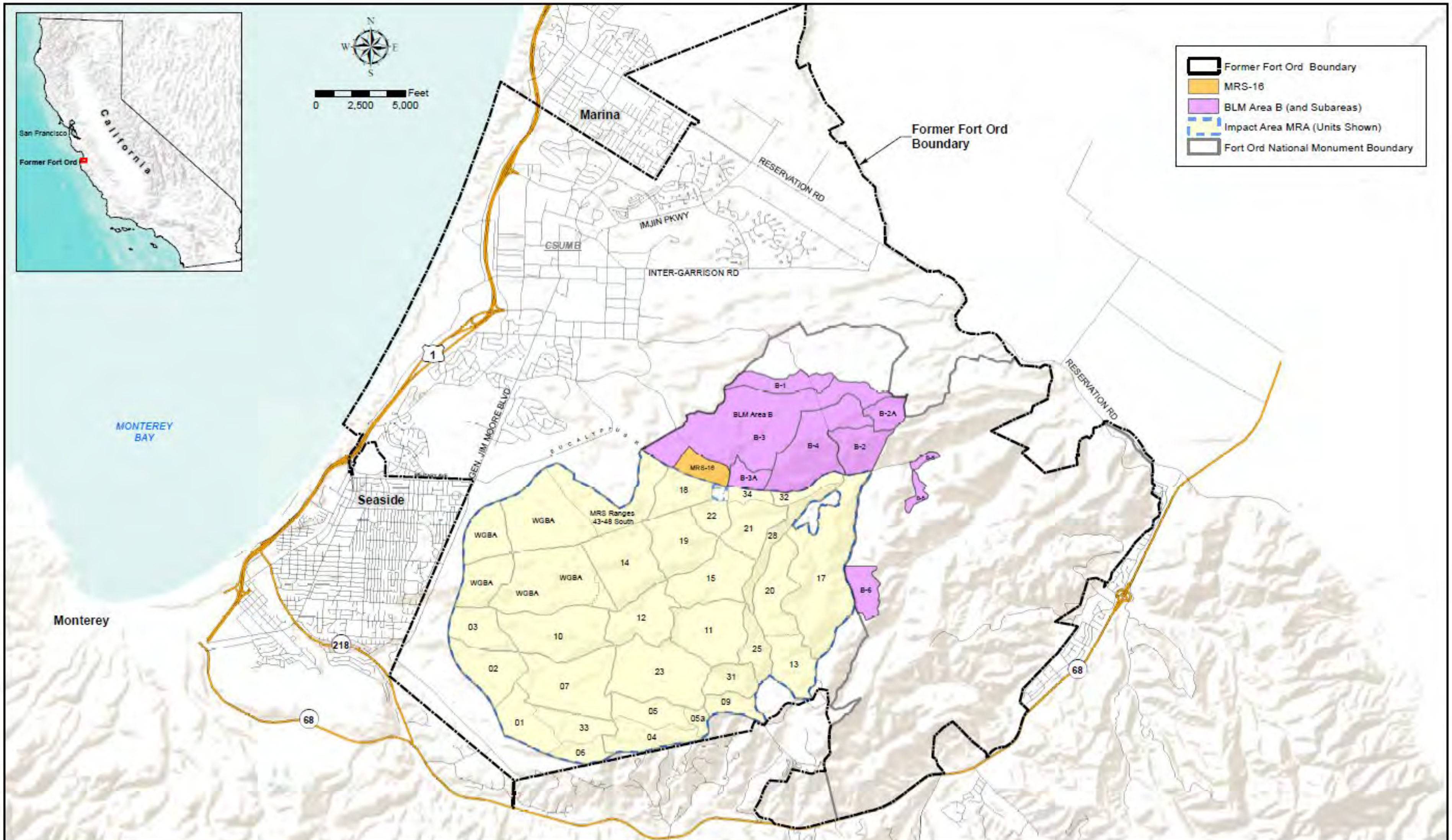
The Track 3 site, known as the Impact Area MRA, consists of the 6,560-acre portion of the 8,000-acre historical Impact Area that is entirely within the natural resources management area described in the *Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California* (HMP; USACE, 1997), and is currently identified for transfer to the BLM. The Impact Area MRA is currently being used as a habitat for endangered species.

Based on the historical range uses, various types of munitions items are expected on the surface and subsurface within the Impact Area MRA. The potential future receptors for this area include firefighters performing prescribed burns, habitat monitors, habitat workers, and visitors that could encounter MEC within the Impact Area MRA. In accordance with the Track 3 ROD (signed in 2008), remedial actions have been conducted in several units within the Impact Area MRA and will continue to be implemented. The Track 3 ROD remedy also includes LUCs to manage residual risks during the long-term reuse.

BLM Area B

The portion of the BLM Area B where the Track 2 ROD (signed 2017) required MEC removals (sub-areas B-2A and B-3) is approximately 792 acres and is located north of the Impact Area MRA. BLM Area B is designated as habitat reserve under the *Installation-Wide Multispecies Habitat Management Plan for former Fort Ord* (USACE, 1997) and is currently either transferred or designated for transfer to BLM and is currently open to public recreation.

Based on historical training use, there is the potential for various types of munitions items to remain on the surface and subsurface with portions the BLM Area B. The potential future receptors include recreational users, firefighters performing prescribed burns, habitat monitors, and habitat workers that could encounter MEC with BLM Area B. In accordance with the Track 2 ROD (Army, 2017), MEC remedial actions have been conducted in BLM Area B Units B, B-2A, B-3E, B-3E-NE, B-3W, and C, and the roads (KEMRON, 2020b). Completion of the MEC remedial action in Unit A is pending. The Track 2 ROD remedy also includes land use controls to manage residual risks during the long-term reuse.



Ahtna	**Munitions and Explosives of Concern** **Quality Assurance Project Plan** Former Fort Ord Monterey County, California	**Figure 2-1** Site Locations

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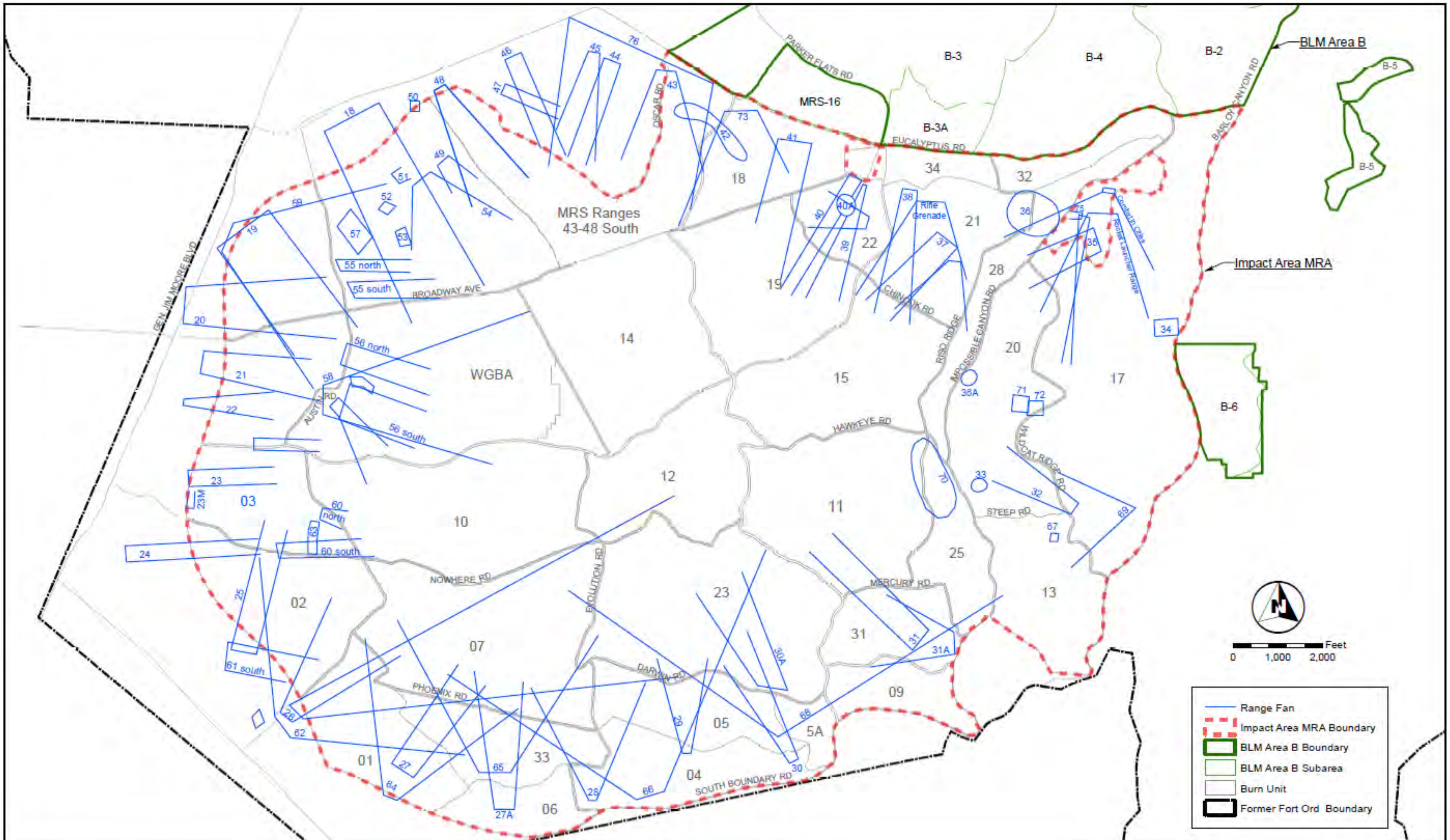

Ahtna

Munitions and Explosives of Concern
Quality Assurance Project Plan
Former Fort Ord
Monterey County, California

Figure 2-2
Impact Area Ranges

2.2 Data Quality Objectives (QAPP Worksheet #11)

DQOs have been developed based on the conceptual site model for potential contact with MEC described in Section 2.1 of this MEC QAPP Addendum.

As defined by the United States Environmental Protection Agency (USEPA) (USEPA, 2006), DQOs are most commonly used during the planning stages of any study that requires data collection. DQOs define the goals of the investigation, guide data collection, and formalize agreements on when data collection is complete, what will be done with the data, and what decisions will be made from the data. In environmental data collection projects, the goal of the DQO process is to obtain high quality and valid data to support environmental decisions. This goal can be achieved through systematic planning and strict adherence to QA/QC measures. The DQO process is a seven-step iterative process designed to ensure that data collection is resource effective, while meeting the objectives of the study. The DQO process consists of the seven steps below.

- Step 1: State the problem
- Step 2: Identify the goal of the study
- Step 3: Identify information inputs
- Step 4: Define the boundaries of the study
- Step 5: Develop the analytical approach (Decision rules)
- Step 6: Specify performance or acceptance criteria
- Step 7: Develop the plan for obtaining data

For the MEC remedial actions that are to be performed in the Impact Area MRA and BLM Area B, the seven step DQO process is described in detail for each of the three DQOs below. The three DQOs are:

- DQO #1: Technology-Aided Surface MEC Removal
- DQO #2: Digital Geophysical Mapping (DGM) Survey
- DQO #3: Subsurface MEC Removal in Selected Areas

<u>Impact Area MRA (Track 3 ROD and Track 3 RD/RA Work Plan Update)</u>

The Track 3 ROD and Track 3 RD/RA Workplan Update (Army, 2008 and KEMRON, 2018; respectively) identify the types of areas where additional work (e.g. subsurface MEC removal) would be conducted to include the following:

- Regularly maintained fuel breaks and access roads
- 100 foot wide buffers along the habitat-development border
- Other areas to address specific risk and/or land use needs, such as future habitat restoration sites

The regularly maintained fuel breaks are identified in the *Final Site-Specific Work Plan, Munitions and Explosives of Concern Remedial Action, Non-Burn Areas, Former Fort Ord, California* (Shaw Environmental, Inc., 2010). Subsurface removals in the 100 foot buffers have been completed (Letter from BRAC to USEPA, Region IX, 12/17/15 [Army, 2015]). The third type of areas can be identified through the Technical Memorandum process; once surface MEC removal and DGM are conducted, the data is reviewed, and BLM is consulted to identify specific areas that may warrant additional work. The identified areas are then evaluated using the four criteria described in the Track 3 ROD.

When evaluating whether additional removal is recommended, the Army will consider, among other factors:

- Explosive hazards associated with MEC so far recovered
- The proximity to potential receptors
- The density of MEC recovered
- Consistency with ARARs (e.g., HMP and Biological Opinions)

Examples of the third type of areas include "areas where there are high density of anomalies associated with impact areas where military munitions with sensitive fuzes (40-millimeter [mm] grenade high explosive or 40mm practice projectiles M382 series or M407 series [or any other 40mm practice series projectiles containing enough explosives to rupture the projectile]) were fired" (page 3 of the Track 3 ROD [Army, 2008]). These areas are candidates for subsurface removal utilizing excavation and sifting because the standard approach of detection and investigation of intrusive anomalies might not be conducted efficiently. Large-scale excavation requires careful evaluation before such a decision is made.

The Army conducted a field study to further evaluate approaches and options to address areas with a high density of anomalies and where UXO of the type containing sensitive fuzes are recovered. The field study was designed to provide more information about how areas/grids where sensitively fuzed items are recovered during surface removal could be approached. The *Field Study Report, Munitions with Sensitive Fuzes Field Study, Impact Area Munitions Response Area* (KEMRON, 2020a) demonstrated the capability of the advanced classification approach for the identification of subsurface MEC, specifically those with sensitive fuzes, in areas with anomaly densities of approximately 2,900 anomalies per acre or lower. In areas of subsurface anomaly density greater than 2,900 anomalies per acre, the advanced classification approach can still be useful in planning and conducting successful MEC remediation depending on project objectives. The project team must consider the efficiency of the classification approach and the potential reduction in required intrusive investigation when determining the use of advanced electromagnetic induction sensors and advanced geophysical classification approach for the identification of subsurface anomalies.

BLM Area B (Track 2 ROD and Track 2 RD/RA Work Plan)

The Track 2 ROD (Army, 2017) describes the subsurface removal will be conducted in portions of the remedial action area (e.g., proposed roads, fuel breaks, trails, and habitat restoration sites) to reduce the risk to allow for their proposed reuse needs.

The Army will review the data from the surface removal and DGM and submit a Technical Memorandum to the regulatory agencies. The Technical Memorandum will provide an evaluation of the work completed to date and, if necessary, recommend subsurface removals based on the results of the evaluation. Factors that will be considered when determining whether additional remedial actions are necessary include:

- The types and amounts of MEC recovered during the technology-aided surface removal
- Reasonably anticipated or known reuse activities that will occur

If the Army does not recommend additional remedial actions, it will document the recommendation and its rationale in the Technical Memorandum.

The DQOs described below are consistent with the MEC QAPP (KEMRON, 2016) and apply to Ahtna's MEC remedial actions in the Impact Area MRA and BLM Area B. They do not address advanced geophysical classification or excavation and sifting.

2.2.1 DQO #1: Technology Aided Surface MEC Removal

Step 1: State the Problem

- Technology-aided surface MEC removal operations are to be completed.

Step 2: Identify the Goals of the Study

- To complete technology-aided surface MEC removal and demonstrate with data, documentation, and QC program that the operation was adequately completed.

Step 3: Identify Information Inputs

- Data for technology-aided surface MEC removal operations are collected on a grid by grid basis. Grids are 100 foot by 100 foot in size; however, grids of various sizes are expected due to their location in relation to planned Unit boundaries. The grid system is based on the Fort Ord Master Grid System.
- Data related to vegetation and/or terrain that could affect the conduct of the operation.
- QC documentation of technology-aided surface MEC removal operations (to include blind seed item [BSI] information and QC inspection results).
- Field data related to MEC items that are located and the amount of recovered munitions debris (MD) and range-related debris (RRD) items on a grid by grid basis by weight (lbs).

Step 4: Define the Boundaries of the Study

- The spatial boundaries of the Impact Area MRA, as shown on Figure 2-1 above, comprise the MEC remedial action boundaries of the Track 3 ROD. The special boundaries of BLAM Area B Sub Areas B-2A and B-3 comprise the MEC remedial action boundaries of the Track 2 ROD.
- Identify and record location of inaccessible areas (i.e. areas with standing water, structures, areas with extreme terrain, etc.) that could preclude the safe conduct of vegetation clearance and technology-aided surface MEC removal.
- The vertical extent of the technology-aided surface MEC removal is the ground surface.

Step 5: Develop the Analytical Approach (Decision Rules)

- If the technology-aided surface MEC removal operations identify discrete metallic objects on the ground surface, then the UXO Team will investigate the discrete metallic objects to determine their nature (i.e., MEC, MPPEH, MD, RRD, other).
- If the UXO Team identifies an object that requires detonation (i.e. MEC, MPPEH), a description of the item and its location will be recorded by the Team Leader, and the item will be managed in accordance with this MEC QAPP Addendum, Attachment B, UXO SOP 5 (MEC and MPPEH Management).

- If the technology-aided surface MEC removal operations identify MD and/or RRD on the ground surface (other than MEC and/or MPPEH), then the UXO Team will record the total weight (lbs) of the MD and/or RRD that are removed on a grid by grid basis and this data is provided to the Site-Specific Data Manager (SSDM) daily.
- If the MD is identified as being related to munitions with sensitive fuzes, then the types (if able to be ascertained) and total weight (lbs) of items related to munitions with sensitive fuzes will be digitally recorded by the Team Leader on a grid by grid basis and this data is to be provided to the SSDM daily.
- Inaccessible areas will be documented and evaluated for appropriate risk management measures to support long-term use.

Step 6: Specify Performance or Acceptance Criteria

Worksheet #12 of this MEC QAPP Addendum provides the Measurement Performance Criteria (MPCs) to be used for acceptance of the data that is to be used in decision making. QC activities, including blind seeding, will ensure that measurement errors are managed effectively.

Step 7: Develop the Plan for Obtaining Data (Optimize the Design)

Areas designated for technology-aided surface MEC removal will be 100 percent investigated unless inaccessible (i.e., areas with standing water, structures, areas with extreme terrain, etc.). Areas in which surface removal cannot be conducted will be documented. Data for technology-aided surface MEC removal operations are to be digitally recorded by the Team Leader and are provided to the SSDM daily. Data is to include the type and location of MEC found during the technology-aided surface MEC removal operation. This data is to include the weight (lbs) of metallic objects (MD and RRD) that have been removed and information related to the type (if able to be ascertained) and total weight of munitions with sensitive fuzes located on a per-grid basis. Data to be recorded for technology-aided surface MEC removal operations is described in this MEC QAPP Addendum, Attachment B, UXO SOP 2 (Technology-Aided Surface MEC Removal). A QC program, including blind seeding, will be implemented to demonstrate compliance with this MEC QAPP and successful completion of the surface removal requirements.

2.2.2 DQO #2: DGM

Step 1: State the Problem

DGM operations are to be completed following technology-aided surface MEC removal operations to provide a record of anomalies to assist future property users in identifying areas where explosives safety support may be required for ground disturbing or intrusive activities. DGM data may also be used to support subsurface removal in selected areas.

Step 2: Identify the Goals of the Study

- The goals of the study are to:
  - Perform DGM operations where DGM operations have not been previously conducted.
  - Provide a record of subsurface anomalies for BLM
  - Provide anomaly density information
  - Support subsurface removal in select areas where DGM operations have been completed.

- o Demonstrate with data, documentation, and the QC program, that the operation was adequately completed.

Step 3: Identify Information Inputs

- DGM area classification (Category A or Category B). DGM surveys will be categorized as either Category A or Category B. Category A DGM surveys will be conducted in areas where future subsurface removal actions (based on the DGM data) are planned. Subsurface removal requires the most precise level of DGM data, and Category A DGM therefore has the most stringent MQOs. The objective of Category B DGM surveys is to obtain DGM data of sufficient quality to characterize the site for overall anomaly distribution and density. Category B DGM is not intended to support subsurface MEC removal and therefore requires less stringent MQOs. Differences in the MPCs between these two categories are described in Worksheet #12 of this MEC QAPP Addendum.
- Data for DGM operations on a DGM dataset and/or grid by grid basis.
- Data related to vegetation density and/or terrain that could affect the conduct of operation.
- QC documentation of DGM operations (to include instrument verification strip [IVS] and BSI information, and QC inspection results).

Step 4: Define the Boundaries of the Study

- The spatial boundaries of the Impact Area MRA, as shown on Figure 2-1 above, comprise the MEC remedial action boundaries of the Track 3 ROD. The special boundaries of BLAM Area B Sub Areas B-2A and B-3 comprise the MEC remedial action boundaries of the Track 2 ROD.
- Identify and record location of inaccessible areas (i.e. areas with standing water, structures, areas with extreme terrain, etc.) that could preclude the safe conduct of DGM operations.
- The vertical extent of the DGM operation is dependent on the depth of detection of the EM61MK2 instrument which varies depending on a variety of factors including size, shape, wall thickness, metallic composition, and depth of the metallic object that is under the ground surface.

Step 5: Develop the Analytical Approach (Decision Rules)

- If a unit/area/grid is designated for future intrusive investigation the area is classified as a DGM Category A area.
- If a unit/area/grid is not designated for future intrusive investigation the area is classified as a DGM Category B area.
- For Category A areas, if an anomaly is found to be above the target threshold of 14.0 millivolt (or as specified in the SSWP) using the sum of all four EM61MK2 channels, then the anomaly is to be classified as a target.[1]
- For Category B areas, a target threshold of 14.0 millivolt (or as specified in the SSWP) using the sum of all four EM61MK2 channels, will be used to generate millivolt contour maps.[1]

[1] The target threshold is based on the geophysical prove-out that was conducted by Shaw Environmental at MRS-16 (Shaw, 2007. [OE-0601F]).

- If a Category A DGM survey area contains inaccessible areas that do not allow for the collection of DGM data (e.g. standing water, topography, vegetation, etc.), then an alternative approach will be used (e.g., analog subsurface removal).
- If a Category B DGM area contains inaccessible areas that do not allow for the collection of DGM data (e.g. standing water, topography, vegetation, etc.), then the area will be documented.

Step 6: Specify Performance or Acceptance Criteria

Worksheet #12 of this MEC QAPP Addendum provides the MPCs to be used for acceptance of the data that is to be used in decision making. QC activities, including blind seeding, will ensure that measurement errors are managed effectively.

Step 7: Develop the Plan for Obtaining Data (Optimize the Design)

Areas that are to have DGM operations will be designated as either Category A or Category B in coordination with the BRAC Office and USACE, with each Category meeting their individual MQOs that are described in this MEC QAPP Addendum Worksheet #12. DGM operations are to follow procedures described in this MEC QAPP Addendum, Attachment B GEO SOP 3 (DGM using a Person- Portable System) and GEO SOP 4 (DGM Using a Towed Array System). Data for DGM operations are to be provided to the SSDM daily. DGM data is to be processed according to this MEC QAPP Addendum, Attachment B GEO SOP 5 (DGM Data Processing using a Person-Portable System) and GEO SOP 6 (DGM Data Processing Using a Towed Array System). Once the data is processed, Category A DGM data is used to generate DGM maps, and target lists for the intrusive investigation team. Category B data is used to characterize the site for overall anomaly distribution and density through the generation of maps that show the millivolt responses in a color contour format. These DGM contour maps will be developed to assist in the Army's decision process to conduct subsurface MEC removals and provide BLM with a record of anomalies to assist in land management. A QC program, including blind seeding, will be implemented to demonstrate compliance with this MEC QAPP Addendum and successful completion of the DGM requirements.

2.2.3 DQO #3: Subsurface MEC Removal in Selected Areas

Step 1: State the Problem

Identify the types of areas where additional work (e.g. subsurface MEC removal) would be conducted. These types of areas are:

- Designated fuel breaks and access roads
- Other areas to address specific risk and/or land use needs, such as future habitat restoration sites

These areas are to be identified in the SSWP and/or the Technical Memorandum that will be developed after the completion of instrument-aided surface MEC removal and DGM in a unit. Complete subsurface removal in selected areas as identified in the SSWP and Technical Memorandum.

Step 2: Identify the Goals of the Study

- To perform subsurface MEC removal in the selected areas; and demonstrate with data, documentation, and QC program that the operation was adequately completed.

Step 3: Identify Information Inputs

- Data for intrusive investigations are collected on a grid by grid basis. Grids are 100 foot by 100 foot in size; however, grids of various sizes are expected due to their location in relation to planned unit boundaries. The grid system is based on the Fort Ord Master Grid System.
- Data related to terrain that could affect the conduct of the operation.
- QC documentation of subsurface MEC removal operations (to include BSI information and QC inspection results).
- For the subsurface MEC removal operation using DGM targets, field data related to MEC, MD, and RRD that is recovered is to be recorded on a per anomaly basis and is to be provided to the SSDM daily. For subsurface MEC removal using analog methods, field data related to individual MEC items is recorded. The weight (lbs) of MD and RRD is to be recorded on a per grid basis. This data is provided to the SSDM daily.

Step 4: Define the Boundaries of the Study

- The spatial boundaries of the Impact Area MRA, as shown on Figure 2-1 above, comprise the MEC remedial action boundaries of the Track 3 ROD. The special boundaries of BLAM Area B Sub Areas B-2A and B-3 comprise the MEC remedial action boundaries of the Track 2 ROD.
- Identify and record location of inaccessible areas (i.e. areas with standing water, structures, areas with extreme terrain, etc.) that could preclude the safe conduct of subsurface MEC removal operations.
- The vertical extent of the subsurface MEC removal is from the ground surface to depths determined in the SSWP based on the military munitions used, the depth to which these types of munitions would penetrate or be found, the planned reuse of the specific areas, and the capabilities of the geophysical detection equipment selected for use.

Step 5: Develop the Analytical Approach (Decision Rules)

- If the DGM-based method is selected (as described in DQO #2 – Step 5 – Bullet #3), and if the DGM operation identifies subsurface DGM anomalies, then the intrusive team will investigate the DGM anomalies to determine their nature. Intrusive data for each DGM anomaly will be recorded by the Team Leader and provided to the SSDM daily.
- If an analog intrusive investigation is selected (as described in DQO #2 – Step 5 – Bullet #5), and if the analog intrusive investigation team identifies subsurface anomalies, then the analog intrusive team will investigate the anomalies to determine their nature. MEC and/or MPPEH items that are identified as part of the subsurface MEC removal operation that require detonation will have their data recorded on an individual basis by the Team Leader as described in this MEC QAPP Addendum, Attachment B UXO SOP 5 (MEC and MPPEH Management); with the data being provided to the SSDM daily.
- Inaccessible areas will be documented and evaluated for appropriate risk management measures to support long-term reuse.
- If an alternative method of subsurface removal is selected (e.g., advanced geophysical classification, excavation, and sifting), a SSWP will be developed.

Step 6: Specify Performance or Acceptance Criteria

Worksheet #12 of this MEC QAPP Addendum provides the MPCs to be used for acceptance of the data that is to be used in decision making. QC activities, including blind seeding, ensure that measurement errors are managed effectively.

Step 7: Develop the Plan for Obtaining Data (Optimize the Design)

Areas designated for intrusive investigation will be investigated. Data for intrusive investigation operations are to be digitally recorded by the Team Leader and are provided to the SSDM daily. Data to be recorded for intrusive investigation operations are described in this MEC QAPP Addendum, Attachment B UXO SOP 3 (Intrusive Investigation Using Analog Methods) and UXO SOP 4 (Intrusive Investigation of DGM Targets). A QC program, including blind seeding, will be implemented to demonstrate compliance with this MEC QAPP Addendum and successful completion of the subsurface MEC removal requirements.

2.3 Measurement Performance Criteria (QAPP Worksheet #12)

The tables below identify the data quality indicators (DQIs), QC sample and/or activity to be inspected, MPCs, and QC sample frequency that will be used to assess measurement performance for every Definable Feature of Work (DFW) associated with this the project. The MEC QAPP (KEMRON, 2016) Worksheet #12 remains applicable.

The list below contains a list of all the DFWs for the MEC remedial actions that are to be completed at the former Fort Ord under this MEC QAPP Addendum.

- Field Data Management
- GIS Data Management
- MMRP Data Management (Post Migration)
- Field Documentation
- Environmental Protection
- Grid and Border Survey
- Vegetation Removal
- IVS Installation and Use
- BSI Installation
- DGM using a Person-Portable System
- DGM using a Towed Array System
- DGM Data Processing for a Person-Portable System
- DGM Data Processing for a Towed Array System
- DGM Target Reacquisition using a Person-Portable System
- DGM Data Transfer to BRAC
- QC of Geophysical Operations
- Function Check Area (FCA) Installation and Use
- Technology-Aided Surface MEC Removal
- Intrusive Investigation Using Analog Methods
- Intrusive Investigation of DGM Targets
- Sifting Operations
- MEC and MPPEH Management
- Demolition of MEC and MPPEH

- Explosives Management
- Explosives Siting
- Exclusion Zones
- QC of MEC and Explosives Related Operations

DFW: Field Data Management

Procedures for Field Data Management operations are located in Attachment B (DATA SOP 1) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Field Data	Completeness/ Accuracy	QC inspection of field data management	• Daily geophysical / positional data are collected and stored in a data logger (for PP DGM) or laptop (for towed array) and subsequently downloaded to a personal computer at the end of each day. • All geophysical data is backed up daily and a copy transferred for off-site storage and archival • Data related to vegetation removal, BSIs and IVSs, Technology-Aided Surface MEC Removal, target reacquisition, intrusive investigation (analog based, DGM based and sifting), and QC operations is recorded on a digital tablet and is downloaded by the SSDM at the end of each day, with data being backed up daily. • QA data consisting of QA seeds located by the technology-aided surface MEC removal and/or intrusive investigation teams is recorded. • Data related to MEC and MPPEH management and demolition is recorded on a digital tablet, is downloaded by the SSDM at the end of each day, with data being backed up daily. • Field data management is being conducted in accordance with approved procedures.	Weekly or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: GIS Data Management

Procedures for GIS Data Management operations are located in Attachment B (DATA SOP 2) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure
GIS Data	Completeness/ Accuracy	QC inspection of GIS data management	• GIS data standards are being followed • GIS data file standards are being followed • Geospatial data types for field data are being followed • GIS data feature classes (and specifics for these feature classes) are being used / generated / updated • GIS data deliverables are being generated and submitted	Weekly or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: MMRP Data Management (Post Migration)

Procedures for MMRP Data Management (Post Migration) operations are located in Attachment B (DATA SOP 3) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure
MMRP Data Base	Completeness/ Accuracy	QC inspection of MMRP database management	• The field database is loaded to the FODIS FTP site and appended to the MMRP database on a weekly basis. • Other external data is being uploaded to the MMRP database • The IMEC form is updating the MMRP database automatically • All data is backed up daily and a copy transferred for off-site storage and archival	Weekly or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: DGM Data Transfer to BRAC

Procedures for the DGM Data Transfer to BRAC operations are located in Attachment B (DATA SOP 4) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure
DGM Data Transfer	Completeness/ Accuracy	QC inspection of DGM Data Transfer	• The following is being generated and is being transferred to BRAC: o GIS Grid file is joined with the MMRP database via grid ops link and grid block tables o Metadata for DGM data for MMRP database is being generated o Density Excel file for each area (density by grid by acre) is being generated o DGM mV contour maps are following prescribed settings o USACE folder structure is being adhered to	Weekly or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: Field Documentation

Procedures for Field Documentation are located in Attachment B (FIELD SOP 1) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Field Documentation	Completeness/ Accuracy	QC inspection of Field Documentation	• Field logbooks, forms and data are being kept in accordance with approved procedures. • Appropriate data is being recorded • Field data forms are being used properly • Corrections are made using proper procedures. • Records (both hard copy and digital) are being backed up. • Chain of Custody is being used in accordance with approved procedures.	Weekly or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: Environmental Protection

Procedures for Environmental Protection are located in Attachment B (FIELD SOP 2) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Environmental Protection	Completeness/ Accuracy	QC inspection of Field Documentation	• Habitat Checklists are being used in accordance with approved procedures. • Forms are being used appropriately and are being submitted in a timely manner. • Employees are being trained • Areas where fire retardants are being used are being mapped. • Vegetation clearance is being monitored by the Senior Biologist. • MEC removal operations are being monitored by the UXOQCs. • Vehicle access is being monitored by the UXOQCS and Senior Biologist. • Local endangered species are being monitored by the Senior Biologist. • Needs for site restoration are being assessed by the Senior Biologist. • Invasive weeds are being monitored by the Senior Biologist. • Project personnel have been made aware of the potential for currently unlocated resources and procedures for inadvertent discovery of cultural or Native American resources. • Documentation is being filled out appropriately	Weekly or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: Grid and Border Survey

Procedures for the Grid and Border Survey are located in Attachment B (FIELD SOP 3) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Grid and Border Survey	Completeness/ Accuracy	QC inspection of Field Documentation	• Grids are being installed using the Fort Ord Master Grid System. • Handheld metal detectors are being tested regularly. • Grid stakes are being installed correctly and are labeled properly. • Safety procedures are being followed during stake installation.	Weekly or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: Vegetation Removal

Procedures for the Vegetation Removal are located in Attachment B (FIELD SOP 4) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Vegetation Removal	Completeness/ Accuracy	QC inspection of Field Documentation	• Each vegetation removal team has a UXO escort. • Trees are limbed at their correct height (according to the SSWP) • Areas with light to medium vegetation are cut in one stage to 6 inches above ground surface. • Areas with dense vegetation - first cut will be made to a height between 18-24 inches above the ground. After a review by the UXO escort has been conducted a second cut is made to a height of no more than six inches above the ground. • Site security is established if fencing is removed • Vegetation is removed in accordance with the SSWP.	Weekly or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure
			• Documentation is in accordance with approved procedures.		
Planned Prescription Burn Area Preparation	Completeness	QC inspection of Field Operations	• Site security is established if fencing is removed. • Vegetation is removed in accordance with the SSWP • Combustible materials that exist within the burn area have been removed prior to the commencement of the burn • Structures not to be burned are protected prior to the commencement of the burn. • Burn support is being conducted appropriately • Documentation is in accordance with approved procedures	Weekly or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:

For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: IVS Installation and Use

Procedures for the IVS Installation and Use are located in Attachment B (GEO SOP 1) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure
IVS Installation	Precision/ Accuracy	Geodetic Equipment Functionality	• RTK-GPS units are verified to have a positional accuracy not to exceed ± 3 inches (7.6 cm) from the established baseline position. • IVS is installed in a “quiet” area • Documentation for IVS items is properly recorded, including position	Once during IVS installation	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel. Repair or replace malfunctioning instrument
Analog Instrument Function Check	Sensitivity	Instrument function check of hand-held metal detectors at FCA	Hand-held metal detectors able to detect all FCA items	Once daily at start of operations	Repair or replace malfunctioning instrument

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure
		Instrument function check of EM61MK2 using jig	EM61MK2 Static spike must be within 10% of expected baseline millivolt response (channel 2).	Twice Daily – AM and mid-day	Repair or replace malfunctioning instrument

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: BSI Installation

Procedures for BSI Installation are located in Attachment B (GEO SOP 2) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Analog Instrument Function Check	Sensitivity	Instrument function check of hand-held metal detectors at FCA	• Hand-held metal detectors are verified to be functioning properly at FCA • Safety procedures are being followed • Appropriate data for BSI items is being recorded • BSIs have a unique identifier • Documentation for BSI items is properly recorded, including position • BSI integrity is being maintained	Once daily at start of operations	Repair or replace malfunctioning instrument

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: DGM Using a Person-Portable System

Procedures for DGM using a Person-Portable System and process for Simultaneous Localization and Mapping (SLAM) are located in Attachment B (GEO SOP 3 and GEO SOP 10, respectively) of this MEC QAPP Addendum. SLAM Position System will be used for DGM data acquisition and target reacquisition in areas and situations where traditional real-time kinematic (RTK) global positioning system (GPS) cannot be used due to limited or no GPS reception. SLAM is a Light Detection and Ranging based positioning system that uses local landmarks such as trees, poles, fences, and buildings to create a georeferenced base map that can then be used to position a sensor relative to these known features.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure [a]
Chable Shake Test	Sensitivity	Instrument Response Tests at the IVS	Cable shake test: 98% of response values will not exceed +/- 2 millivolt when system cables are moved (for all EM61MK2 channels).	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and cable shake test has passed.
Personnel Test	Sensitivity	Instrument Response Tests at the IVS	Personnel test (Person-Portable): 98% of response values (due to proximity of data collection personnel) will not exceed +/- 2 millivolt (for all EM61MK2 channels).	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and cable shake test has passed.
Static repeatability (instrument functionality) [b]	Accuracy/ Precision	Instrument Response Tests at the IVS	98% of the daily static background response values (no test object) will not exceed +/- 2 mV of expected baseline response (for all EM61MK2 channels) [d] 98% of the response values to the standard spike test item (ISO fixed at an orientation and distance from the sensor to provide an approximately 100 millivolt response on channel 2 of the EM61MK2) will not exceed +/- 10% of the expected baseline response (for all EM61MK2 channels). [d]	Twice Daily (AM/PM)	If failure occurs during the AM static test, do not proceed with DGM field activities until failure is resolved and AM static test(s) have passed. If failure occurs during PM static test, the day's data fails unless BSI is mapped

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure [(a)]
					that day with repeatable anomaly characteristics (see dynamic detection repeatability (GSV blind seeding).
Along track sampling	Completeness	DGM Data Set or Grid	98% <= 0.65 ft (20cm)	By grid or dataset [(c)]	Dataset submittal fails
Coverage	Completeness	DGM using GPS: DGM Data Set or Grid	<u>Category A (Person-Portable)</u>: A lane spacing of 2 feet (0.61 meter) is to be used for the PP system. 95% (or greater) of the line spacing is to be at the project design line spacing of 2 feet. 100% of the line spacing is to be at 3 feet. No unexplained data gaps. <u>Category B (Person-Portable)</u>: A lane spacing of 2.5 feet is to be used for the PP system. 95% (or greater) of the line spacing is to be at the project design line spacing of 2.5 feet. 98% (or greater) of the line spacing is to be at 3 feet.	By grid or dataset [(c)]	Data gaps must be filled in before submittal is accepted.
	Completeness	DGM using SLAM positioning: DGM Data Set or Grid	Perform random inspection of SLAM positioning methodology used by DGM team	Visual inspection by QC Geophysicist minimum once per day	Submittal fails
Dynamic detection repeatability (IVS)	Accuracy/ Precision	Instrument Response Tests at the IVS	• 98% of the dynamic background response values during the daily IVS survey will not exceed +/- 3 millivolt of expected baseline response (for all EM61MK2 channels). [(d)] • Instrument response to each IVS item will be within +/- 25% or +/- 2 millivolt (whichever is greater) of the expected baseline response (for	Twice daily (AM/PM)	If failure occurs during the AM IVS test, do not proceed with DGM field activities until failure is resolved and AM

Data Type	**DQI**	**QC Sample and/or Assess Measurement Performance**	**MPC**	**Frequency**	**Consequence of Failure** [(a)]
			all EM61MK2 channels). The baseline response for each IVS item will be the average of the instrument responses to that item measured during the first week of IVS surveys. [(d)]		dynamic IVS test(s) have passed. If failure occurs during PM IVS test, the day's data fails unless BSI is mapped that day with repeatable anomaly characteristics (see Dynamic Detection Repeatability [GSV blind seeding]).
Dynamic detection repeatability (GSV blind seeding)	Sensitivity / Accuracy / Precision / Completeness	DGM Data Set or Grid	All BSIs must be located. Peak response >75% of maximum expected BSI response. [(d)]	Twice daily (AM/PM)	Submittal fails if BSI was installed but not located by DGM.
Dynamic positioning repeatability (IVS)	Accuracy / Precision	Instrument Response Test at the IVS	Position offset of IVS targets < 25cm	Twice daily (AM/PM)	If failure occurs during the AM IVS test, do not proceed with DGM field activities until failure is resolved and AM dynamic IVS test(s) have passed. If failure occurs during PM IVS test, the day's data fails unless BSI is mapped that day with repeatable anomaly characteristics (see Dynamic Detection

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure [(a)]
					Repeatability [GSV blind seeding]).
Dynamic positioning repeatability (GSV blind seeding)	Sensitivity / Accuracy / Precision / Completeness	DGM Data Set or Grid	90% positioning offset is <=25cm + ½ line/sensor spacing and 100% is <=35cm + ½ line/sensor for digital positioning systems (<=50cm + 1/2 line spacing for SLAM positioned data) • For Person-Portable using 2 ft line spacing (Category A) and RTK-GPS: 90% <= 22 inches 100% <=26 inches • For Person-Portable DGM using 2 ft line spacing (Category A) and SLAM positioning: 100% <=32 inches • For Person-Portable DGM using 2.5 ft line spacing (Category B) and RTK-GPS: 90% <= 25 inches 100% <= 29 inches • For Person-Portable DGM using 2.5 ft line spacing (Category B) and SLAM positioning: 100% <= 35 inches	1 per team per day (number per acre to be based on production rate - same as dynamic detection repeatability (GSV blind seeding) As required per day for DGM using SLAM position	Submittal fails
SLAM equipment functionality	Accuracy / Precision	SLAM Function check at IVS	SLAM position checks will not exceed ± 4- inches (10 cm) from the established baseline position.	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and positional check has passed.
SLAM internal accuracy	Accuracy / Precision	DGM using SLAM positioning: by Grid	Grid corners are internally consistent within 30 cm on any leg or diagonal (only relates if grid corner stakes are installed without using RTK-GPS).	Per Grid	Redo affected work (corner placement and data collection or data processing)

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure [(a)]
Velocity	Completeness	DGM Data Set or Grid	95% of all geophysical measurements with the EM61MK2 will be collected at a speed not to exceed 4 miles per hour (1.8 meters per second).	By grid or dataset [(c)]	Submittal fails
Target selection	Completeness	DGM Data Set or Grid	All dig list targets are selected according to project design as detailed in the SSWP.	By grid or dataset [(c)]	Submittal fails
Geodetic equipment functionality	Accuracy/ Precision	GPS Function check at IVS	GPS position checks will not exceed ± 3 inches (7.6 cm) from the established baseline position.	Once daily (AM)	Do not proceed with DGM field activities until failure is resolved and positional check has passed.
Geodetic accuracy	Accuracy/ Precision	GPS Function Check of Positional monuments used for RTK-GPS base station(s)	Project control points that are used more than once must be repeatable to within 5cm. [(e)]	For points used more than once, occupation will be repeated [(f)] for each point used, either monthly (for frequently used points) or before re-use (if used infrequently). [(g)]	Reset points not located at original locations or resurvey point.
Verify Field Work Methods	Accuracy/ Precision	QC Geophysicist will monitor field teamwork methods	Verify work methods are being performed in accordance with this MEC QAPP Addendum, SOPs, and SSWP.	Daily	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions.
DGM Data Reprocessing	Sensitivity / Accuracy /	10% of DGM Data Set or Grid	DGM data will be reprocessed by the QC Geophysicist in accordance with Attachment B,	As necessary	Stop work. Generate an RCA, CAR and CAP (as necessary).

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure [(a)]
	Precision / Completeness		GEO SOP 8 Geophysical QC, of this MEC QAPP Addendum.		Implement corrective actions.

Notes:

For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

[(a)] All failures require an RCA

[(b)] Duration of data collection is 1 minute for background, 1 minute for spike and 1 minute for second background measurement. All static repeatability is to be compared to original readings to ensure instrument is consistent throughout the project.

[(c)] The terms grid and dataset refer to logical groupings of data or data collection event. Logical groupings of data are contiguous areas mapped by the same instrument and in the same relative timeframe. These can be grids, acres, or some other unit of area. A data collection event is similar to logical groupings of data but refers to data collected over a contiguous timeframe, such as morning, afternoon, battery life, or some other measure of contiguous time.

[(d)] For static background, the expected baseline millivolt response is to be based on an average of all the static background readings collected during the first four days (or first week). For static spike the expected baseline peak millivolt response is to be based on an average of all the static spike readings collected during the first four days (or first week). For the IVS background, the expected baseline millivolt response is to be based on an average of all the IVS background readings for the first four days (or first week). For the IVS spike, the expected baseline millivolt response is to be based on an average of all the IVS spike readings for the first four days (or first week). For GSV BSI items the baseline millivolt response will be determined by recording an additional survey line that is offset ½ of the planned survey line spacing (1 foot) from the center of the seeded IVS line. This offset line will be recorded twice daily (AM/PM) during the first four days (or first week) of DGM operation with the PP system(s) and the baseline millivolt response to be used for BSIs (for PP and towed array systems) will then be calculated by averaging all of the peak readings for each ISO at this 1 ft offset. Note that separate baselines will be generated and used for the PP and towed-array system static and IVS tests.

[(e)] GPS base station coordinates that are currently being used are provided by the BRAC Office.

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

[(g)] An example of frequently used control points would be points used as RTK-GPS base stations. Infrequently used points could be those used during GPS operations where the control point was used during mapping and then again at some later time for reacquisition and QC statistical sampling. Infrequently used points also could include grid corners; they are used for SLAM positioning and then reused for reacquisition or QC statistical sampling.

Although it is highly unlikely, should an area originally categorized and seeded for Category B (i.e. seeded for DGM at a rate of approximately 1 BSI for every 4 acres and not planned for intrusive investigation) then be upgraded to Category A after DGM has been completed (i.e. should be seeded at a rate of 1 BSI per dig team per day and planned for intrusive investigation), that if the dig team does not have 1 BSI per dig team per day that this would not constitute a QC failure because the density of BSIs installed would have been based on the original selection of this area as Category B. The rationale for stating this scenario is that once the DGM data has been collected, it is impossible to add additional BSIs (i.e. add additional anomalies to the previously collected DGM data). If this scenario does occur, it has been identified in the QAPP and discussed in relation to QC objectives and their pass/fail criteria.

DFW: DGM using a Towed Array System

Procedures for the DGM Using a Towed Array System are located in Attachment B (GEO SOP 4) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure[a]
Cable Shake Test	Sensitivity	Instrument Response Tests at the IVS	Cable shake test: 98% of response values will not exceed +/- 2 millivolt when system cables are moved (for all EM61MK2 channels).	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and cable shake test has passed.
Personnel Test	Sensitivity	Instrument Response Tests at the IVS	Personnel test : 98% of response values (due to proximity of data collection personnel) will not exceed +/- 2 millivolt (for all EM61MK2 channels).	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and personnel test has passed.
Tow Vehicle Test	Sensitivity	Instrument Response Tests at the IVS	Tow vehicle test (towed array): 98% of response values (due to elevated tow vehicle RPM) will not exceed +/- 2 millivolt (for all EM61MK2 channels).	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and tow vehicle test has passed.
Static repeatability (instrument functionality) [b]	Accuracy/ Precision	Instrument Response Tests at the IVS	98% of the daily static background response values (no test object) will not exceed +/- 2 millivolt of expected baseline response (for all EM61MK2 channels). [d] 98% of the response values to the standard spike test item (a small ISO fixed at an orientation and distance from the sensor to provide an approximately 100 millivolt response on channel 2 of the EM61MK2) will not exceed +/- 10% of the expected baseline response (for all EM61MK2 channels). [d]	Twice Daily (AM / PM)	If failure occurs during the AM static test, do not proceed with DGM field activities until failure is resolved and AM static test(s) have passed. If failure occurs during PM static test, the day's data fails unless BSI is mapped that day with repeatable anomaly characteristics (see

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure[a]
					dynamic detection repeatability [GSV blind seeding]).
Along track sampling	Completeness	DGM Data Set or Grid	98% <= 0.65 ft (20cm)	By grid or dataset [c]	Dataset submittal fails.
Coverage	Completeness	DGM using GPS Positioning: DGM Data Set or Grid	<u>Category A (towed array):</u> A lane spacing of 2 feet is to be used for the towed array. 95% (or greater) of the lane spacing is to be at the project design lane spacing of 2 feet. 100% of the lane spacing is to be at 3 ft. No unexplained data gaps. <u>Category B (towed array):</u> A lane spacing of 2 feet is to be used for the towed array. 95% (or greater) of the lane spacing is to be at the project design lane spacing of 2 feet. 98% (or greater) of the lane spacing is to be at 3 feet.	By grid or dataset [c]	Data gaps must be filled in before submittal is accepted.

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure[a]
Dynamic detection repeatability (IVS)	Accuracy/ Precision	Instrument Response Tests at the IVS	• 98% of the dynamic background response values during the daily IVS survey will not exceed +/- 3 millivolt of expected baseline response (for all EM61MK2 channels). [d] • Instrument response to each IVS item will be within +/- 25% or +/- 2 millivolt (whichever is greater) of the expected baseline response (for all EM61MK2 channels). The baseline response for each IVS item will be the average of the instrument responses to that item measured during the first week of IVS surveys. [d]	Twice daily (AM / PM)	If failure occurs during the AM IVS test, do not proceed with DGM field activities until failure is resolved and AM dynamic IVS test(s) have passed. If failure occurs during PM IVS test, the day's data fails unless BSI is mapped that day with repeatable anomaly characteristics (see dynamic detection repeatability [GSV blind seeding]).
Dynamic detection repeatability (GSV blind seeding)	Sensitivity/ Accuracy/ Precision/ Completeness	DGM Data Set or Grid	All BSIs must be located. Peak response >75% of maximum expected BSI response. (d)	1 per day per team (number per acre to be based on production rate)	Submittal Fails
Dynamic positioning repeatability (IVS)	Accuracy / Precision	Instrument Response Test at the IVS	Position offset of IVS targets < 25cm.	Twice daily (AM/PM)	If failure occurs during the AM IVS test, do not proceed with DGM field activities until failure is resolved and AM dynamic IVS test(s) have passed. If failure occurs during PM IVS test,

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure[(a)]
					the day's data fails unless BSI is mapped that day with repeatable positional characteristics (see Dynamic Positioning Repeatability (GSV blind seeding))
Dynamic positioning repeatability (GSV blind seeding)	Sensitivity / Accuracy / Precision / Completeness	DGM Data Set or Grid	90% positioning offset is <=25 cm + ½ line/sensor spacing and 100% is <=35cm + ½ line/sensor for digital positioning systems • For Towed Array DGM using 2 ft line spacing (Category A and Category B) and RTK-GPS: 90% <= 22 inches 100% <=26 inches	1 per team per day (number per acre to be based on production rate - same as dynamic detection repeatability (GSV blind seeding)	Submittal fails
Velocity	Completeness	DGM Data Set or Grid	95% of all geophysical measurements with the EM61MK2 will be collected at a speed not to exceed 4 miles per hour (1.8 meters per second)	By grid or dataset [(c)]	Submittal fails
Target selection	Completeness	DGM Data Set or Grid	All dig list targets are selected according to project design as detailed in the SSWP	By grid or dataset [(c)]	Submittal fails.
Geodetic equipment functionality	Accuracy / Precision	GPS Function check at IVS	GPS position checks will not exceed ± 3 inches (7.6cm) from the established baseline position.	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and positional check has passed
Geodetic accuracy	Accuracy / Precision	GPS Function Check of Positional monuments used for RTK-GPS base station(s)	Project control points that are used more than once must be repeatable to within 5 cm [(e)]	For points used more than once, occupation will be repeated (f) for each point used, either monthly (for frequently used points) or before re-use	Reset points not located at original locations or resurvey point

Data Type	DQI	QC Sample and/or Assess Measurement Performance	MPC	Frequency	Consequence of Failure[(a)]
				(if used infrequently) [(g)]	
Verify Field Work Methods	Accuracy / Precision	QC Geophysicist will monitor field team work methods	Verify work methods are being performed in accordance with this MEC QAPP Addendum, SOPs, and SSWP	Daily	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions
DGM Data Reprocessing	Sensitivity / Accuracy / Precision / Completeness	10% of DGM Data Set or Grid	DGM data will be reprocessed by the QC Geophysicist in accordance with GEO SOP 8 (Geophysical QC)	Daily	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions

Notes:

For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

[(a)] All failures require an RCA

[(b)] Duration of data collection is 1 minute for background, 1 minute for spike and 1 minute for second background measurement. All static repeatability is to be compared to original readings to ensure instrument is consistent throughout the project.

[(c)] The terms grid and dataset refer to logical groupings of data or data collection event. Logical groupings of data are contiguous areas mapped by the same instrument and in the same relative timeframe. These can be grids, acres, or some other unit of area. A data collection event is similar to logical groupings of data but refers to data collected over a contiguous timeframe, such as morning, afternoon, battery life, or some other measure of contiguous time.

[(d)] For static background, the expected baseline millivolt response is to be based on an average of all the static background readings collected during the first four days (or first week). For static spike the expected baseline peak millivolt response is to be based on an average of all the static spike readings collected during the first four days (or first week). For the IVS background, the expected baseline millivolt response is to be based on an average of all the IVS background readings for the first four days (or first week). For the IVS spike, the expected baseline millivolt response is to be based on an average of all the IVS spike readings for the first four days (or first week). For GSV BSI items the baseline millivolt response will be determined by recording an additional survey line that is offset ½ of the planned survey line spacing (1 foot) from the center of the seeded IVS line. This offset line will be recorded twice daily (AM/PM) during the first four days (or first week) of DGM operation with the PP system(s) and the baseline millivolt response to be used for BSIs (for PP and towed array systems) will then be calculated by averaging all of the peak readings for each ISO at this 1 ft offset. Note that separate baselines will be generated and used for the PP and towed-array system static and IVS tests.

[(e)] GPS base station coordinates that are currently being used are provided by the BRAC office.

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

[(g)] An example of frequently used control points would be points used as RTK-GPS base stations. Infrequently used points could be those used during GPS operations where the control point was used during mapping and then again at some later time for reacquisition and QC statistical sampling. Infrequently used points also could include grid corners; they are used for SLAM positioning and then reused for reacquisition or QC statistical sampling.

Although it is highly unlikely, should an area originally categorized and seeded for Category B (i.e. seeded for DGM at a rate of approximately 1 BSI for every 4 acres and not planned for intrusive investigation) then be upgraded to Category A after DGM has been completed (i.e. should be seeded at a rate of 1 BSI per dig team per day and planned for intrusive investigation), that if the dig team does not have 1 BSI per dig team per day that this would not constitute a QC failure because the density of BSIs installed would have been based on the original selection of this area as Category B. The rationale for stating this scenario is that once the DGM data has been collected, it is impossible to add additional BSIs (i.e. add additional anomalies to the previously collected DGM data). If this scenario does occur, it has been identified in the QAPP and discussed in relation to QC objectives and their pass/fail criteria.

DFW: DGM Data Processing For a Person-Portable System

Procedures for DGM Data Processing for a Person-Portable System are in Attachment B (GEO SOP 5) of this MEC QAPP Addendum. MPCs associated with the entire Person-Portable DGM operation (by definition including data processing) are described above in DFW: DGM Using a Person-Portable System.

DFW: DGM Data Processing for a Towed Array System

Procedures for DGM Data Processing for a Towed Array System are in Attachment B (GEO SOP 6) of this MEC QAPP Addendum. MPCs associated with the entire towed array DGM operation (which includes data processing) are described above in DFW: DGM Using a Towed Array System.

DFW: DGM Target Reacquisition Using a Person-Portable System

Procedures for Target Reacquisition using a PP System are located in Attachment B (GEO SOP 7) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Positioning	Precision, Accuracy, Repeatability	GPS positional check	GPS position checks will not exceed ± 3 inches (7.6 cm) from the established baseline position.	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and GPS positional check has passed
Geophysical	Accuracy	Personnel Test	Personnel test: 98% of response values (due to proximity of data collection personnel) will not exceed +/- 2 millivolt (for all EM61MK2 channels).	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and personnel test has passed.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Geophysical	Precision, Accuracy, Repeatability	Cable shake test	Cable shake test: 98% of response values will not exceed +/- 2 millivolt when system cables are moved (for all EM61MK2 channels).	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and cable shake test has passed
Geophysical	Precision, Accuracy, Repeatability	Static Background and Spike Readings	98% of the daily static background response values (no test object) will not exceed +/- 2 millivolt of expected baseline response (for all EM61MK2 channels). 98% of the response values to the standard spike test item (a small ISO fixed at an orientation and distance from the sensor to provide an approximately 100 millivolt response on channel 2 of the EM61MK2) will not exceed +/- 10% of the expected baseline response (for all EM61MK2 channels).	Twice Daily AM/PM	If failure occurs in the morning, do not proceed with DGM field activities until failure is resolved and static checks have passed. If failure occurs at the end of the collection day, the day's data fails unless seed item is mapped that day with repeatable anomaly characteristics (see Dynamic Detection Repeatability [GSV blind seeding])

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: QC of Geophysical Operations

Procedures for the QC of Geophysical Operations are located in Attachment B (GEO SOP 8) of this MEC QAPP Addendum. The QC Geophysicist is to verify that all MPCs associated with the entire DGM operation are being achieved. As such there are no MPCs for the QC of Geophysical Operations because they are intrinsic to this QC operation.

DFW: FCA Installation and Use

Procedures for FCA Installation and Use are located in Attachment B (UXO SOP 1) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Analog Instrument Function Check	Sensitivity	Instrument function check of hand-held metal detectors at FCA	Hand-held metal detectors able to detect all FCA items.	Once daily at start of operations	Repair or replace malfunctioning instrument

Notes:

For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document. FCA use is described in DFW: Technology-Aided Surface MEC Removal, and DFW: Intrusive Investigation using Analog Methods, and DFW: Intrusive Investigation of DGM Targets shown below.

DFW: Technology-Aided Surface MEC Removal

Procedures for FCA Installation and Use are located in Attachment B (UXO SOP 2) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Instrument Function Check	Sensitivity	Instrument function check at the FCA	Hand-held metal detectors able to detect all FCA items.	Once daily at start of operations	Repair or replace malfunctioning instrument
Verify Field Work Methods	Accuracy / Precision	UXOQCS to monitor field team work methods	Verify work methods are being performed in accordance with this MEC QAPP Addendum, SOPs, and SSWP.	Daily	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Grid QC inspection	Completeness	UXOQCS to inspect a minimum of 10% of each grid completed	Location of any MEC or MD item that could be mistaken for MEC will constitute a QC grid failure. Location of any metallic object the size of an LE, MK1, 37mm projectile (without fuze) [1.47" x 1.47" x 3.5"] or larger will constitute a QC failure. Location of single expended small arms cartridge casing(s) on the surface will not constitute a QC failure.	Per QC Lot [(a)]	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions
Verification of BSI recovery	Completeness	UXOQCS places QC seeds within surface removal area	QC seeds identified during surface removal operations.	One per team per day (minimum of 1 every 4 acres)	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.
[(a)] QC Lot size and criteria for designation will be detailed in the SSWP generated for each area/unit.

DFW: Intrusive Investigation Using Analog Methods

Procedures for Intrusive Investigation Using Analog Methods are located in Attachment B (UXO SOP 3) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Analog Instrument Function Check	Sensitivity	Instrument function check of hand-held metal detectors at FCA	Hand-held metal detectors able to detect all FCA items.	Once daily at start of operations	Repair or replace malfunctioning instrument
		Instrument function check of EM61MK2 (if used) using jig	EM61MK2 Static spike must be within 10% of expected baseline millivolt response (channel 2). (EM61MK2 data is not recorded in the allegro. Team Leader records millivolt spike reading in digital tablet)	Twice Daily - AM and mid-day	Repair or replace malfunctioning instrument
Verify Field Work Methods	Accuracy / Precision	UXOQCS to monitor field team work methods	Verify work methods are being performed in accordance with this MEC QAPP Addendum, SOPs, and the SSWP	Daily	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions
Grid QC Inspection	Completeness	UXOQCS to inspect a minimum of 10% of each grid completed [(a)]	Verify grid has been cleared in accordance with criteria established in this MEC QAPP Addendum and SSWP.	Per QC Lot [(b)]	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions
Grid QC Inspection	Completeness	UXOQCS to inspect 10% of each grid completed [(a)]	Location of any metallic object the size of an LE, MK1, 37mm projectile (without fuze) [1.47” x 1.47” x 3.5"] or larger will constitute a QC failure. Note: if the EM61 is used in analog mode to verify that anomaly locations are clear, depending on the subsurface clearance depth (typically 4 foot), and the millivolt reading is above target threshold, and	Per QC Lot [(b)]	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
			the clearance depth has been reached, then the anomaly location will be deemed "clear" by the intrusive team. For this scenario, if the millivolt reading is still above target threshold (as detailed in the SSWP) during QC inspection, this would not constitute a QC failure.		
Verification of BSI recovery	Completeness	UXOQCS places QC seeds within analog intrusive investigation removal area	QC seeds identified during subsurface removal operations.	One per team per day (minimum of 1 every acre)	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions

Notes:

For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

[(a)] Analog intrusive investigations do not require the use of pin flags. UXOQCS may use an EM61MK2, Schonstedt GA-52Cx or White DFX 300 to check holes.

[(b)] QC Lot size and criteria for designation will be detailed in the SSWP generated for each area.

DFW: Intrusive Investigation of DGM Targets

Procedures for Intrusive Investigation of DGM Targets are located in Attachment B (UXO SOP 4) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Analog Instrument Function Check	Sensitivity, Accuracy, Repeatability	Instrument function check of hand-held metal detectors at FCA	Hand-held metal detectors able to detect all FCA items.	Once daily at start of operations	Repair or replace malfunctioning instrument
		Instrument function check of EM61MK2 using jig	EM61MK2 Static spike must be within 10% of expected baseline millivolt response (channel 2). (Team Leader records millivolt spike readings in the digital tablet.)	Twice Daily AM and mid-day	If failure occurs in the morning, do not proceed with intrusive field activities until failure is resolved and static checks have passed. If failure occurs at mid-day notify QC Geophysicist and UXOQCS for corrective action.
Anomaly resolution [a]	Completeness	UXOQCS to inspect a minimum of 10% of the DGM Targets that are intrusively investigated within each grid [b]	Location of any metallic object the size of an LE, MK1, 37mm projectile (without fuze) [1.47” x 1.47” x 3.5"] or larger will constitute a QC failure. Note: when the EM61 is used in analog mode to verify that anomaly locations are clear, depending on the subsurface clearance depth (typically 4 foot), and the millivolt reading is above target threshold, and the clearance depth has been reached, then the anomaly location will be deemed “clear” by the intrusive team. For this scenario, if the millivolt reading is still above target threshold (as detailed in the SSWP) during QC inspection, this	Per QC Lot [c]	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
			would not constitute a QC failure.		
Anomaly resolution [(a)]	Completeness	QC Geophysicist to inspect a minimum of 10% of the DGM Targets that are intrusively investigated within each grid using an EM61MK2	Verify grid has been cleared in accordance with criteria established in this MEC QAPP Addendum and SSWP. Anomaly location is below 14.5 millivolt (sum 4 EM61MK2 channels)	Per QC Lot [(c)]	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions
Verify BSI Recovery	Completeness	QC Geophysicist places BSIs within areas to have DGM	QC seeds identified during intrusive investigation operations.	One per team per day	Stop work. Generate an RCA, CAR and CAP (as necessary). Implement corrective actions

Notes:

For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

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

[(b)] Flags associated with DGM targets will be left at excavated locations until QC is complete. Holes that knowingly have metal left in them will be indicated as such by the intrusive team on the dig sheet. UXOQCS may use an EM61MK2, Schonstedt GA-52Cx or White DFX 300 to check holes.

[(c)] QC Lot size and criteria for designation will be detailed in the SSWP generated for each area.

DFW: Sifting Operations

Procedures for Sifting Operation are to be generated based on site specific information and requirements.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Analog Instrument Function Check	Sensitivity	Instrument function check of hand-held metal detectors at FCA	• Hand-held metal detectors able to detect all FCA items. • Safety procedures are being adhered to • Documentation is filled out appropriately	Once daily at start of operations	Repair or replace malfunctioning instrument

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: MEC and MPPEH Management

Procedures for the MEC and MPPEH Management are located in Attachment B (UXO SOP 5) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
MEC Management	Accuracy Completeness	Random Inspection	• Safety procedures are being adhered to • Regulatory guidance is being followed • MEC items are properly identified • MEC is transported using appropriate procedures and precautions	Per event or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.
MPPEH Management	Accuracy	Random Inspection	• Materials are correctly segregated and identified as MEC, MPPEH, DMM, or MDAS. • MDAS is properly certified • MDAS is secured in lockable containers with serialized locks • Chain-of-custody procedures are being followed • Procedures for item(s) with unknown fillers are being followed • New MEC model information is being uploaded to the MMRP Database	Per event or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel. Should any comingling of MEC/MPPEH/DMM/

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
					MDAS occur, all affected material will undergo another 100% inspection and 100% re-inspection to properly classify and re- document the explosive status of the material
Documentation	Accuracy Completeness	UXOQCS verification of documentation	All required documentation has been completed	Per event or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: Demolition of MEC and MPPEH

Procedures for the MEC and MPPEH are located in Attachment B (UXO SOP 6) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Demolition of MEC and MPPEH	Accuracy	Demolition Supervisor verification of proper positioning of explosives for disposal	Donor explosives are placed correctly for the type of munition(s) being destroyed. Demolition team must perform MEC demolition in accordance with DDESB-approved ESS and USACE disposal manuals	Per event or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Demolition of MEC and MPPEH	Completeness	SUXOS verification of complete destruction	All explosive materials (MEC, MPPEH and donor explosives) placed in a demolition shot are consumed by the explosion and there are no kickouts.	Per event or as necessary	If MPC is not met, perform an additional demolition of remaining materials.
Documentation	Accuracy Completeness	UXOQCS verification of documentation	All required documentation has been completed	Per event or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: Explosives Management

Procedures for the Explosives Management are located in Attachment B (UXO SOP 7) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Documentation	Accuracy Completeness	UXOQCS verification of documentation	All required documentation has been completed	Per event or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: Explosives Siting

Procedures for the Explosives Siting are located in Attachment B (UXO SOP 8) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Documentation	Accuracy Completeness	UXOQCS verification of documentation	All required documentation has been completed	Per event or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: Exclusion Zones

Procedures for the Exclusion Zones are located in Attachment B (UXO SOP 9) of this MEC QAPP Addendum.

Data Type	DQI	QC Sample and/or Activity to Assess Measurement Performance	MPC	Frequency	Consequence of Failure
Documentation	Accuracy Completeness	UXOQCS verification of documentation	All required documentation has been completed	Per event or as necessary	Stop activity until full compliance is assured. Brief and retrain personnel or replace personnel.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

DFW: QC of MEC and Explosives Related Operations

Procedures for the QC of MEC and Explosives Related Operations are located in Attachment B (UXO SOP 10) of this MEC QAPP Addendum. The UXOQCS is to verify that all MPCs associated with the MEC, and explosives related operations are being achieved. As such there are no MPCs for the QC of MEC and explosives related operations because they are intrinsic to this QC operation.

2.5 Project Tasks and Schedule (QAPP Worksheet #14 and #16)

Project Tasks

The table below identifies the DFWs and Summary of Tasks associated with this project. The MEC QAPP (KEMRON, 2016) Worksheets #14 and 16 remain applicable.

DFW	Summary of Tasks
Field Data Management	• Attend a daily safety briefing and sign attendance roster • Perform field data and records management in accordance with DATA SOP 1 (Field Data Management) of this MEC QAPP Addendum.
GIS Data Management	• Perform GIS data and record management in accordance with DATA SOP 2 (GIS Data Management) of this MEC QAPP Addendum.
MMRP Data Management (post migration)	• Perform MMRP data and record management in accordance with DATA SOP 3 (MMRP Data Management – post migration) of this MEC QAPP Addendum.
DGM Data Transfer to BRAC	• Perform transfer of DGM data to BRAC in accordance with DATA SOP 4 (DGM Data Transfer to BRAC) of this MEC QAPP Addendum.
Field Documentation	• Generate field documentation in accordance with FIELD SOP 1 (Field Documentation) of this MEC QAPP Addendum.
Environmental Protection	• Attend a daily safety briefing and sign attendance roster • Don the appropriate PPE for the task assigned • Conduct environmental protection operations in accordance with FIELD SOP 2 (Environmental Protection) of this MEC QAPP Addendum. • Determine if a habitat checklist is required.
Grid and Border Survey	• Completion of a habitat checklist (if not already prepared) • Attend a daily safety briefing and sign attendance roster

DFW	Summary of Tasks
	• Don the approved PPE for the task assigned • Conduct the grid and border survey in accordance with FIELD SOP 3 (Grid and Border Survey) of this MEC QAPP Addendum.
Vegetation Removal	• Completion of a habitat checklist (if not already prepared) • Attend a daily safety briefing and sign attendance roster • Establish environmental controls for refueling and fuel spill prevention and cleanup • Don the approved PPE for the task assigned • Conduct vegetation removal in accordance with FIELD SOP 4 (Vegetation Removal) of this MEC QAPP Addendum.
IVS Installation and Use	• Completion of a habitat checklist (if not already prepared) • Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct the IVS Installation (and use of the IVS) in accordance with GEO SOP 1 (IVS Installation and Use) of this MEC QAPP Addendum.
BSI Installation	• Completion of a habitat checklist (if not already prepared) • Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct the BSI Installation in accordance with GEO SOP 2 (BSI Installation) of this MEC QAPP Addendum.
DGM Using a Person-Portable System	• Completion of a habitat checklist (if not already prepared) • Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct the DGM using a Person-Portable system operation in accordance with GEO SOP 3 (DGM Using a PP System) and GEO SOP 10 (SLAM Positioning System) of this MEC QAPP Addendum.
DGM using a Towed Array System	• Completion of a habitat checklist (if not already prepared) • Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct the DGM using a towed array system operation in accordance with GEO SOP 4 (DGM Using a Towed Array System) of this MEC QAPP Addendum.

DFW	Summary of Tasks
DGM Data Processing for a Person-Portable System	• Conduct the DGM data processing for a Person-Portable system in accordance with GEO SOP 5 (DGM Data Processing for a Person-Portable System) of this MEC QAPP Addendum.
DGM Data Processing for a Towed Array System	• Conduct the DGM data processing for a towed array system in accordance with GEO SOP 6 (DGM Data Processing for a Towed Array System) of this MEC QAPP Addendum.
DGM Target Reacquisition using a Person-Portable System	• Completion of a habitat checklist (if not already prepared) • Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct the DGM target reacquisition using a Person-Portable system in accordance with GEO SOP 7 (DGM Target Reacquisition using a Person-Portable system) of this MEC QAPP Addendum.
QC of Geophysical Operations	• Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct the QC of Geophysical Operations in accordance with GEO SOP 8 (Geophysical QC) of this MEC QAPP Addendum.
FCA Installation and Use	• Completion of a habitat checklist (if not already prepared) • Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct FCA installation and use in accordance with UXO SOP 1 (FCA Installation and Use) of this MEC QAPP Addendum.
Technology-Aided Surface MEC Removal	• Completion of a habitat checklist (if not already prepared) • Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct Technology-Aided Surface MEC Removal operations in accordance with UXO SOP 2 (Technology-Aided Surface MEC Removal) of this MEC QAPP Addendum.

DFW	Summary of Tasks
Intrusive Investigation Using Analog Methods	• Completion of a habitat checklist (if not already prepared) • Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct intrusive investigation using analog methods in accordance with UXO SOP 3 (Intrusive Investigation Using Analog Methodologies) of this MEC QAPP Addendum.
Intrusive Investigation of DGM Targets	• Completion of a habitat checklist (if not already prepared) • Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct intrusive investigation of DGM targets in accordance with UXO SOP 4 (Intrusive Investigation of DGM Targets) of this MEC QAPP Addendum.
Sifting Operations	• Note that the SOP and QC checklist for sifting operations will be generated only when this DFW is to be used because generation of the sifting operation SOP will depend on a variety of site and operational specific details.
MEC and MPPEH Management	• Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct MEC and MPPEH management in accordance with UXO SOP 5 (MEC and MPPEH Management) of this MEC QAPP Addendum.
Demolition of MEC and MPPEH	• Completion of a habitat checklist (if not already prepared) • Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct demolition of MEC and MPPEH in accordance with UXO SOP 6 (Demolition of MEC an MPPEH) of this MEC QAPP Addendum.
Explosives Management	• Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct explosives management in accordance with UXO SOP 7 (Explosives Management) of this MEC QAPP Addendum.

DFW	Summary of Tasks
Explosives Siting	• Conduct explosives siting in accordance with UXO SOP 8 (Explosives Siting) of this MEC QAPP Addendum.
Exclusion Zones	• Generate and employ exclusion zones in accordance with UXO SOP 9 (Exclusion Zones) of this MEC QAPP Addendum.
QC of MEC and Explosives Related Operations	• Attend a daily safety briefing and sign attendance roster • Don the approved PPE for the task assigned • Conduct QC of MEC and explosives related operations in accordance with UXO SOP 10 (QC of MEC and Explosives Related Operations) of this MEC QAPP Addendum.

The project schedule is not included as part of this MEC QAPP Addendum because the schedule of events will change frequently over time due to numerous variables.

3.0 SAMPLING DESIGN

This section serves as an update to the MEC QAPP Section 3.1 MEC Investigation Design and Rationale (QAPP Worksheet #17).

3.1 MEC Investigation Design and Rationale (QAPP Worksheet #17)

Impact Area MRA

MEC remedial actions in the Impact Area MRA are being conducted in accordance with the Track 3 ROD (Army, 2008), Track 3 RD/RA Work Plan (USACE, 2009), and Track 3 RD/RA Work Plan Update (KEMRON, 2018). The Track 3 ROD was signed in May 2008 after the completion of a public comment period for the Track 3 Proposed Plan dated June 25, 2007. The selected remedy for the Impact Area MRA is *Technology-Aided Surface MEC Remediation, With Subsurface MEC Remediation in Selected Areas and LUCs*. The remedy was selected because it will achieve both substantial risk reduction through MEC remediation and risk management through implementation of LUCs. The selected remedy best balances the risk reduction and associated environmental impacts in supporting the anticipated future use of the site as a habitat reserve.

Per the Track 3 ROD the following subsurface MEC remediation (intrusive investigation of anomalies) is to be conducted in the Impact Area MRA fuel breaks and roads essential to habitat management activities, and in select areas that require subsurface MEC removal for specific purposes to support the reuse (estimated to be approximately 10 percent of the Impact Area MRA).Additionally, per the Track 3 ROD, areas where there is a high density of anomalies associated with impact areas where military munitions with sensitive fuzes were fired would be candidates for subsurface MEC removal utilizing excavation and sifting because the standard approach of detection and investigation of intrusive anomalies might not be conducted efficiently. Large scale excavation requires careful evaluation before such a decision is made.

BLM Area B

MEC remedial actions in BLM Area B are being conducted in accordance with the Track 2 ROD (Army, 2017) and Track 2 RD/RA Work Plan (KEMRON, 2017a). The Track 2 ROD was signed in May 2017 after the completion of a public comment period for the Track 2 Proposed Plan dated April 8, 2015. The selected remedies for BLM Area B include LUCs for Military Munitions Site (MRS)-16 and BLM Area B sub-areas B-1, B-2, B-3A, B-4, B-5 and B-6; and Technology-aided Surface Removal, Subsurface Removal in Selected Areas, and LUCs for BLM Area B sub-areas B—2A and B-3. The remedies were selected because they will achieve both substantial risk reduction through MEC remediation in BLM Area B sub-areas B-2A and B-3 and risk management through implementation of LUCs throughout BLM Area B. The selected remedies best balance the risk reduction and associated environmental impacts in supporting the anticipated future use of the site as a habitat reserve.

Per the Track 2 ROD, the following subsurface MEC remediation is to be conducted in BLM Area B sub-areas B-2A and B-3:

- In selected areas (estimated to be 10 percent of acreage) that are identified in coordination with BLM to address the risk associated with specific reuse.

Applicable MEC standard procedures, protocols, and methodologies that are to be followed during execution of MEC activities at the former Fort Ord are presented in this MEC QAPP Addendum and subsequent SOPs (MEC QAPP Addendum - Attachment B). Activities specific to an individual or group of Units within the Impact Area MRA and BLM Area B are to be specified in the SSWP for that Unit(s).

4.0 Sampling Requirements

This section serves as an update to MEC QAPP Section 4.2 Field Quality Control Summary (QAPP Worksheet #20), Section 4.3 Field SOPs/Methods (QAPP Worksheet #21) and Section 4.4 field Equipment Calibration, Maintenance, Testing and Inspection table (QAPP Worksheet #22).

4.2 Field Quality Control Summary (QAPP Worksheet #20)

Technology-Aided Surface MEC Removal, DGM, Intrusive Investigation (Analog and DGM Tarte Related)

The table below summarizes the Field Quality Controls associated with this project. The MEC QAPP (KEMRON, 2016) Worksheet #20 remains applicable.

Matrix	Procedure	Sample Population Applicable to QC Inspection	Minimum Number of BSIs	Size of QC Sample
Surface Removal	Technology-Aided Surface MEC Removal	QC Inspections (PP, IP, FP)	NA	Variable (duration dependent)
Surface Removal	Technology-Aided Surface MEC Removal	TBD based on production rate	1 per team per day	TBD based on production rate
Surface Removal	Technology-Aided Surface MEC Removal	Minimum of 10% of each grid surface swept to be inspected by UXOQCS	NA	1 grid
DGM Data Collection	All DGM related field operations	QC Inspections (PP, IP, FP)	NA	Variable (duration dependent)
DGM Data Collection	Person -Portable DGM Survey using RTK-GPS	1 acre	1 per team per day [(a)]	1 acre
DGM Data Collection	Person-Portable DGM Survey using SLAM	1 acre	As required per day for DGM using SLAM	1 acre

Matrix	Procedure	Sample Population Applicable to QC Inspection	Minimum Number of BSIs	Size of QC Sample
			position	
DGM Data Collection	Towed Array DGM Survey	4 acres	1 per team per day [(b)]	4 acres
DGM Data Collection and Data Processing	DGM Data Collection and Data Processing	Minimum of 10% of DGM data (including targeting) to be inspected and reprocessed by QC Geophysicist	NA	10% of DGM data
Sub-Surface Removal	Analog and DGM Target Related	QC Inspections (PP, IP, FP)	NA	Variable (duration dependent)
Sub-Surface Removal	Intrusive Investigation Using Analog Methodologies	TBD based on production rate	1 per team per day	TBD based on production rate
Sub-Surface Removal	Intrusive Investigation Using Analog Methodologies	Minimum of 10% of each grid intrusively investigated using analog methodologies to be inspected by UXOQCS	NA	1 grid

Note:

For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

(a) 1 per team per day (estimate 1 BSI every acre however is TBD based on production).

(b) 1 per team per day (estimate 1 BSI every 4 acres however is TBD based on production).

4.3 Field SOPs/Methods (QAPP Worksheet #21)

This worksheet documents specific field procedures and methods that will be implemented for work conducted at the Impact Area MRA and BLM Area B associated with this project. Applicable field SOPs will be readily available to all field personnel responsible for their implementation. The SOPs listed in the following are included in Attachment B of this MEC QAPP Addendum. The MEC QAPP (KEMRON, 2016) Worksheet # 21 remains applicable.

SOP Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Is the SOP Specific to this Project? (Yes/No)
DATA SOP 1	Field Data Management	NAEVA	Digital Tablet	Yes
DATA SOP 2	GIS Data Management	Ahtna	NA	Yes
DATA SOP 3	MMRP Data Management (Post Migration)	NAEVA	NA	Yes
DATA SOP 4	DGM Data Transfer to BRAC	InDepth	NA	Yes
FIELD SOP 1	Field Documentation	Ahtna	Digital Tablet, GPS	Yes
FIELD SOP 2	Environmental Protection	Ahtna	Digital Tablet, GPS (if used)	Yes
FIELD SOP 3	Grid and Border Survey	Ahtna	Digital Tablet, RTK-GPS	Yes
FIELD SOP 4	Vegetation Removal	Ahtna	Vegetation removal equipment, GPS	Yes
GEO SOP 1	IVS Installation and Use	InDepth	Digital Tablet, RTK-GPS	Yes
GEO SOP 2	BSI Installation	InDepth	Digital Tablet, RTK-GPS	Yes
GEO SOP 3	DGM Using a Person-Portable System	InDepth	Digital Tablet, RTK-GPS, EM61MK2, SLAM	Yes
GEO SOP 4	DGM Using a Towed Array System	InDepth	Digital Tablet, RTK-GPS, EM61MK2, SLAM	Yes
GEO SOP 5	DGM Data Processing for a Person-Portable System	InDepth	Geosoft Software	Yes
GEO SOP 6	DGM Data Processing for a Towed Array System	InDepth	Geosoft Software	Yes
GEO SOP 7	DGM Target Reacquisition using a Person-Portable System	InDepth	Digital Tablet, RTK-GPS, EM61MK2, SLAM	Yes
GEO SOP 8	Geophysical QC	InDepth	Digital Tablet, RTK-GPS (if used), EM61MK2, SLAM	Yes
GEO SOP 9	RTK-GPS	InDepth	RTK-GPS	Yes
GEO SOP 10	SLAM	InDepth	SLAM	Yes
UXO SOP 1	FCA Installation and Use	Ahtna	Digital Tablet, GPS	Yes

SOP Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Is the SOP Specific to this Project? (Yes/No)
UXO SOP 2	Technology-Aided Surface MEC Removal	Ahtna	Digital Tablet, RTK-GPS, GPS, handheld metal detector	Yes
UXO SOP 3	Intrusive Investigation Using Analog Methods	Ahtna	Digital Tablet, RTK-GPS, GPS, handheld metal detector, EM61MK2	Yes
UXO SOP 4	Intrusive Investigation of DGM Targets	Ahtna	Digital Tablet, RTK-GPS, GPS, handheld metal detector, EM61MK2	Yes
UXO SOP 5	MEC and Material Potentially Presenting an Explosive Hazard Management	Ahtna	Digital Tablet, RTK-GPS, GPS	Yes
UXO SOP 6	Demolition of MEC and Material Documented as an Explosive Hazard	Ahtna	Digital Tablet	Yes
UXO SOP 7	Explosives Management	Ahtna	Digital Tablet	Yes
UXO SOP 8	Explosives Sitting	Ahtna	N/A	Yes
UXO SOP 9	Exclusion Zones	Ahtna	N/A	Yes
UXO SOP 10	QC of MEC and Explosives Related Operations	Ahtna	Digital Tablet, RTK-GPS, GPS, handheld metal detector, EM61MK2	Yes

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

4.4 Field Equipment Calibration, Maintenance, Testing and Inspection Table (QAPP Worksheet #22)

The table below identifies the field equipment calibration, maintenance, testing and inspections associated with this project. The MEC QPP (KERMON, 2016b) Worksheet #22 remains applicable.

Field Equipment	Calibration Activity	Frequency	Acceptance Criteria	Corrective Acton	Responsible Person	SOP Reference
Hand-held metal detectors	Standardization	Daily	Per manufacturer's specifications	Fix or replace	Field Team Leader	UXO SOP 1 UXO SOP 2 UXO SOP 3 UXO SOP 4
	Repeatability	Daily	Per manufacturer's specifications	Replace instrument or retrain operator		
Geophysical Instruments (Geonics EM61MK2)	Standardization	Daily	Per Manufactures specifications	Fix or replace	DGM and UXO Team Members	GEO SOP 1 GEO SOP 3 GEO SOP 4 GEO SOP 7 GEO SOP 8 GEO SOP 9 UXO SOP 3 UXO SOP 4
	Repeatability	Daily	**Static Repeatability – Background**: 98% of the daily static background response values (no test object) will not exceed +/- 2 millivolt of expected baseline response (for all EM61MK2 channels).	Replace instrument or retrain operator		
			Static Repeatability – Spike: 98% of the response values to the standard spike test item (a small ISO fixed at an orientation and distance from the sensor to provide an approximately 100 millivolt response on channel 2 of the EM61MK2) will not exceed +/- 10% of the expected baseline response (for all EM61MK2 channels).			
			Dynamic Repeatability (IVS) – Background: 98% of the dynamic background response values during the daily IVS survey will not exceed +/- 3 mV of expected baseline response (for all EM61MK2 channels). **Dynamic Repeatability (IVS) – Spike**: Instrument response to each IVS item will be within +/- 25% or +/- 2 millivolt (whichever is greater) of the expected baseline response (for all EM61MK2 channels). The baseline response for each IVS item will be the average of the instrument responses to that item measured during the first week of IVS surveys.			
			Cable Shake Test. 98% of response values will not exceed +/- 2 millivolt when system cables are moved (for all EM61MK2 channels).			
			Personnel Test (PP EM61MK2 only). 98% of response values (due to proximity of data collection personnel) will not exceed +/- 2 millivolt (for all EM61MK2 channels).			
			Tow Vehicle Test (Towed Array only). 98% of response values (due to elevated tow vehicle RPM) will not exceed +/- 2 millivolt (for all EM61MK2 channels).			

Field Equipment	Calibration Activity	Frequency	Acceptance Criteria	Corrective Acton	Responsible Person	SOP Reference
RTK-GPS	Repeatability	Daily (for DGM related operations)	**GPS Static Position Check**: GPS position checks will not exceed +/- 3 inches (7.6 cm) from the established baseline position.	Replace instrument or retrain operator	GPS Operators (Including DGM Team Members)	FIELD SOP 3 GEO SOP 2 GEO SOP 3 GEO SOP 4 GEO SOP 7 GEO SOP 9
SLAM	Repeatability	Daily (for DGM related operations	**Known Point Static Position Check**: SLAM position checks will not exceed 4 inches (10 cm) from the established known point location.	Replace instrument or retrain operator	DGM and UXO Team Members	GEO SOP 4 GEO SOP 5 GEO SOP 10

Notes: For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

6.0 Data Management and Data Review

This section serves as an update to MEC QAPP Section 6.1 Project Documents and Records Table (QAPP Worksheet #29), Section 6.2 Assessment and Corrective Action (QAPP Worksheets #31, #32, and #33), Section 6.4 Data Verification Procedures (QAPP Worksheet #35), Section 6.5 Data Validation Procedures (QAPP Worksheet #36), and Section 6.6 Data Usability Assessment (QAPP Worksheet #37).

6.1 Project Documents and Records Table (QAPP Worksheet #29)

DGM, Surface and Subsurface MEC Remediation

The table below lists the project documents and records associated with this project. The MEC QAPP (KEMRON, 2016) Worksheet #29 remains applicable.

Document/Record	Generation	Verification	Frequency (generation of document / record)	Where Maintained
Site-Specific Work Plans	Site Project Manager	MMRP Project Manager	As Necessary	Electronic project file to be maintained on SharePoint.
Digital field notes / logbook (if used)	Field Team Leaders	UXOQCS QC Geophysicist	Daily	Hardcopy onsite (if used). Electronic data to be maintained in the Ahtna Database.
Production/Safety/QC Daily Reports	SUXOS UXOSO UXOQCS	Site Project Manager	Daily	Electronic project file to be maintained on SharePoint.
Three Phase QC Inspection Forms	UXOQCS QC Geophysicist	Site Project Manager	As Necessary	Electronic project file to be maintained on SharePoint.
Habitat Checklist Forms	Senior Biologist	UXOQCS	As Necessary	Electronic project file to be maintained on SharePoint.
Bi-weekly Production / Status Report (MMRP Meeting)	SUXOS Site Project Manager	MMRP Project Manager	Bi-weekly (every 2 weeks)	Electronic project file to be maintained on SharePoint.

Document/Record	Generation	Verification	Frequency (generation of document / record)	Where Maintained
BSI Information	UXOQCS QC Geophysicist	SSDM	Daily During QC Seeding Operations	Ahtna Database (limited to QC personnel). Sent to USACE QA Geophysicist and USACE OESS on a weekly basis.
DGM Data (including maps, target lists, data processing logs, QC data, etc.)	Field Geophysicists	QC Geophysicist	Daily During DGM Operations	Electronic data to be maintained on FTP Site
Field Data: Analog Surface Clearance, Target Reacquisition, Analog Intrusive Investigation, DGM Related Intrusive Investigation, Site Feature Data	Field Team Leaders	UXOQCS QC Geophysicist	Daily	Hardcopy onsite (if used) Ahtna Database
MEC / UXO tracking form to include incidental items from activities/locations unrelated to the remedial action	SUXOS	UXOQCS	As Necessary	Electronic project file to be maintained on SharePoint.
Grid summary sheet (analog operations)	SUXOS	UXOQCS	Daily	Electronic project file to be maintained on SharePoint.
MEC disposal checklist	SUXOS	UXOQCS	As Necessary	Electronic project file to be maintained on SharePoint.
Fire risk assessment worksheet	SUXOS[a]	UXOQCS	As Necessary	Electronic project file to be maintained on SharePoint.
MD scrap tracking form	SUXOS	UXOQCS	Daily During scrap sorting operations	Electronic project file to be maintained on SharePoint.

Document/Record	Generation	Verification	Frequency (generation of document / record)	Where Maintained
RCA, CAR, CAP	UXOQCS QC Geophysicist	CQCS	As Necessary	Electronic project file to be maintained on SharePoint.
Field Work Variance	Site Project Manager	MMRP Project Manager	As Necessary	Electronic project file to be maintained on SharePoint. Administrative Record
RAR	Site Project Manager	MMRP Project Manager	As Necessary	Electronic project file to be maintained on SharePoint. Administrative Record

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.
(a) SUXOS is responsible for ensuring the Fire Risk Assessment is conducted by the Presidio of Monterey Fire Department and having a signed form on file.

6.2 Assessments and Corrective Action (QAPP Worksheets #31, #32, and #33)

The three-phase QC inspection process includes the Preparatory, Initial and Follow-up QC inspections. Preparatory phase (PP) QC inspections are to be completed prior to commencement of a DFW. Initial phase (IP) QC inspections are to be completed the first time that a DFW is being conducted. Follow-up phase QC inspections are to be completed as the DFW operation is ongoing.

Procedures for the three-phase QC inspection process, and procedures for the QC of operations associated with the investigation and management of MEC, and other explosives related operations, are located in UXO SOP 10 (MEC QAPP Addendum Attachment B). Procedures for the three-phase QC inspection process and procedures for the QC of geophysical related operations are located in GEO SOP 8 (MEC QAPP Addendum Attachment B).

The table below documents the QC inspection information for each DFW associated with this project. QC inspection checklist for each DFW is included in corresponding SOPs (MEC QAPP Addendum Attachment B). MPCs for each DFW are listed in Worksheet #12 of this MEC QAPP Addendum. Note that the SOP and QC checklist for sifting operations will be generated only when this DFW is to be used. Sifting operations will depend on a variety of site and operational specific details. The feature classes in the GIS enterprise geodatabase have been updated since the publication of the MEC QAPP (KEMRON, 2016). The BRAC GIS Manager maintains the current featured class list. The MMRP Database and all hosting software are now being hosted on the cloud servers by the BRAC GIS Manager. All backups and data validation are performed by the BRAC GIS Manager. The MEC QAPP (KEMRON, 2016) Worksheets #31, #32, and #33 remain applicable.

DFW	Type of Inspection to be Used	Reference	Forms Used	Inspection to be Completed By	Follow-up Phase QC Inspection Frequency	Verify the following	Corrective Action Criteria
Field Data Management	PP, IP, FP inspections. Additional FP inspections as necessary.	DATA SOP 1	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS (or designee)	Weekly or as necessary	• Operations are in accordance with the Field Data Management SOP (MEC QAPP Addendum, Attachment B DATA SOP 1). • Authorize access to BSI data as described in the Blind Seed Firewall Plan (MEC QAPP Addendum – Attachment A)	• Operations not in accordance with SOP • Authorization access not compliant with Blind Seed Firewall Plan
GIS Data Management	PP, IP, FP inspections. Additional FP inspections as necessary.	DATA SOP 2	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	CQCS (or designee)	Weekly or as necessary	Operations are in accordance with the GIS Data Management SOP (MEC QAPP Addendum, Attachment B DATA SOP 2).	Operations not in accordance with SOP
MMRP Data Management	PP, IP, FP inspections. Additional FP inspections as necessary.	DATA SOP 3	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS (or designee)	Weekly or as necessary	Operations are in accordance with the MMRP Data Management SOP (MEC QAPP Addendum, Attachment B DATA SOP 3).	Operations not in accordance with SOP
DGM Data Transfer to BRAC	PP, IP, FP inspections. Additional FP inspections as necessary.	DATA SOP 4	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	QC Geophysicist	Weekly or as necessary	Operations are in accordance with the DGM Data Transfer to BRAC SOP (MEC QAPP Addendum, Attachment B DATA SOP 4)	Operations not in accordance with SOP
Field Documentation	PP, IP, FP inspections. Additional FP inspections as necessary.	FIELD SOP 1	PP, IP, FP check sheets, QC surveillance	Site Project Manager (or designee)	Weekly or as necessary	Field Documentation is completed in accordance with the Field Documentation SOP (MEC	Operations not in accordance with SOP

DFW	Type of Inspection to be Used	Reference	Forms Used	Inspection to be Completed By	Follow-up Phase QC Inspection Frequency	Verify the following	Corrective Action Criteria
			form, CAR, CAP			QAPP Addendum, Attachment B FIELD SOP 1)	
Environmental Protection	PP, IP, FP inspections. Additional FP inspections as necessary.	FIELD SOP 2	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCs (or designee)	Weekly or as necessary	Operations are completed in accordance with the Environmental Protection SOP (MEC QAPP Addendum, Attachment B FIELD SOP 2)	Operations not in accordance with SOP
Grid and Border Survey	PP, IP, FP inspections. Additional FP inspections as necessary.	FIELD SOP 3	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS (or designee)	Weekly or as necessary	Operations are completed in accordance with the Grid and Border Survey SOP (MEC QAPP Addendum, Attachment B FIELD SOP 3)	Operations not in accordance with SOP
Vegetation Removal	PP, IP, FP inspections. Additional FP inspections as necessary.	FIELD SOP 4	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS (or designee)	Weekly or as necessary	Operations are completed in accordance with the Vegetation Removal SOP (MEC QAPP Addendum, Attachment B FIELD SOP 4)	Operations not in accordance with SOP
IVS Installation and Use	PP, IP, FP inspections. Additional FP inspections as necessary.	GEO SOP 1	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	QC Geophysicist (or designee)	Once during IVS installation Weekly or as necessary for IVS use	Operations are completed in accordance with the IVS Installation and Use SOP (MEC QAPP Addendum, Attachment B GEO SOP 1)	Operations not in accordance with SOP
BSI Installation	PP, IP, FP inspections. Additional FP inspections as necessary.	GEO SOP 2 Blind Seed Firewall Plan	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	QC Geophysicist / UXOQCS (or designee)	Weekly or as necessary	• Operations are completed in accordance with the BSI Installation SOP (MEC QAPP Addendum, Attachment B GEO SOP 2). • Integrity of BSI data is in compliance with the	Operations not in accordance with SOP

DFW	Type of Inspection to be Used	Reference	Forms Used	Inspection to be Completed By	Follow-up Phase QC Inspection Frequency	Verify the following	Corrective Action Criteria
						Blind Seed Firewall Plan (MEC QAPP Addendum Attachment A)	
DGM using a Person-Portable System	PP, IP, FP inspections. Additional FP inspections as necessary.	GEO SOP 3	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	QC Geophysicist	Weekly or as necessary	Operations are completed in accordance with the DGM using a PP System SOP (MEC QAPP Addendum, Attachment B GEO SOP 3)	Operations not in accordance with SOP
DGM using a Towed Array System	PP, IP, FP inspections. Additional FP inspections as necessary.	GEO SOP 4	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	QC Geophysicist	Weekly or as necessary	Operations are completed in accordance with the DGM using a Towed Array System SOP (MEC QAPP Addendum, Attachment B GEO SOP 4)	Operations not in accordance with SOP
DGM Data Processing for a Person- Portable system	PP, IP, FP inspections. Additional FP inspections as necessary.	GEO SOP 5	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	QC Geophysicist	Weekly or as necessary	Operations are completed in accordance with the DGM Data Processing for a PP System SOP (MEC QAPP Addendum, Attachment B GEO SOP 5)	Operations not in accordance with SOP
DGM Data Processing for a Towed Array System	PP, IP, FP inspections. Additional FP inspections as necessary.	GEO SOP 6	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	QC Geophysicist	Weekly or as necessary	Operations are completed in accordance with the DGM Data Processing for a Towed Array System SOP (MEC QAPP Addendum, Attachment B GEO SOP 6)	Operations not in accordance with SOP
DGM Target Reacquisition using a PP System	PP, IP, FP inspections. Additional FP inspections as necessary.	GEO SOP 7	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	QC Geophysicist	Weekly or as necessary	Operations are completed in accordance with the DGM Target Reacquisition using a PP System SOP (MEC QAPP Addendum, Attachment B GEO SOP 7)	Operations not in accordance with SOP

DFW	Type of Inspection to be Used	Reference	Forms Used	Inspection to be Completed By	Follow-up Phase QC Inspection Frequency	Verify the following	Corrective Action Criteria
FCA Installation and Use	PP, IP, FP inspections. Additional FP inspections as necessary.	UXO SOP 1	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS (or designee)	Once during FCA installation Weekly or as necessary for FCA use	Operations are completed in accordance with the FCA Installation and Use SOP (MEC QAPP Addendum, Attachment B UXO SOP 1)	Operations not in accordance with SOP
Technology-Aided Surface MEC Removal	PP, IP, FP inspections. Additional FP inspections as necessary.	UXO SOP 2	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS	Weekly or as necessary	Operations are completed in accordance with the Technology- Aided Surface MEC Removal SOP (MEC QAPP Addendum, Attachment B UXO SOP 2)	Operations not in accordance with SOP
Intrusive Investigation using Analog Methods	PP, IP, FP inspections. Additional FP inspections as necessary.	UXO SOP 3	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS	Weekly or as necessary	Operations are completed in accordance with the Intrusive Investigation using analog methods SOP (MEC QAPP Addendum, Attachment B UXO SOP 3)	Operations not in accordance with SOP
Intrusive Investigation of DGM Targets	PP, IP, FP inspections. Additional FP inspections as necessary.	UXO SOP 4	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS	Weekly or as necessary	Operations are completed in accordance with the Intrusive Investigation of DGM Targets SOP (MEC QAPP Addendum, Attachment B UXO SOP 4)	Operations not in accordance with SOP
MEC and MPPEH Management	PP, IP, FP inspections. Additional FP inspections as necessary.	UXO SOP 5	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS	Weekly or as necessary	Operations are completed in accordance with the MEC and MPPEH Management SOP (MEC QAPP Addendum, Attachment B UXO SOP 5)	Operations not in accordance with SOP
Demolition of MEC and MPPEH	PP, IP, FP inspections. Additional FP inspections as necessary.	UXO SOP 6	PP, IP, FP check sheets, QC surveillance	UXOQCS	Per event or as necessary	Operations are completed in accordance with the Demolition of MEC and MPPEH SOP (MEC QAPP	Operations not in accordance with SOP

DFW	Type of Inspection to be Used	Reference	Forms Used	Inspection to be Completed By	Follow-up Phase QC Inspection Frequency	Verify the following	Corrective Action Criteria
			form, CAR, CAP			Addendum, Attachment B UXO SOP 6)	
Explosives Management	PP, IP, FP inspections. Additional FP inspections as necessary.	UXO SOP 7	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS	Weekly or as necessary	Operations are completed in accordance with the Explosives Management SOP (MEC QAPP Addendum, Attachment B UXO SOP 7)	Operations not in accordance with SOP
Explosives Siting	PP, IP, FP inspections. Additional FP inspections as necessary.	UXO SOP 8	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS	Per event or as necessary	Operations are completed in accordance with the Explosives Siting SOP (UXO SOP 8)	Operations not in accordance with SOP
Exclusion Zones	PP, IP, FP inspections. Additional FP inspections as necessary.	UXO SOP 9	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS (or designee)	Per event or as necessary	Operations are completed in accordance with the Exclusion Zones SOP (UXO SOP 9)	Operations not in accordance with SOP
Sifting Operations	PP, IP, FP inspections. Additional FP inspections as necessary.	TBD	PP, IP, FP check sheets, QC surveillance form, CAR, CAP	UXOQCS (or designee)	Weekly or as necessary	Operations are completed in accordance with the Sifting Operations SOP (TBD)	Operations not in accordance with SOP

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

6.4 Data Verification Procedures (QAPP Worksheet #35)

This worksheet documents procedures that will be used to verify project data associated with this project. It applies to both field and digital data. Data verification is a completeness check to confirm that all required activities were conducted, all specified records are present, and the contents of the records are complete. The MEC QAPP (KEMRON, 2016) Worksheet #35 remains applicable.

Records Reviewed	Requirement Documents	Process Description	Responsible for Verification (Frequency, Title)
FADL	MEC QAPP Addendum	Verify that FADL forms are present and complete for each day of field activities. Verify that all activities (including QC) are documented. Verify that changes to equipment / personnel / operations are documented and were reported in accordance with required standards.	Weekly Site Project Manager (or designee)
Field Data Forms (digital)	MEC QAPP Addendum	Verify that data for each form has been filled out properly and are complete.	Weekly UXOQCS, QC Geophysicist
Daily Safety Reports	MEC QAPP Addendum APP/SSHP	Verify that all planned safety audits were conducted. Review safety audit surveillances, inspections and reports. If deficiencies are noted verify that corrective action was implemented according to the CAR (and CAP if generated) that was generated for each deficiency / non-conformance.	Daily UXOSO
Daily QC Reports	MEC QAPP Addendum	Verify that all planned QC audits were conducted. Review QC audit surveillances, inspections, checklists and reports. If deficiencies are noted verify that corrective action was implemented according to the CAR that was generated for each deficiency / non-conformance.	Daily Site Project Manager (or designee)
DGM Survey and QC Data	MEC QAPP Addendum	Verify that the DGM operation (system) met the performance criteria for all days that DGM data was collected. Verify that all DGM data meets requirements in the QAPP. Verify that all DGM IVS metrics described in Worksheet #12 of this MEC QAPP Addendum have been met and that all BSIs have been located within metrics described in Worksheet #12.	Daily QC Geophysicist

Records Reviewed	Requirement Documents	Process Description	Responsible for Verification (Frequency, Title)
Intrusive Investigation Data	MEC QAPP Addendum	Verify that the intrusive investigation data has been filled out properly and is complete.	Daily UXOQCS
MEC Data	MEC QAPP Addendum	Verify that all recovered MEC items are documented in the Ahtna Database, including final disposition and date destroyed.	As Necessary UXOQCS (or designee)
RCA and CARs	MEC QAPP Addendum	Verify that corrective actions were implemented for each deficiency / non-conformance noted according to the CAR.	As Necessary CQCS (or designee)

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

6.5 Data Validation Procedures (QAPP Worksheet #36)

This worksheet lists the inputs that will be used during data validation associated with this project. Data validation is the evaluation of conformance to stated requirements, including those in the contract, MEC QAPP Addendum and associated SOPs. The MEC QAPP (KEMRON, 2016) Worksheet #36 remains applicable.

Inputs	Records Reviewed	Process Description	When is Validation Performed	Responsible for Validation (Title)
MEC QAPP Addendum and associated SOPs	FADL	Validate that the FADL Form conforms to requirements.	Every 6 months	Site Project Manager (or designee)
MEC QAPP Addendum and associated SOPs	Field Data Forms (digital)	Validate that all field data forms (digital) conform to requirements.	Every 6 months	UXOQCS, QC Geophysicist

Inputs	Records Reviewed	Process Description	When is Validation Performed	Responsible for Validation (Title)
MEC QAPP Addendum and associated SOPs	Daily Safety Reports	Validate that the Daily Safety Report conforms to requirements.	Every 6 months	UXOSO
MEC QAPP Addendum and associated SOPs	Daily QC Reports	Validate that the Daily QC Report conforms to requirements.	Every 6 months	Site Project Manager (or designee)
MEC QAPP Addendum and associated SOPs	DGM Survey and QC Data	Validate that the DGM Survey and QC Data (including the IVS report, IVS data and BSI data) conform to requirements. If all IVS and BSI MQO metrics are met, then the data has been verified and validated and is usable.	Every 6 months	QC Geophysicist
MEC QAPP Addendum and associated SOPs	Intrusive Investigation Data	Validate that all intrusive investigation data conform to requirements.	Every 6 months	UXOQCS
MEC QAPP Addendum and associated SOPs	MEC Data	Validate that all data relating to MEC conforms to requirements.	Every 6 months	UXOQCS (or designee)
MEC QAPP Addendum and associated SOPs	RCAs, CARs, CAPs.	Validate that all RCA, CAR and CAP data conform to requirements.	Every 6 months	CQCS (or designee), UXOQCS, QC Geophysicist

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

6.6 Data Usability Assessment (QAPP Worksheet #37)

This worksheet documents the procedures associated with this project that will be used to perform the data usability assessment and involves a qualitative and quantitative evaluation of the collected data to determine if the project data are of the right type, quality, and quantity to support the decisions that need to be made. It involves a retrospective review of the systematic planning process to evaluate whether underlying assumptions are supported, sources of uncertainty have been managed appropriately, data are representative of the population of interest, and the results can be used as intended, with an acceptable level of confidence. The MEC QAPP (KEMRON, 2016) Worksheet #37 remains applicable.

Personnel responsible for participating in the data usability assessment preparation or review for this project are as follows:

Name	Title	Organization	Role in Usability Assessment
Kevin Siemann	Project Manager Forward	USACE	Reviewer
James Britt	OESS	USACE	Reviewer
Kyle Lindsay	QA Geophysicist	USACE	Reviewer
Bruce Wilcer	CQCS	Ahtna	Preparation
Linda Temple	MMRP Project Manager	Ahtna	Preparation
Noel Handley	Site Project Manager	Ahtna	Preparation
Bruce Moe	SUXOS	Ahtna	Preparation
Bruce McClain	UXOQCS	Ahtna	Preparation
TBD	UXOSO	Ahtna	Preparation
Shaelyn Hession	GIS Manager	Ahtna	Preparation
Penny Johnson	SSDM	NAEVA	Preparation
Brian Hecker	Senior Geophysicist	InDepth	Preparation
Trevor Smith	QC Geophysicist	InDepth	Preparation

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

Documents and data to be used as input to the data usability assessment:

- QAPP
- Contract Specifications
- Daily / Weekly QC reports and QC inspection forms/data
- CARs
- IVS Report
- IVS Data
- BSI data

The data usability report will be included as an Appendix to the Final Report for each Unit. The steps used in performing the data usability assessment will include the following:

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

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Attachments

Attachment A. Blind Seed Firewall Plan

Blind Seed Firewall Plan
Attachment A to the Addendum to the Final Quality Assurance Project Plan, Volume II, Appendix A

Munitions and Explosives of Concern Remedial Action
Former Fort Ord, California

Prepared for:

U.S. Department of the Army
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Prepared by:

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USACE Contract No.	W9123824D0002
Delivery Order:	W9123824F0055 (TO #1)
Date	March 2025
Version	Draft

Introduction

This Blind Seed Firewall Plan has been developed for the Remedial Action being performed at the former Fort Ord under Contract W9123824D0002, Delivery Order: W9123824F0055 (TO #1). This plan describes the procedures and methodologies that will be used to create a "firewall" between project personnel that require access to blind seed item (BSI) information and those who are initially denied access because granting them access to this information would compromise the integrity of various project operations.

Data Access

Personnel involved with the following operations will be firewalled from having access to BSI information until the following tasks have been completed for an entire unit: technology-aided surface Munitions and Explosives of Concern removal, the collection of Digital Geophysical Mapping (DGM) data, DGM data processing, DGM target reacquisition and intrusive investigation activities (analog and DGM related). BSI information will be made available to these teams only after permission to share this information has been granted by the U.S. Army Corps of Engineers (USACE). The following personnel are the only members of the team who will have initial access to BSI information:

- Land Survey personnel (if used)
- Ahtna Global, LLC- Unexploded Ordnance Quality Control Specialist (UXOQCS)
- InDepth – Quality Control (QC) Geophysicist
- NAEVA – Site Specific Data Manager (SSDM)

Information Transfer/Storage

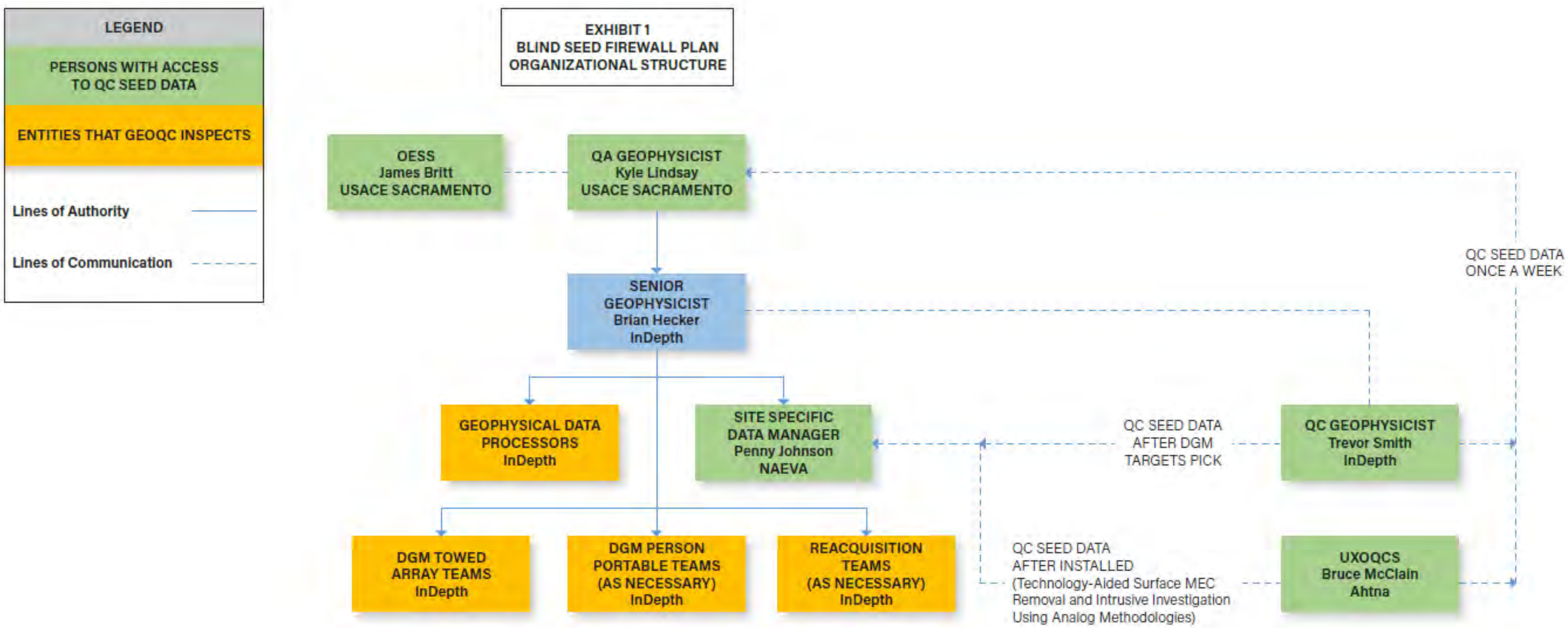
Upon placement of the BSIs the UXOQCS and QC Geophysicist will digitally record the following information for each BSI:

- BSI unique identification number
- Seed Type (Inert ordnance or industry standard object)
- Nomenclature (if inert ordnance)
- Diameter (if inert ordnance)
- Length (if inert ordnance)
- Max Depth (if inert ordnance)
- Depth of BSI (center of mass) [if buried]
- Date Installed
- GPS coordinate - or X,Y position from the southwest corner stake (if using tape measures)

BSI information related to the Technology-Aided Surface MEC Removal operation and the Intrusive Investigation using Analog Methodologies will be provided to the SSDM by the UXOQCS. BSI information related to DGM operations will be transferred to the SSDM by the QC Geophysicist only after the DGM data has been processed and targets have been generated. The SSDM will store this information in a protected database (Ahtna Database). The SSDM will review and analyze the BSI information and will inform the QC staff of the status of BSIs daily. Should a BSI be missed by one of the various operations the QC staff will contact USACE to get permission to release information for the missed BSI to the appropriate team so that a root-cause analysis can then be conducted as part of the corrective action process. BSI information will be sent to the USACE QA Geophysicist and Ordnance and Explosives Safety Specialist weekly. The organizational structure for this Blind Seed Firewall Plan is included as Exhibit 1 of this plan.

Firewall Compliance

All staff identified in this document, or others added with USACE's permission, will be required to provide a written (signed) commitment to comply with the requirements established in this document. These signatures of compliance will be kept on record by the Ahtna Site Project Manager and added to the project files.


LEGEND
PERSONS WITH ACCESS TO QC SEED DATA
ENTITIES THAT GEOQC INSPECTS
Lines of Authority
Lines of Communication
EXHIBIT 1
BLIND SEED FIREWALL PLAN
ORGANIZATIONAL STRUCTURE
OESS
James Britt
USACE SACRAMENTO
QA GEOPHYSICIST
Kyle Lindsay
USACE SACRAMENTO
QC SEED DATA ONCE A WEEK
SENIOR GEOPHYSICIST
Brian Hecker
InDepth
GEOPHYSICAL DATA PROCESSORS
InDepth
SITE SPECIFIC DATA MANAGER
Penny Johnson
NAEVA
QC SEED DATA AFTER DGM TARGETS PICK
QC GEOPHYSICIST
Trevor Smith
InDepth
DGM TOWED ARRAY TEAMS
InDepth
DGM PERSON PORTABLE TEAMS (AS NECESSARY)
InDepth
REACQUISITION TEAMS (AS NECESSARY)
InDepth
QC SEED DATA AFTER INSTALLED (Technology-Aided Surface MEC Removal and Intrusive Investigation Using Analog Methodologies)
UXOQCS
Bruce McClain
Ahtna

Attachment B. Standard Operating Procedures

LIST OF SOPs

DATA SOP 1 – FIELD DATA MANAGEMENT
DATA SOP 2 – GIS DATA MANAGEMENT
DATA SOP 3 – MMRP DATA MANAGEMENT (Post Migration)
DATA SOP 4 – DGM DATA TRANSFER TO BRAC
FIELD SOP 1 – FIELD DOCUMENTATION
FIELD SOP 2 – ENVIRONMENTAL PROTECTION
FIELD SOP 3 – GRID AND BORDER SURVEY
FIELD SOP 4 – VEGETATION REMOVAL
GEO SOP 1 – IVS INSTALLATION AND USE
GEO SOP 2 – BLIND SEED ITEM INSTALLATION
GEO SOP 3 – DGM USING A PERSON-PORTABLE SYSTEM
GEO SOP 4 – DGM USING A TOWED ARRAY SYSTEM
GEO SOP 5 – DGM DATA PROCESSING FOR A PERSON-PORTABLE SYSTEM
GEO SOP 6 – DGM DATA PROCESSING FOR A TOWED ARRAY SYSTEM
GEO SOP 7 – DGM TARGET REACQUISITION USING A PERSON-PORTABLE SYSTEM
GEO SOP 8 – GEOPHYSICAL QUALITY CONTROL
GEO SOP 9 – RTK-GPS POSITIONING SYSTEMS
GEO SOP 10 – SIMULTANEOUS LOCALIZATION AND MAPPING (SLAM) POSITIONING SYSTEM
UXO SOP 1 – FCA INSTALLATION AND USE
UXO SOP 2 – TECHNOLOGY-AIDED SURFACE MEC REMOVAL
UXO SOP 3 – INTRUSIVE INVESTIGATION USING ANALOG METHODS
UXO SOP 4 – INTRUSIVE INVESTIGATION OF DGM TARGETS
UXO SOP 5 – MEC AND MPPEH MANAGEMENT
UXO SOP 6 – DEMOLITION OF MEC AND MPPEH
UXO SOP 7 – EXPLOSIVES MANAGEMENT
UXO SOP 8 – EXPLOSIVES SITING
UXO SOP 9 – EXCLUSION ZONES
UXO SOP 10 – QC OF TASKS RELATED TO THE INVESTIGATION AND MANAGEMENT OF MEC, AND OTHER EXPLOSIVES-RELATED OPERATIONS

SOP 1
FIELD DATA MANAGEMENT

STANDARD OPERATING PROCEDURE FOR FIELD DATA MANAGEMENT

DATA SOP 1

Original Issue Date: August 2016

Last Review/Implementation Date: January 2025

NAEVA, Inc.

3343 Mineral Drive, Earlysville, VA 22936

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LIST OF APPENDICES

Appendix A: SOP Signature Page

Appendix B: Three Phase Checklist

LIST OF ACRONYMS

BSI	Blind Seed Item
DGM	Digital Geophysical Mapping
FCA	Function Check Area
FTP	File Transfer Protocol
GPS	Global Positioning System
ID	Identification
IVS	Instrument Verification Strip
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MPPEH	Material Potentially Presenting an Explosive Hazard
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RRD	Range Related Debris
SOP	Standard Operating Procedure
SSDM	Site Specific Data Manager
UXOQCS	Unexploded Ordnance Quality Control Specialist

1 Policy

Ahtna and subcontractor personnel will follow procedures established in this Standard Operating Procedure (SOP) for all Site Specific Data Manager (SSDM) operations that are to be conducted in support of Munitions and Explosives of Concern (MEC) remediation projects.

2 Purpose

The purpose of this SOP is to provide standardized procedures for the management and internal quality control (QC) of data gathered during field operations which is then cataloged and stored in the Microsoft Access field database. Procedures outlined in this SOP will be conducted in accordance with the MEC Quality Assurance Project Plan (QAPP) Addendum.

3 Scope

This SOP provides technical guidance on the daily gathering of field data as it relates to Military Munitions Response Program (MMRP) operations including, but not limited to, the following operations:

- Field Documentation;
- Environmental Protection;
- Grid and Border Survey;
- Vegetation Removal;
- Instrument Verification Strip (IVS) installation, use, and related data;
- Blind Seed Items (BSIs) installation and related data;
- Digital Geophysical Mapping (DGM) [data collection and data processing];
- DGM Target Reacquisition;
- Geophysical Quality Control (QC);
- Function Check Area (FCA) Installation, use, and related data;
- Technology-Aided Surface MEC Removal;
- Intrusive Operations;
- MEC and Material Potentially Presenting an Explosive Hazard (MPPEH) management;
- Demolition of MEC and MPPEH;
- QC of MEC and explosives related operations; and
- Quality Assurance (QA).

This document is not intended to contain all requirements needed to ensure the proper management of project data but should be used in conjunction with the documents listed in the reference section below. Data formats will be consistent with those already existing in the Fort Ord MMRP Database.

4 Maintenance

NAEVA personnel are responsible for the maintenance of this SOP.

5 Responsibilities

Ahtna and subcontractor personnel are required to follow the procedures specified in this SOP during the performance of all field data management operations. The SSDM is required to sign off that they have read and understand this SOP prior to beginning field work.

6 Personnel

All field Team Leaders are responsible for the generation of field data. The SSDM is responsible for the input of this data into the field database and management of the field database. See MEC QAPP Addendum, Attachment B DATA SOP 3 – MMRP Data Management (Post Migration).

7 Equipment

- Digital Tablet

8 Types of Data

The following data types listed below represent a sampling of the information that will be digitally recorded on field tablet forms and otherwise incorporated into the field database:

- Surface Clearance and/or Analog Investigation data may include (but are not limited to) anomaly information as it relates to MEC, MPPEH, Munitions Debris (MD), Range Related Debris (RRD), BSIs, or cultural items located during the investigation. Positional information may be in the form of Global Positioning System (GPS) data or local coordinates.
- DGM data collection may include (but are not limited to) function test (static, IVS, geodetic functionality), documentation, dataset identification (ID), locations covered, surface conditions, weather, obstacles encountered, battery voltage, team and personnel ID, file names, and coordinate system.
- DGM data processing information may include (but are not limited to) data processor ID, data correction parameters (leveling, lag correction, filtering), EM61-MK2 channel selected for analysis, gridding parameters, target selection methodology including targeting threshold, and any comments that might prove helpful during the intrusive process.
- DGM target reacquisition data may include (but are not limited to) anomaly information such as the unique ID, original location, offset from original location, reacquired response, and comments that might prove helpful during the intrusive process.
- Intrusive Investigation data may include (but are not limited to) anomaly information as it relates to MEC, MPPEH, MD, RRD, BSIs, or cultural items located during the intrusive investigation, and investigation related QC data. Positional information may be in the form of GPS or local coordinates.
- DGM related BSI data are to be recorded in accordance with the Blind Seed Firewall Plan (MEC QAPP Addendum – Attachment A) and are to initially be managed by the QC Geophysicist. DGM related BSI data will not be made available to the SSDM until after the QC Geophysicist has identified as to whether the DGM related BSI(s) match (or do not match) anomalies in the DGM target list. BSI information related to analog operations will be forwarded directly to SSDM on a daily basis by the Unexploded Ordnance Quality Control Specialist (UXOQCS) as they are installed. The SSDM will safeguard the integrity of both the DGM and analog BSI information by keeping this BSI information external to the field database and will not release it (except to United States Army Corpe of Engineers) until the investigation (surface sweep or intrusive) for that unit/area has been completed and an assessment of the status of the BSIs has been made and documented by QC personnel.
- Other items to be tracked include data for sifting operations, MEC and MPPEH management, Demolition of MEC and MPPEH, areas with high slope and/or inaccessible areas, and/or other items of interest that are to be used for the Basewide Range Assessment.

- QC information such as daily instrument test results, BSIs, Anomaly Resolution, QC inspection results, geodetic equipment functionality, Geodetic Accuracy, etc. are also maintained in the field database.

9 Procedures

The primary method of collecting field data will be through the use of digital tablets assigned to each field team that are pre-loaded with forms designed to capture all of the information pertinent to that activity. These forms are administered by the SSDM using the Pendragon Forms web application. The form templates are stored in Structured Query Language Cloud Tables and can be assigned remotely to the appropriate tablet in advance. At the end of each field day, information gathered in the forms is synchronized directly to the Cloud Tables. The data is subsequently downloaded from the Cloud Tables via Open Database Connectivity connection into the field database where it is immediately reviewed for accuracy and completeness by the SSDM. In general, the SSDM will be responsible for performing the following tasks on a daily basis:

- Verify time/date status on tablets and distribute to field teams;
- Perform tablet user proficiency training as necessary;
- Update operations status information in database;
- Create updated field Status Maps and distribute as appropriate;
- Track status of QC BSIs and send notifications as appropriate;
- Track demolition items (currently awaiting demo, or have been demolished);
- Create updated forms in Pendragon for distribution to tablets at the end of the field day;
- At end of day, receive all completed forms entries from field teams and synchronize the Cloud Tables with the field database;
- Perform internal QC review of all new information received from field forms;
- Merge new information received from off-site DGM data processors and QC review of new information;
- After completing all daily QC reviews, upload new copy of the master field database to project File Transfer Protocol (FTP) site (or similar location);
- Send email summary of daily progress to appropriate parties; and
- Periodically, at least weekly, export the field database contents and submit for inclusion in the Fort Ord MMRP Database

10 Database QC and Archiving

All data uploaded to the field database will be reviewed for appropriateness, quality, and completeness by the SSDM on a daily basis. After this initial QC review, the field database will be uploaded to the project FTP site for storage and to allow access to other project personnel. Appropriate QC personnel (UXOQCS, QC Geophysicist, etc.) will also perform regular QC reviews and inspections of all aspects of the field database that pertain to their specific operations. Once all QC checks have been performed, a minimum of once per week, the updated field database contents will be exported in the appropriate format for QA review and ultimate inclusion into the Fort Ord MMRP Database (external operation). The SSDM will be responsible for performing all field database updates and edits requested by QC and QA personnel and by other project staff that relate to the field database.

Inspection checklists specific to this SOP are located at the end of this SOP. Measurement Performance Criteria for Field Data Management can be found in Worksheet #12 of the MEC QAPP Addendum. See Worksheet #31, 32, 33 of the MEC QAPP Addendum for a description of who will conduct the QC inspection for this Definable Feature of Work and the frequency of the Follow-up Phase QC inspections.

11 Associated SOPs

- FIELD SOP 1 – Field Documentation
- FIELD SOP 2 – Environmental Protection
- FIELD SOP 3 – Grid and Border Survey
- FIELD SOP 4 – Vegetation Removal
- GEO SOP 1 – IVS Installation and Use
- GEO SOP 2 – Blind Seed Item Installation
- GEO SOP 3 – DGM Using a Person-Portable System
- GEO SOP 4 – DGM Using a Towed Array System
- GEO SOP 5 – DGM Data Processing Using a Person-Portable System
- GEO SOP 6 – DGM Data Processing Using a Towed Array System
- GEO SOP 7 – DGM Target Reacquisition Using a Person-Portable System
- GEO SOP 8 – Geophysical QC
- GEO SOP 9 – Real-time Kinematic GPS Positioning System
- GEO SOP 10 – Simultaneous Localization and Mapping Positioning System
- UXO SOP 1 – FCA Installation and Use
- UXO SOP 2 – Technology-Aided Surface MEC Removal
- UXO SOP 3 – Intrusive Investigation using Analog Methods
- UXO SOP 4 – Intrusive Investigation of DGM Targets
- UXO SOP 5 – MEC and MPPEH management
- UXO SOP 6 – Demolition of MEC and MPPEH
- UXO SOP 10 – QC of MEC and Explosives Related Operations

12 References

USACE, 2024. EM 200-1-15 – Environmental Quality Technical Guidance for Military Munitions Response Actions

Appendix A: SOP Signature Page

The following persons have read and understand this SOP:

Signature:	Date:

Three-Phase Quality-Control Checklist

Project Information
DATA SOP 1 – Field Data Management
Contract and Task Order:
Site:

Team Information		
Data Manager:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	Section Reference	Inspection Point	Yes	No	N/A	Comments
1	Signature Page	Verify that all personnel have signed the SOP Signature Page				*(P)*
2	2.0	Verify Microsoft Access is being used to develop and manage the database				*(P)*
3	9.0	Verify Pendragon Forms is being used to develop and manage the data acquisition forms				*(P)*
4	7.0	Digital tablets have been acquired for all field teams				*(P)*
5	9.0	Field forms for the day have been distributed to the appropriate tablets				*(I),(F)*
6	9.0	Tablet user proficiency training has been performed				*(I),(F)*
7	9.0	Status information has been updated in the field database				*(I),(F)*
8	9.0	Field status maps have been created and distributed as appropriate				*(I),(F)*
9	9.0	Blind Seeds have been checked for recovery, as appropriate. Notifications sent.				*(I),(F)*
10	9.0	Demo items have been checked for complete and accurate information				*(I),(F)*
11	9.0	Field materials (maps, targets lists, etc.) have been assembled for grids that have moved to a new status				*(I),(F)*
12	9.0	Updated forms have been created for the next day's work, as appropriate				*(I),(F)*
13	9.0	All daily forms with new information have been reviewed (internal QC review) and synchronized with the field database at the end of the day.				*(I),(F)*

Checklist						
Item	Section Reference	Inspection Point	Yes	No	N/A	Comments
14	9.0	New information from off-site data processors has been reviewed and synchronized with the field database				*(I),(F)*
15	9.0	An updated copy of the field database has been uploaded to the project FTP site				*(I),(F)*
16	9.0	Daily progress email has been sent to the appropriate parties				*(I),(F)*
17	9.0	Weekly export has been created for updating the Fort Ord MMRP Database				*(I),(F)*

Punch list Items	
No.	

Conducted by: ________________________________ DATE: ______________________________

Approved by: ________________________________ DATE: ______________________________

DATA SOP 2
GIS DATA MANAGEMENT

Technical Procedure: DATA SOP 2

STANDARD OPERATING PROCEDURE FOR GIS DATA MANAGEMENT

Original Issue Date: August 2016

Last Review/Implementation Date: January 2025

Ahtna Global, LLC

9699 Blue Larkspur Lane, Monterey, CA 93940

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF ACRONYMS

BRAC	Base Realignment and Closure
DGM	Digital Geophysical Mapping
ESRI	Environmental Sciences Research Institute
FODIS	Fort Ord Data Integration System
GIS	Geographic Information System
GPS	Global Positioning System
ID	Identification
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MR	Munitions Response
MRA	Munitions Response Area
NAD	North American Datum
NAVD	North American Vertical Datum
OE	Ordnance and Explosives
RA	Remedial Action
RTK	Real-time Kinematic
SDSFIE	Spatial Data Standards for Facilities, Infrastructure, and the Environment.
SOP	Standard Operating Procedure
SQL	Structured Query Language
tiff	Tagged Image File Format

1. POLICY

Ahtna and subcontractor personnel will follow procedures established in this Standard Operating Procedure (SOP) for all work related to Geographic Information System (GIS) data management. This SOP must be distributed to, and signed by all personnel performing GIS data management, and must be adhered to as GIS activities are being performed.

2. PURPOSE

The purpose of this SOP is to provide an overview and standards for the management and delivery of GIS data related to the Munitions Response (MR) Remedial Action (RA) activities that are to be conducted at the former Fort Ord. This SOP does not detail the use of the equipment that is described herein. This SOP assumes that experienced personnel that will be using this SOP are familiar with the equipment and are competent in their use.

3. SCOPE

This scope of this SOP is to provide technical information and guidance on the procedures to be used for GIS data usage, storage, tracking, management and delivery of GIS data as it relates to the MR RA operations that are to be conducted at the former Fort Ord. Specifically, the GIS will be used to produce figures/maps to support project reports, and to document physical progress of MR related field activities, typically shown visually on maps, with percent complete being reported in tabular form. The GIS data will also be used to provide web based mapping services for the two project websites: Fort Ord Data Integration System (FODIS).net, and the public web site (FortOrdCleanup.com).

The GIS provides an efficient mechanism for inputting, tracking and retrieving MR related information for the use of technical evaluation, ongoing removal efforts, reporting, and ultimately to assist in the efficient transfer and reuse of land parcels at the former Fort Ord. The master repository of the geospatial electronic files documenting the MR related field activities will be managed and maintained by the Base Realignment and Closure (BRAC) GIS Manager.

This SOP is not intended to be used on other projects.

4. MAINTENANCE

The Ahtna GIS Manager is responsible for the maintenance of this SOP.

5. PROCEDURES

This SOP describes the following GIS standards and operations to be used on the Fort Ord project:

- GIS Software
- GIS Data Standards
- GIS Data File Standards
- Geospatial Data Types
- GIS Data Feature Classes

5.1 GIS Software

The Fort Ord GIS project uses Environmental Sciences Research Institute (ESRI) GIS software, which includes ArcGIS Pro and other related extensions such as Spatial and 3D Analyst.

5.2 GIS Data Standards

5.2.1 Geospatial Data Standards

Spatial Data Standards for Facilities, Infrastructure, and the Environment (SDSFIE) shall be used, where applicable. The standard is currently being used in the fort_ord.gdb file geodatabase and shall continue to be used per the discretion of the BRAC GIS Manager.

5.2.2 Spatial Coordinate Reference System

- Horizontal: California State Plane, Zone IV, U.S. Survey Feet; Datum: North American Datum 1983 (NAD 83)
- Vertical: North America Vertical Datum 1988 (NAVD 1988), U.S. Survey Feet

5.2.3 Metadata Standard

All metadata is to be generated in accordance with Federal Geographic Data Committee (FGDC) standards.

5.3 GIS Data File Standards

The following are file types used on the Fort Ord project:

- GIS software data: ESRI map document files (.aprx - map file document format), ESRI vector files, including ESRI Geodatabase (file and personal) feature classes and shapefiles. The preferred storage method is the geodatabase format, however, shapefiles may be used as needed.

- Raster data: a raster dataset consists of a matrix of cells (or pixels) organized into rows and columns (or a grid) where each cell contains a value representing information, such as elevation. Raster files may include digital aerial photographs, scanned images such as maps, and interpolated surface layers generated from geoprocessing point data (i.e. .grid file, LIDAR files (.las), Digital Geophysical Mapping (DGM) and terrain related files. When possible, an open format such as Tagged Image File Format (.tiff) will be used to ensure long-term compatibility.

- Tabular data: .xlsx (Excel), .dbf, .csv, and .txt (text/ASCII) file types. When possible, files will be exported to an open format such as ASCII, to ensure long-term compatibility.

- Computer-aided Design (CAD) files: DWG, DGN, and DXF formats.

5.4 Geospatial Data Types

Geospatial data collected during the RA will consist of field data associated with MR field activities and will include GIS data generated as a result of analysis of this field data. This field data includes (but is not limited to) the following:

- Survey Data (i.e. point data from surveyed features);
- MR RA activity being conducted (i.e. operation, location, boundaries, etc.); and
- MR RA related data that is collected during the various RA field operations (i.e. Vegetation removal, Technology-Aides Surface MEC Removal, DGM, Intrusive Investigation, etc.).

5.5 GIS Data Feature Classes

The primary GIS data is stored in the fort_ord.gdb geodatabase. Below is a list of the Geodatabase feature class layers within the fort_ord.gdb that are specific to the MR RA activities that are to be performed at the former Fort Ord. Updates to these feature classes are performed by the Ahtna GIS Manager. These updates are then to be incorporated into the fort_ord.gdb file by the BRAC GIS Manager.

fort_ord.gdb\env_haz_remediation\Fuel_Breaks:
This polygon feature class consists of fuel break grid polygons. Fuel break grids are typically 45 feet wide and 100 feet in length. A fuel break is typically a road or corridor that is 45 foot wide and cleared of MEC to a depth of 4 feet. This layer is typically created by the Ahtna GIS Manager. The fuel break grid locations are determined through discussions with the project team. Once the locations are determined the Ahtna GIS Manager will deliver the fuel break grid boundary and corner files (i.e. a table containing stake point coordinates) to the field survey team, who will use Real-time Kinematic (RTK) Global Positioning System (GPS) to install wooden stakes that will be used to delineate the fuel break grids. This layer is updated on an as-needed basis.

fort_ord.gdb\env_haz_remediation\oe_item_point
This point feature class consists of all MEC items encountered on the former Fort Ord, which includes both historic and recent MEC items that have been located. This is the primary layer used on the project for MEC analysis or maps depicting MEC locations. The *oe_item_point* layer is automatically generated via Python script (currently named *ODBFetchMEC_Well_5_2016_frmServer.py*) which is run daily. The script resides and is executed on the Fort Ord web server. This script interacts with the Military Munitions Response Program (MMRP) Structured Query Language (SQL) Server database by “fetching” 24 columns from view *dbo.View_MEC_FeatureClass* in the *FTO_OE* database. The script then uses ArcGIS Pro to process the fetched tabular data and converts it into a feature class layer, which is then used to update the *fort_ord.gdb* geodatabase. The BRAC and Ahtna GIS Managers are responsible for the operation and maintenance of this script.

fort_ord.gdb\flora\ flora_fire_area
The *flora_fire_area* polygon feature class contains the estimated and surveyed perimeters of both prescribed burns and accidental fires that have occurred at the former Fort Ord since approximately 1981. The layer is updated by the Ahtna GIS Manager and is managed/updated in the *fort_ord.gdb* by the BRAC GIS Manager.

fort_ord.gdb\flora\ flora_presc_burn_area
The *flora_presc_burn_area* polygon feature class contains the planned prescribed burn areas and associated containment areas. Editing to this layer is coordinated with the BRAC Office , and integrated into the *fort_ord.gdb* by the BRAC Office.

fort_ord.gdb\flora\ flora_special_species_area_VEGMONITORING
This polygon feature class contains the locations of sensitive vegetation/species of concern, such as the Monterey spineflower and Sand gilia. This layer is used to determine areas that require special consideration when preparing for MEC remediation activities. The content of the layer is provided by the project biologists (contractor and BRAC). This data is updated in the layer by the Ahtna GIS Manager and integrated into the *fort_ord.gdb* by the BRAC GIS Manager.

fort_ord.gdb\military_operations\historic_impact_area_TRACK3
This polygon feature class contains the boundary of the current Impact Area (per Track 3 status). This is the primary layer used when depicting the current boundary of the Impact Area Munitions Response Area (MRA). This layer is updated on an as-needed basis by the BRAC GIS Manager.

fort_ord.gdb\military_operations\military_target_point
This point feature class contains suspected former target locations on the training ranges. This layer is typically updated via aerial photo inspection, or field observations/GPS points. The layer is updated by the Ahtna GIS Manager and integrated into the *fort_ord.gdb* by the BRAC GIS Manager.

fort_ord.gdb\cadastre\installation_historical_area
This polygon feature class contains the historic boundary of the former Fort Ord, and is the primary layer used when producing maps for the project. This layer is not anticipated to require updating.

fort_ord.gdb\common\coordinate_grid_area
This polygon feature class contains the standard 100 foot by 100 foot grid system that is used as the basis for the MR RA at the former Fort Ord. This layer contains standardized Identifications (ID)s for each grid. The current grid ID used on this project is the short version of the ID which is contained in the field *GRID_ID_SH.* This layer is not anticipated to require updating.

fort_ord.gdb\military_operations\HA
This line feature class contains historic areas/training ranges previously used at Fort Ord. This line feature class is the primary feature class used to depict range fans on maps for the Fort Ord project. This layer is not anticipated to require updating.

fort_ord_ops.gdb\RA_GridOps
Polygon feature class that consists of polygon representations of grid operations through 2014. This layer was created from the grid operations layer from the Operations_Final.mdb and FortOrd_RA_GridOps_final.mdb geodatabases.

fort_ord_ops.gdb\RA_GridOps_Ahtna
Polygon feature class that consists of grid operations from 2024-present. This layer is created by the Ahtna GIS manager and integrated into the geodatabase by the BRAC GIS manager. It is created by joining a work grid/operations polygon layer (which represents the actual grids that remedial work was be performed in) with dbo_tblGrid_Ops_Lnk from the MMRP database. The resulting output is a GIS layer that contains an individual polygon for every remedial grid operation performed on a particular grid (i.e. removal action, QC, and QA, resulting in three coinciding grids, etc.) This layer is updated routinely, per the discretion of the BRAC and Ahtna GIS managers.

fort_ord_ops.gdb\RA_DGMOps
Polygon feature class that consists of polygon representations of DGM operations through 2024.

fort_ord_ops.gdb\RA_DGMOps_Ahtna
Polygon feature class that consists of DGM operations from 2024-present. This layer is created by the Ahtna GIS manager and integrated into the geodatabase by the BRAC GIS manager. It is created by joining a DGM grid block polygon layer with dbo_tblGeo_GridBlock_Lnk from the MMRP database. The resulting output is a GIS layer that contains an individual polygon for every DGM operation performed on that particular grid. This layer is updated routinely, per the discretion of the BRAC and Ahtna GIS managers.

6. GIS DATA DELIVERABLES

GIS data generated by Ahtna, including field data and reporting data, will be delivered to the BRAC Database upon completion of each site specific project and/or report. This GIS data will be delivered in ArcGIS Pro formats. Report data will be delivered via ArcGIS Pro map packages, which will include the .aprx map document file. Data used to generate each map will be included as geodatabase or shapefiles (as necessary). Only data not already in the fortord.gdb file will be included in the map packages. Field data will be delivered in geodatabase format. The data will be uploaded to the 'Contractor Deliverables' folder on the Fort Ord AWS instance. The project files will be checked that they are mapped correctly with the corresponding data files.

7. QUALITY CONTROL

Inspection checklists specific to this SOP are located at the end of this SOP. Measurement Performance Criteria for GIS Data Management can be found in Worksheet #12 of the MEC QAPP Addendum. See Worksheet #31, 32, 33 of the MEC QAPP Addendum for a description of who will conduct the QC inspection for this Definable Feature of Work and the frequency of the Follow-up Phase QC inspections.

Appendix A: SOP Signature Page

The following persons have read and understand this SOP:

Signature:	Date:

Three-Phase Quality-Control Checklist

Project Information
DATA SOP 2 – GIS Data Management
Contract and Task Order:
Site:

Team Information		
Data Manager:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	Section Reference	Inspection Point	Yes	No	N/A	Comments
1	Signature Page	Verify that all personnel have signed the SOP Signature Page				*(P)*
2	5.1	Verify ESRI GIS software (which includes ArcGIS Pro, Spatial and 3D Analyst) are being used				*(P)*
3	5.2.1	Verify SDSFIE is being used				*(I),(F)*
4	5.2.2	Verify correct coordinate system is being used				*(I),(F)*
5	5.2.2	Verify correct vertical datum being used				*(I),(F)*
6	5.2.3	Verify metadata is being generated in accordance with FGDC				*(I),(F)*
7	5.4	Verify Geospatial Data Types for field data are: • Survey data • MR RA activity • MR RA related data				*(I),(F)*
8	5.5	Verify that the 14 feature classes that exist in Section 5.5 of this SOP are being updated.				*(I),(F)*
9	6.0	Verify GIS data is delivered to BRAC GIS Database upon completion of each site specific project and/or report. Data will be uploaded to the ‘Contractor Deliverables” folder on the Fort Ord AWS instance. Project files will be checked that they area mapped correctly with the corresponding data files.				*(I),(F)*
10	6.0	Verify GIS data is delivered in ArcGIS Pro formats				*(I),(F)*
11	6.0	Verify report data is delivered via ArcGIS Pro map packages that include the .aprx map document file.				*(I),(F)*

Checklist						
Item	Section Reference	Inspection Point	Yes	No	N/A	Comments
12	6.0	Verify data used to generate maps are included as geodatabase or shapefiles.				*(I),(F)*
13	6.0	Verify that only data not already in the fortord.gdb file is included in the map packages.				*(I),(F)*
14	6.0	Verify field data is delivered in geodatabase format.				*(I),(F)*

Punch list Items	
No.	

Conducted by: ______________________________ DATE: ____________________________

Approved by: ______________________________ DATE: ____________________________

DATA SOP 3
MMRP DATA MANAGEMENT
(Post Migration)

STANDARD OPERATING PROCEDURE
FOR MMRP DATA MANAGEMENT – POST MIGRATION

DATA SOP 3

Original Issue Date: August 2016

Last Review / Implementation Date: January 2025

Prepared by:
NAEVA, Inc. 3343 Mineral Drive,
Earlysville, VA 22942

Submitted by:
Penny Johnson, DBA, NAEVA, Inc.

Table of Contents

List of Appendices

Acronyms

AWS	Amazon Web Services
BSI	Blind Seeding Item
DBA	Database Administrator
DGM	Digital Geophysical Mapping
DOCX	Microsoft Word Document file
FODIS	Fort Ord Data Integration System
FTP	Fiel Transfer Protocol
GPS	Global Positioning System
ID	Identification
IVS	Instrument Validation Strip
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MPPEH	Material Potentially Presenting an Explosive Hazard
PDF	Portable Document Format (Adobe Acrobat) file
PNG	Portable Network Graphics image file
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RRD	Range Related Debris
SSDM	Site Specific Data Manager

SSIS	SQL Server Integration Services
SP	Stored Procedures
SQL	Structured Query Language
USACE	United States Army Corps of Engineers
UXO	Unexploded Ordnance
UXOQCS	UXO Quality Control Specialist
VBA	Visual Basic for Applications
VSD	Microsoft Visio Document data/image file
XLSX	Excel tabular data file

1 Policy

Ahtna and NAEVA shall follow procedures established in this Standard Operating Procedure (SOP) for integrating third party data into the Military Munitions Response Program (MMRP) database. This SOP must be distributed to, and signed by all personnel performing MMRP data management, and must be adhered to as MMRP database activities are being performed.

2 Purpose

Establish sound methodologies and mechanisms for loading/importing, updating, and deleting data from the MMRP database.

3 Scope

This document provides technical and procedural guidelines for the handling of data for the MMRP database.

4 Maintenance

NAEVA Personnel are responsible for the maintenance of this SOP.

5 Responsibilities

The Database Administrator (DBA; Alphaglyx, acting for BRAC) shall be responsible for developing mechanisms to facilitate the automated loading/importing, updating, and deleting data from the MMRP database. The DBA shall ensure all imported data conforms to relational requirements. The DBA shall provide templates to the Site Specific Data Manager (SSDM; NAEVA) who submits data to be loaded into the MMRP database.

The SSDM shall be responsible for developing verification mechanisms to ensure that the field database and the MMRP database are in sync. Database verification will be performed after each database integration instance.

6 Personnel

Cary Stiebel, BRAC GIS Manager [PIE Services - acting for BRAC]
Shaelyn Hession, GIS Data Manager (Ahtna)
Penny Johnson, SSDM (NAEVA)
Kevin Glickmann, DBA (Alphaglyx – Acting for BRAC)

7 Types of data

The following data types listed below represent a sampling of the information that will be recorded on field tablet forms and otherwise incorporated into the field data
base:

- Surface Clearance and/or Analog Investigation data may include (but are not limited to) anomaly

information as it relates to Munitions and Explosives of Concern (MEC), Material Potentially Presenting an Explosive Hazard (MPPEH), Munitions Debris (MD), Range Related Debris (RRD), Blind Seed Items (BSIs), or cultural items located during the investigation. Positional information may be in the form of Global Positioning Systems (GPS) or local coordinates.
Digital Geophysical Mapping (DGM) data may include (but are not limited to) function test (static, instrument verification strip [IVS], geodetic functionality) documentation, dataset identification (ID), locations covered, surface conditions, weather, obstacles encountered, battery voltage, team and personnel ID, file names, and coordinate system.

- Data processing information may include (but are not limited to) data processor ID, data correction parameters (leveling, lag correction, filtering), EM61-MK2A channel selected for analysis, gridding parameters, target selection methodology including targeting threshold, and any comments that might prove helpful during the intrusive process.
- Reacquisition data may include (but are not limited to) anomaly information such as the unique ID, original location, offset from original location, reacquired response, and comments that might prove helpful during the intrusive process.
- Intrusive Investigation data may include (but are not limited to) anomaly information as it relates to MEC, MPPEH, MD, RRD, BSIs, or cultural items located during the intrusive investigation, and investigation related QC data. Positional information may be in the form of GPS or local coordinates.
- DGM related BSI data are to be recorded and initially managed by the QC Geophysicist. DGM related BSI data will not be made available to the SSDM until after the QC Geophysicist has identified as to whether the DGM related BSI(s) match (or do not match) anomalies in the DGM target list. BSI information related to analog operations will be forwarded directly to SSDM on a daily basis by the UXOQCS as they are installed. The SSDM will safeguard the integrity of both the DGM and analog BSI information by keeping this BSI information external to the field database and will not release it (except to USACE) until the investigation (surface removal or intrusive) for that Unit has been completed and an assessment of the status of the BSIs has been made and documented by the QC staff.
- Other items to be tracked include data for sifting operations, MEC and MPPEH management, Demolition of MEC and MPPEH, areas with high slope and/or inaccessible areas, and/or other items of interest that are to be used for the Basewide Range Assessment.
- QC information such as daily instrument test results, BSIs, Anomaly Resolution, QC inspection results, geodetic equipment functionality, Geodetic Accuracy, etc. are also tracked.

8 Procedures

Data are collected in the field via a variety of digital and analog mechanisms. Digital mechanisms may include GPS, DGM equipment, and digital based tablets. Digital data is recorded by Ahtna field teams and is reported to the SSDM on a daily basis. Analog mechanisms include analog hand-held metal detectors, and visual observation. Analog data generated by Ahtna field teams is reported to the SSDM on a daily basis.

Visual observations of MEC may be reported by Contractors (other than Ahtna), Law Enforcement, First Responders, and the general public via the Fort Ord MEC Incident Recording Form which can be accessed via fortordcleanup.com, or the Fort Ord Data Integration System (FODIS) web site. MEC items found by Ahtna staff (digital and analog) would be reported via procedures discussed in the MEC Quality

Assurance Project Plan (QAPP) Addendum, UXO SOP 5 (MEC and MPPEH Management).

The database verification routine is performed by the SSDM following each integration instance to ensure that the field database and the MMRP database remain in sync. The verification routine identifies all differences that exist between the field database and the MMRP database (including updated or corrected data). The DBA is notified of all results from the verification routine and is provided with the updates that are needed in the MMRP database by the SSDM. After the updates are completed by the DBA, the SSDM re-runs the verification routine to ensure that the field database and the MMRP database are in sync.

There are currently three primary paths for submitting data to the MMRP Database:

- NAEVA Geophysics (Field Database)
- Other Data (external to Ahtna Operations)
- Fort Ord MEC Incident Recording Form

8.1 Field Database

Data collected by field staff are uploaded to the field database on a nightly basis. The data are then initially checked by the SSDM for errors. Based on a schedule coordinated with the BRAC Office, the field database is uploaded to the FODIS File Transfer Protocol (FTP) site. A scheduled job runs on the FORTORD_DATA based on a schedule coordinated with the BRAC Office. This scheduled job executes a SQL [Structured Query Language] Server Integration Services (SSIS) package (UploadAlphaglyxData). The UploadAlphaglyxData SSIS package performs the following tasks:

- Check for records previously loaded to the MMRP database from the field database that no longer appear in the field database.
    - If such records are identified, those rows are then cued for deletion in the appropriate “Delete” schema table (please refer to the “Alphaglyx-MMRP Integration” document for technical details). After all deletion candidates are cued, those table rows are deleted in reverse hierarchical order, meaning all candidate child or dependent rows are removed prior to a parent/master record’s removal. If all records in a given tree (parent to child) were not deleted from the field database, then the correlating parent/master record in MMRP will remain cued, but not deleted.
- Check for existing records which need updating. Update accordingly.
- Insert new records.
- Report any irregularities in the migration process. Email to DBA.

Specific instances will occur where data requires editing and/or deletion after it has been loaded onto the MMRP Database. In such instances, corrected records are initiated by the UXOQCS or the QC Geophysicist. The SSDM then reviews the required changes to verify that they are appropriate and then ensures the required changes (including the deletion of the previous incorrect record(s)) are implemented. The field database and the MMRP database are backed up on nightly basis. Records that are deleted from these databases can be restored from previous backups.

8.2 Other Data (external to Ahtna operations)

Periodically, other data that is external to Ahtna operations is included in the field database. The procedure for handling this data is determined on a case-by-case basis. The data will be formatted to fit the field database template, QC'd for completeness and accuracy, prior to import. The SSDM will coordinate procedures and integration processes of other data on a case by case basis with the DBA.

8.3 Fort Ord MEC Incident Recording Form

The SQL Server has a scheduled job that runs against the MEC database (FTO_MEC) every five minutes. The Scheduled job is "Move MEC Items to FTO_OE" and it in turn calls the Stored Procedure (SP) sp_IncidentalMecUpdate. The SP processes the migration of new MEC data to the MMRP DB.

8.4 Data Backup and Archival

Backup and archiving of all databases on the AWS: all databases are backed up nightly in full. Fort Ord employs two methods of backups: AWS backs up all of the instances and data nightly and stores 1 year of backups. Also, each database is backed up to an AWS S3.

The field database is backed up daily on the FODIS FTP Site, the NAEVA Server, the NAEVA Cloud Server and an external hard drive stored in a secure location.

9 Quality Control

Inspection checklists specific to this SOP are located at the end of this SOP. Measurement Performance Criteria for MMRP Data Management can be found in Worksheet #12 of the MEC QAPP Addendum. See Worksheet #31, 32, 33 of the MEC QAPP Addendum for a description of who will conduct the QC inspection for this Definable Feature of Work and the frequency of the Follow-up Phase QC inspections.

Appendix A: SOP Signature Page

The following persons have read and understand this SOP:

Signature:	Date:

Three-Phase Quality-Control Checklist

Project Information
DATA SOP 3 – MMRP Data Management
Contract and Task Order:
Site:

Team Information		
Data Manager:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	Section Reference	Inspection Point	Yes	No	N/A	Comments
1	Signature Page	Verify that all personnel have signed the SOP Signature Page.				*(P)*
2	8.1	DBA verifies that the scheduled job runs the SSIS package.				*(I),(F)*
3	8.1	SSDM checks for records previously loaded to MMRP Database from the Field Database that no longer appear in the Field Database.				*(I),(F)*
4	8.1	If such records are identified, DBA verifies those rows are then cued for deletion in the appropriate "Delete" schema table.				*(I),(F)*
5	8.1	DBA checks for existing records which need updating and update accordingly.				*(I),(F)*
6	8.1	SSDM verifies new records are inserted.				*(I),(F)*
7	8.1	SSDM verifies irregularities in the migration process are reported and emailed to DBA.				*(I),(F)*
8	8.1	Verify corrected records are initiated by UXOQC or QC Geophysicist.				*(I),(F)*
9	8.1	Verify SSDM reviews required changes appropriate – that are then verified.				*(I),(F)*
10	8.1	DBA and SSDM verify that the Field and MMRP Databases are backed up on a nightly basis.				*(I),(F)*
11	8.2	SSDM verifies data external to Ahtna operations is formatted to fit field database template and QC'd prior to import				*(I),(F)*
12	8.3	DBA inputs test IMEC form. Verify test MEC data is migrated to MMRP DB.				*(I),(F)*

Checklist						
13	8.4	DBA and SSDM verify weekly backup is conducted and is stored on a virtual hard drive.				*(I),(F)*

Punch list Items	
No.	

Conducted by: ______________________________ DATE: ____________________________

Approved by: ______________________________ DATE: ____________________________

DATA SOP 4
DGM DATA TRASFER TO BRAC

DATA SOP 4

Standard Operating Procedure

DGM Data Transfer to BRAC

Original Issue Date: August 2024
Last Review/Implementation Date: August 2024

InDepth Corporation

10954 Via Frontera
San Diego, California 92127
(858) 716 -0299

Table of Contents

Appendices

Acronyms

DGM	Digital Geophysical Mapping
FTP	File Transfer Protocol
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
QAPP	Quality Assurance Project Plan
QC	Quality Control
SOP	Standard Operating Procedure

1. POLICY

InDepth and project personnel will follow procedures established in this Standard Operating Procedure (SOP) for all Digital Geophysical Mapping (DGM) Data Transfers to BRAC personnel that are to be conducted in support of Munitions and Explosives of Concern (MEC) remediation projects. This SOP must be distributed to and signed by all personnel performing activities related to this SOP and must be adhered to as field activities are performed.

2. PURPOSE & SCOPE

2.1 PURPOSE

The purpose of this SOP is to provide standardized procedures for the preparation of processed data gathered during DGM field operations which is then compiled into a data delivery package per Survey Unit. Procedures outlined in this SOP will be conducted in accordance with the MEC Quality Assurance Project Plan (QAPP) Addendum.

2.2 Scope

This SOP provides technical guidance on the compilation of processed data as it relates to Military Munitions Response Program (MMRP) operations including, but not limited to, the following operations:

- Creation of a survey unit Geosoft database with all processed DGM data.
- Creation of a survey unit Geosoft gridded sum channel data file.
- Creation of a survey Unit pseudo color GeoTIFF of the sum channel data using the project color scheme.
- Delivery of the data listed above as well as all raw and processed geophysical data to BRAC personnel via File Transfer Protocol (FTP) site, portable hard drive, or other agreed upon transfer medium.

This document is not intended to contain all the requirements needed to ensure the proper management of data but should be used in conjunction with the documents listed in the reference section below. Data formats with be compatible with the current release of the data processing software at the time of their delivery.

3. MAINTENANCE

InDepth personnel are responsible for the maintenance of this SOP.

4. PERSONNEL AND EQUIPMENT

4.1 Personnel

Geophysical Data Processors are responsible for generating processed geophysical data files. The QC Geophysicist is responsible for reviewing the processed data and approving it for submission. The qualifications of the key personnel implementing this SOP are documented in the MEC QAPP Addendum Worksheets 4, 7, and 8.

4.2 Equipment

Equipment required for DGM Data Transfer includes the following:

- Computer with adequate processor, memory, and storage for processing geophysical data.
- Geosoft's Oasis Montaj software with the "UXO-Land" module.

5. PROCEDURES

The following data types listed below will be included in the BRAC deliverable:

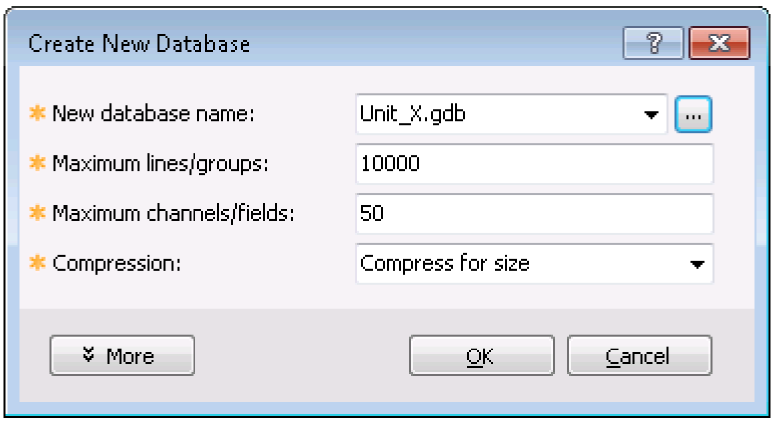
- The complete set of standard data deliverables as listed in section 6.2 Data Outputs (Deliver Digital Data) below and are extracted from the results of the data processing using the MEC QAPP Addendum, Attachment B GEO-SOP-5 (DGM Data Processing for a Person-Portable System) and GEO-SOP-6 (DGM Data Processing for a Towed Array System).
- Geosoft Oasis Montaj database in .gdb format containing process data for the unit.
- Geosoft grid file in .grd format containing processed sum channel data for the unit.
- GeoTiff pseudo color georeferenced image of the sum channel data for the unit using the project color scheme.

The following procedures will be followed to create the DGM Data Transfer deliverables by unit for BRAC. The creation of standard data deliverables is described in MEC QAPP Addendum, Attachment B GEO-SOP-5 (DGM Data Processing for a Person-Portable System) and GEO-SOP-6 (DGM Data Processing for a Towed Array System). Geosoft's

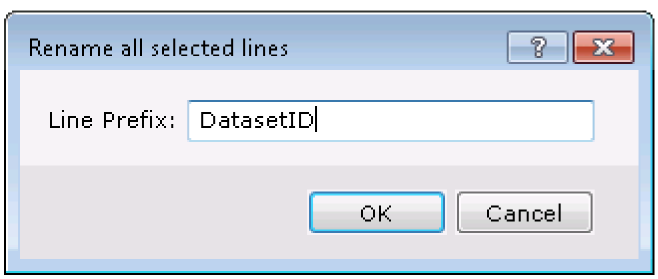
Oasis Montaj and GIS software packages will be used to generate all deliverable data products.

5.1 Create Database

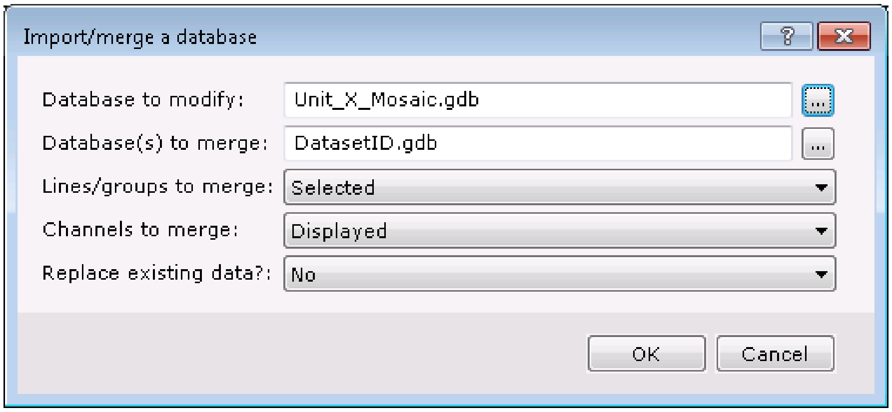
1. Create a new Survey Unit database.



2. For each dataset/grid block database add dataset prefix to line names.



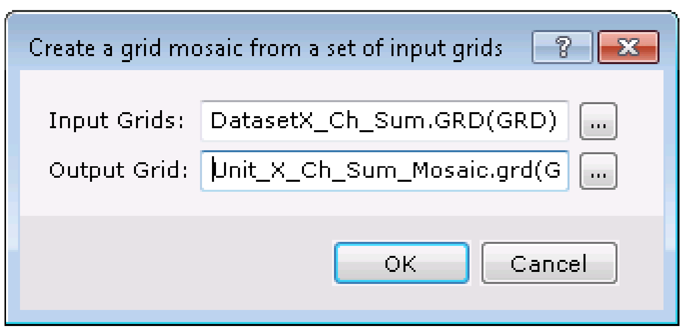
3. Merge the dataset/grid block renamed lines into the new unit database.



4. Remove any unnecessary channels.
5. Save and defragment the unit database.

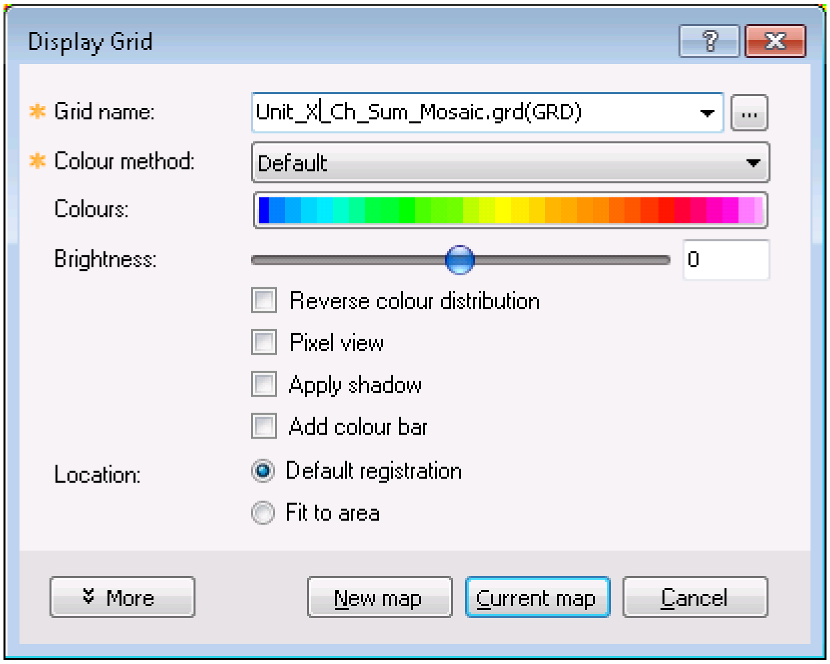
5.2 Create Grid File

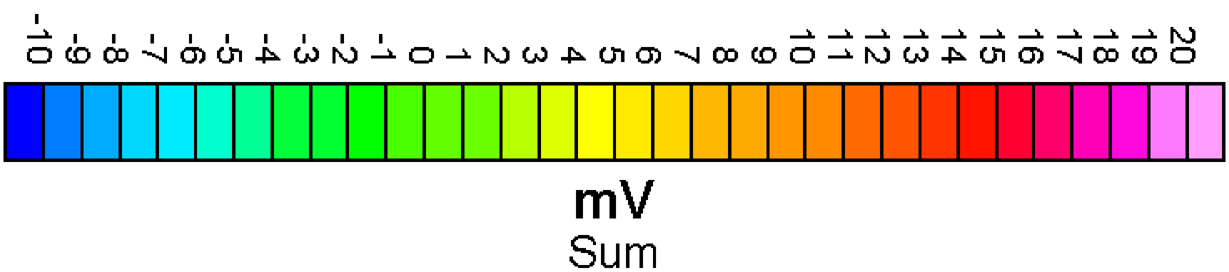
Create a unit sum channel gridded data file by combining all the dataset grids for the unit.



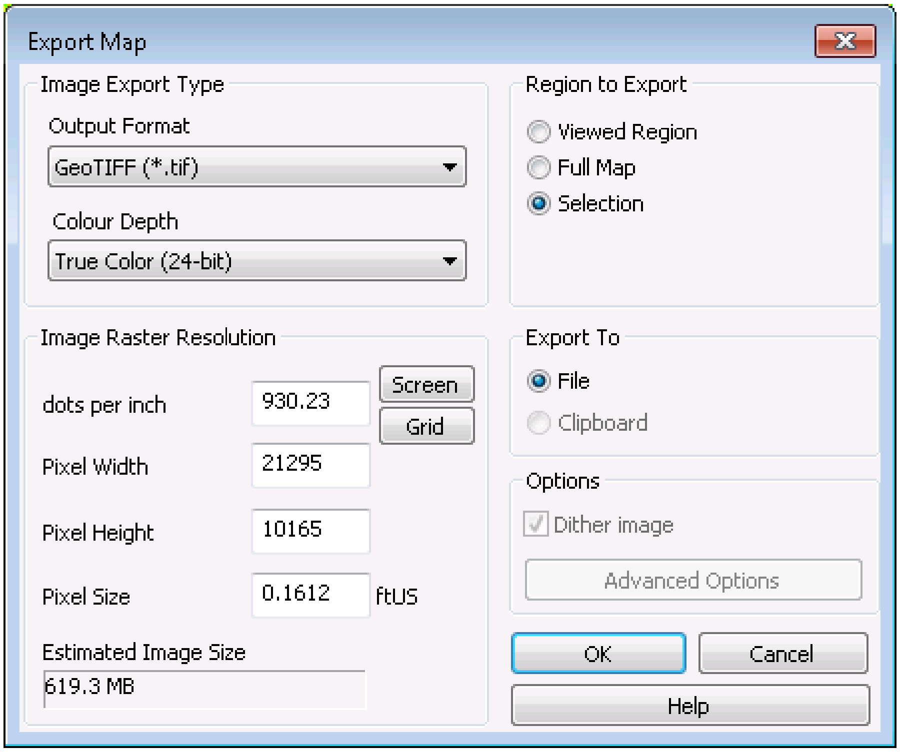
5.3 Create GeoTIFF

1. Display the gridded sum channel data on a new map using the project color scheme.





2. Export the displayed grid as a high resolution GeoTIFF.



6. DATA MANAGEMENT

6.1 DATA INPUTS

Input data required for this SOP is the processed DGM data.

6.2 DATA OUTPUTS (DELIVER DIGITAL DATA)

- The QC Geophysicist will work with the InDepth Data Processor to compile the deliverables into a zip file for upload to the project FTP site or for transfer via an alternate agreed upon medium.

- The QC Geophysicist will upload the deliverables to the project FTP site or bring the deliverables physically to the BRAC office via portable hard drive or other media.
- A notification email will be sent to the appropriate members of the project team that the unit deliverables have been generated and are either available on the project FTP site or have been delivered to BRAC personnel.
- A GIS polygon layer for DGM operations will be created in GIS by the Ahtna GIS Manager (or designee). This layer will be created by performing a join in GIS using the work grid polygon GIS layer and tables in the MMRP database (i.e., dbo_tblGrid_Ops_Lnk, etc.). See the MEC QAPP Addendum, Attachment B Data SOP 2 (GIS Data Management).
- Metadata for DGM data for the MMRP DB will be in accordance with EM 200-1-15.
- Density Excel file for each area (density by grid by acre) for use to generate map density plots.
- DGM metadata for operations performed is uploaded and stored in the MMRP database.
- Generation of DGM mV contour map using the following settings:
    - mV range of -10 -> 20 mV
    - Linear color distribution
    - Default Geosoft Color Bar
- USACE folder structure for DGM data delivery is as follows:
    - Field Data
    - Geotiff
    - Master Database
    - Processed Data

- QC Report

7. QUALITY CONTROL

The QC Inspection checklist is included as Appendix B to this SOP. Measurement Performance Criteria for data delivery can be found in Worksheet #12 of the MEC QAPP Addendum. See Worksheets #31, 32, 33 of the MEC QAPP Addendum for a description of who will conduct the QC inspection for this DFW and the frequency of the Follow-up Phase QC inspections.

8. REFERENCES

- USACE, 2024, Environmental Quality – Technical Guidance Military Munitions Response Actions, EM 200-1-15, Washington, D.C.

9. REVISION HISTORY

Version	Change Summary	Change Reason	Prepared By	Approved By	Published
Rev-1.01	Initial Release	No Change	Hecker	Smith, Welk	20240819

Appendix A
SOP Signature Page

The following individuals have read and understand this SOP:

Signature:	Date:

Appendix B
QC Checklists

Three Phase Quality Control Checklist

DATA SOP 4 - DGM Data Transfer to BRAC

Team information		
Team:	Location:	Date:
Personnel Present:		
Phase of inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
item	Reference	inspection Point	Yes	No	NIA	Comments
I	Signature Page	Verify that all personnel have signed the SOP Signature Page				*(P)*
2	4.1	Verify that the QC Geophysicist is reviewing the processed data and approving it for submission				*(I),(F)*
3	4.2	Verify Geosoft's Oasis montaj software with UXO-Land module is being used				*(I),(F)*
4	6.2	Verify deliverables are provided in a .zip file format				*(I),(F)*
5	6.2	Verify data is uploaded to FTP site or transferred via an alternate medium				*(I),(F)*
6	6.2	Verify notifications have been sent				*(I),(F)*
7	6.2	Verify GIS grid file joins the MMRP DB via grid ops link and grid block tables				*(I),(F)*
8	6.2	Verify metadata is being generated for DGM data for MMRP DB in accordance with EM 200-1-15.				*(I),(F)*
9	6.2	Verify density Excel file for each area (density by grid by acre) is generated				*(I),(F)*
10	6.2	Verify DGM mV contour maps are generated using the following settings: • mV range of -10 -> 20 mV • linear color distribution • default Geosoft Color Bar				*(I),(F)*
11	6.2	Verify that the following USACE folder structure is being followed: • Field Data • Geotiff • Master Database • Processed Data • QC Report				*(I),(F)*

Three Phase Quality Control Checklist

DATA SOP 4 - DGM Data Transfer to BRAC

Punch list items	
No.	

Conducted by: ______________________________ DATE: ____________________________

Approved by: ______________________________ DATE: ____________________________

FIELD SOP 1
FIELD DOCUMENTATION

Field SOP 1:
Field Documentation MMRP

Document Number	Field SOP 1: Field Documentation MMRP
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28,205

Approvals

Christopher Ohland
February 28, 2025
Christopher Ohland — Date
Southwest Environmental Quality Assurance and Compliance Program Manager

February 28, 2025
Bruce Wilcer — Date
Southwest Environmental Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LLC
CoC	Chain of Custody
DGM	Digital Geophysical Mapping
DQCR	Daily Quality Control Report
FLB	Field Logbook
FTP	File Transfer Protocol
GPS	Global Positioning System
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MR	Munitions Response
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Remedial Action
SOP	Standard Operating Procedure
SUXOS	Senior Unexploded Ordnance Supervisor
USACE	United States Army Corps of Engineers
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this Standard Operating Procedure (SOP) for work related to the recording of field documentation during Munitions Response (MR) Remedial Action (RA) at the former Fort Ord. This SOP must be distributed to and signed by all personnel performing activities related to this SOP (Appendix A). Personnel must adhere to these procedures as field activities are performed.

2.0 Purpose

This SOP provides field personnel with the procedures for the field documentation to be completed as part of the Military Munitions Response Program (MMRP) related field operations performed by Ahtna for:

- Recording real-time, chronological logs of field activities and circumstances in field logbooks (FLB)/notepads, field forms, and digital/electronic media
- Documenting fieldwork and fieldwork variances
- Ensuring documentation is reviewed, organized, and safely stored until project closeout

Adequate documentation is necessary to describe the work performed and variances to work plans if any. Attention to detail is vital since field documentation protects our client and Ahtna with secure, legally defensible evidence and has been helpful in administrative, legal, and cost-recovery requirements. For example, field documentation may be used as evidence in legal proceedings to defend procedures and techniques employed during site investigations. Therefore, field documentation must be factual, complete, accurate, consistent, and not contain subjective language. These principles also apply when photographic or videography techniques document site activities. The goal of written, digital, and photographic/video graphics documentation is to represent field activities that accurately portray site conditions or procedures.

3.0 Scope

The scope of this SOP includes data entry and format requirements for MMRP related project field documentation. Client, federal, state, or project-specific requirements may dictate specific types of equipment or procedures to be used when applying this SOP to a particular project. Deviations from this SOP to accommodate site-specific requirements shall be approved by the Ahtna Quality Assurance and Compliance Program Manager, and/or client representative where applicable, prior to the performance of work.

Field documentation should be recorded daily and should, at a minimum, provide the following information regarding field activity operations:

- Duration of time on site
- Personnel conducting field operations

- Subcontractor companies on site
- Visitors (including company affiliation)
- Weather conditions
- Activities completed for the day
- Significant findings or observations
- References to the site(s) worked.

Ahtna shall maintain field records sufficiently to recreate all field activities. Field documentation may be recorded using paper or digital means, that may make reference to other documents, logbooks, records, or other media (to include digital items).

Written records

- FLBs
- Field notepads
- Field forms
- Digital records
- Audio
- Photographic/video
- Data loggers

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Responsibilities

Field Team. A Field Team is one or more individuals working together. Each Field Team is responsible for maintaining a field log of their activities, as applicable.

Senior Unexploded Ordnance Supervisor (SUXOS). The SUXOS provides direction and oversight of the fieldwork. The SUXOS is responsible for reviewing and confirming the adequacy of the field documentation during fieldwork and before releasing the daily field reports. The SUXOS keeps the Site Project Manager informed of field variances or problems encountered in the field.

Site Project Manager. The Site Project Manager is responsible for providing adequate resources to the field staff and ensuring that field staff have adequate experience and training to comply with this SOP successfully. The Site Project Manager is responsible for approving and documenting techniques not described in this SOP but are considered the best methods for the current project. The Site Project Manager documents changes as a variance to the plans and forwards the variance to the MMRP Project Manager and Program Manager for approval. The Site Project Manager is also responsible for confirming the adequacy of the field documentation after fieldwork.

MMRP Project Manager. The MMRP Project Manager is responsible for providing written instruction to their Field Team, which complies with the requirements of this SOP and the client-contracted specifications.

Unexploded Ordnance Quality Control Specialist (UXOQCS). The UXOQCS is responsible for ensuring the quality of MEC investigation of UXO Technicians during investigation activities. The UXOQCS ensures work inspections are performed using the 3-Phases of Quality Control and provides documentation of corrective action/training and daily field activities. The UXOQCS maintains an independent, direct line of reporting to the CQCS, which helps to ensure potential quality concerns receive immediate attention.

Unexploded Ordnance Safety Officer (UXOSO). The UXOSO meets the experience and training requirements of the United States Army Corps of Engineers (USACE) EM-385-1. The UXOSO will be on site during all project activities and is responsible for managing, implementing, and enforcing site-specific health and safety activities, ensuring compliance with the project requirements, and evaluating safety and health concerns regarding military munitions. The UXOSO will provide oversight, feedback, and monitoring, and maintain the highest level of vigilance, reporting directly to the Safety & Health Manager.

Subcontractors. All subcontractors will follow the applicable steps and procedures as stated in this SOP, in the Munitions and Explosives of Concern (MEC) Quality Assurance Project Plan (QAPP) Amendment, the Accident Prevention Plan/Site Safety and Health Plan and may include other documents as directed by the MMRP Project Manager, Site Project Manager and/or Ahtna personnel. Subcontractors are secured under contract and required to meet all local, state, and federal requirements.

6.0 Required Equipment

The materials required for this SOP include the following:

- Bound FLBs (if a digital data recording device is not used)
- Black waterproof and/or indelible ink pens (if a digital data recording device is not used)
- Field forms (if a digital data recording device is not used)
- Digital data recording device (if used)

7.0 Procedures

This section describes various mechanisms of recording documentation, including requirements and procedures. Before fieldwork, each project should define project instructions that identify the mechanism for documentation. The instruction is intended to promote procedural consistency, defined roles and responsibilities, and common language across project teams, promoting efficient reviews and cross-team utilization and training. Once established, project staff shall follow the project instruction.

7.1 Document Control and Storage

7.1.1 Project File

While in the field, the fieldwork documentation project file is managed by the Site Project Manager and consists of:

- Written records: FLB/notepads, field forms
- Digital/electronic records: photos, videos, GPS records

All field documentation is a part of the project file and should be maintained with safe document handling and archiving procedures. Hardcopy documentation and digital files are official records of fieldwork. Scans of official records are helpful for ease of access to project information and generating reports but are not official records.

The Site Project Manager is responsible for all forms of field documentation, and scans of paperwork, digital records, and downloads from electronic devices. All original documents shall be assembled into a data package and archived in the project file. The goal is that all documentation is organized by task/event and stored in a single location.

7.1.2 Problems in the Field and Variances from Project Plans

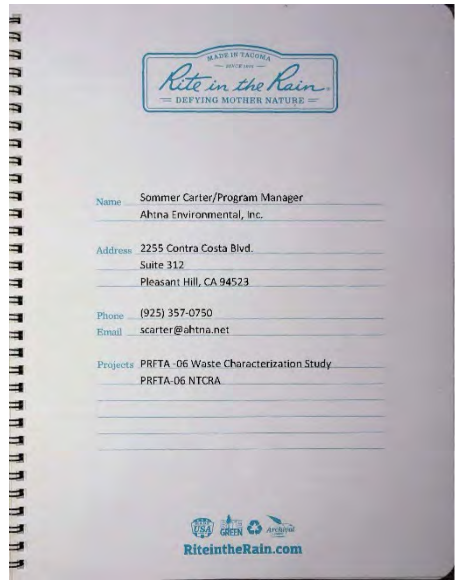
Variances or problems encountered during the fieldwork that cannot be resolved promptly must be communicated promptly in writing to the Site Project Manager, SUXOS and MMRP Project Manager. This may be completed by sending a variance notice by email or other means to promptly communicate the variance or problem and allow for the continuation of the fieldwork. The SUXOS shall provide written approval of recommended solutions or provide an approved alternate solution.

The need for corrective action addressing variances or problems in the field will be determined by the SUXOS in collaboration with the Site Project Manager. The SUXOS will notify the MMRP Project Manager and UXOQCS of any needed corrective action for their concurrence or follow-up.

7.1.3 Field Logbook

FLBs can be spiral- or adhesive-bound and are distributed by the Site Project Manager or designee. The cover of the FLB is labeled with the project number and name of the Installation/Site(s).

The inside cover of the FLB will contain “Ahtna”, the project office address and phone number, book number, project number and name, name and phone number of the FLB owner, team designation, and start and end dates for the FLB. The front of each FLB will contain the project number, team designation, and start and end dates.



The FLB shall be project specific. The Field Team Management (SUXOS, UXOQCS, and UXOSO) and Team Leader (UXO Tech III) use FLBs to record details of their responsibility (e.g., quality control [QC], safety, oversight, etc.) and provide them to the Site Project Manager for their review before submitting daily QC reports (DQCRs).

FLB entries will be legible and entered using black indelible ink. Each page of the field logbook will be consecutively numbered, signed and dated by the field author. Pages should not be removed for any reason. There should be no blank lines on a page. A single blank line or a partial blank line (such as at the end of a paragraph) should be lined to the end of the page. If only part of a page is used, the remainder of the page should have a "Z" drawn across it with the initials of the logbook owner and date placed in the middle of the “Z”. If an error is made in the field, logbook corrections will be made by drawing a single line through the error, entering the correct information, and initial and dating the change. Materials that obliterate the original information, such as correction fluids and/or mark-out tapes are prohibited.

The FLB records are scanned, and the scan is saved as a PDF file on data portal, File Transfer Protocol (FTP) site, or other such data repository to create an electronic record for project reports. The SUXOS shall ensure the FLBs are stored safely until project closeout. The field job box could be used for temporary storage.

7.1.4 Data

Field data may be recorded in a FLB or on a digital tablet (or similar device). All data are to be recorded in chronological order and will contain accurate and inclusive documentation of field activities, including field data observations, deviations from project plans, problems encountered, and actions taken to solve the problem. In addition to documenting field activities, in general, data to be recorded by the field teams will include, but are not limited to, the following:

- Team name and number
- Team Leader initials

- Date
- Site location
- Time / description of meetings (i.e. safety meeting, tailgate meeting, etc.)
- Site and weather conditions
- Personnel present
- Equipment used
- Results of daily equipment function checks
- Field Team location (i.e. Grid identification or other location designation)
- Description and time of field operations being conducted
- Description of results of field operations
- Field observations and events
- Visitors (including company affiliation)

Specific data that is to be recorded for each of the different operations is listed in their corresponding SOP.

7.1.5 Field Forms

Field forms are used by the Field Team to record details of their responsibility (e.g., QC, safety, oversight, etc.) and provided to the SUXOS for their review before submitting DQCRs.

When hard copy field forms are used, all recorded notes are entered using black indelible ink. If multiple pages of a field form are used, the pages are to be numbered using the page number and number of pages (example: “page 1 of 3, page 2 of 3, page 3 of 3”) in a conspicuous location on each page of the data form. Personnel will ensure that any unused portion of the data form is “Z’d” out, initialed, and dated.

Additional field records may be required for specific field events. These additional records may include Explosive Operations Demolition Forms, Motor Vehicle Inspection Forms, Preparatory, Initial and Follow-Up Phase Inspection Forms, Corrective Action Request Forms, Field Activity Daily Log Forms, etc.

The Site Project Manager shall ensure the sheets are stored in three-ring binders or another filing system, labeled with the Installation/Site name, project number, and a descriptive name of the project. If an FLB is also used, a scanned copy of the FLB pages and original copies of the field forms are stored in the binder. The sheets are sequentially numbered, reviewed, and approved by the Site Project Manager. The unbound forms shall be scanned and saved on a data portal, FTP site, or other such data repository to create an electronic record to ensure document preservation and use in project reports.

The Site Project Manager is responsible for safely storing the binder or other filing system until project closeout.

7.1.6 Electronic Files

Photographs and Video

All original digital field documentation shall be downloaded to a designated location for project use. Exclude files that are unnecessary due to unusable image quality or content. The date/time, location, direction (compass point or radial degree), and purpose of the image will be documented. The use of metadata and smartphone applications to gather this information can assist. Files can be edited but maintain the original file and save the edited file with a suffix description.

The Site Project Manager is responsible for providing the location and storage details. Files should be uploaded to the project folders and caption descriptions documented.

Global Positioning Systems

GPS data acquisition activities and related observations will be digitally recorded and later downloaded, and the file saved as described above.

Alternately, the GPS data can be recorded in field documentation to provide a permanent record of field activities supporting digital data that is temporarily stored on the GPS unit. As applicable, observations and data may be recorded in an FLB or field forms. The field forms will record the survey location identifier (e.g., MPPEH, structural feature) and corresponding coordinates and elevation.

The GPS operator should also be thoroughly familiar with the manufacturer's instructions and before performing GPS work in the field.

8.0 Chain of Custody

Chain of custody (CoC) procedures are to be used to track and maintain the integrity of drums (or other such containers) and include the following actions:

- Maintaining custody of items
- Documentation of the CoC

A drum is considered in Custody when it is in a secure area where the drums cannot be tampered.

The CoC record is used to ensure the integrity of the contents within the drum (or other such container) and to document that the contents of the container were maintained. The CoC Record documents the transfer of custody of drums (or other such container) from Ahtna to another person, or another organization (i.e. trucking company, smelter, etc.).

When shipping materials using the CoC process via a common carrier (such as a trucking company), the Relinquished By" box should be signed by the CoC custodian, and the person responsible for shipping that is receiving the custody of the items will fill in the "Received By" section of the CoC Record. Once the shipment arrives at its final destination the person responsible for the shipment will sign the “Relinquished By” box and the person at the final destination will sign the “Received By” section of the CoC. Once the item(s) have reached their final destination and the CoC process has been completed. Once the CoC process is completed a copy of the CoC is to be sent to the Site Project Manager. This CoC will then be scanned and the hard copy will be placed in the project files. The scanned digital copy will be maintained in the digital project files.

9.0 Quality Control

Measurement Performance Criteria for Field Documentation can be found in Worksheet #12 of the MEC QAPP Addendum. Descriptions of personnel conducting QC inspections for the definable features of work and the frequency of the follow up phase QC inspections are listed in the MEC QAPP Addendum.

QC procedures for field documentation review will be performed by the Site Project Manager to ensure the content and level of detail comply with this SOP. The Site Project Manager is responsible for the daily review of the fieldwork documentation for compliance with requirements and legibility. Errors and omissions should be explained and revisions to an entry signed and dated by appropriate field personnel.

Appendix A: SOP Signature Page

Project Information
Field SOP 1 – Fieldwork Documentation
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	Date:

Appendix B: Three Phase Quality Control Checklist

Project Information
Field SOP 1 – Fieldwork Documentation
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
1	Signature Page	All personnel have signed the SOP Signature Page				*(P)*
2	3.0	Any deviations to this SOP are approved by the Ahtna QA and Compliance Program Manager and/or client representative (if applicable).				*(P)*
3	3.0	Field documentation includes time onsite, the names of the crew, subcontractors onsite, names of any visitors, weather conditions, activities performed, significant findings or observations, and references to the site(s) worked.				*(I),(F)*
4	6.0	Personnel have the following required materials: • Bound field logbooks (if digital data recording device is not used) • Black waterproof and/or indelible ink pens (if digital data recording device is not used) • Field forms (if digital data recording device is not used) • Digital data recording device				*(I),(F)*
5	7.1.3	The inside cover of the FLB will contain "Ahtna", the project office address and phone number, book number, project number and name, name and phone number of the FLB owner, team designation, and start and end dates for the FLB. The front of each FLB will contain the project number, team designation, and start and end dates.				*(I),(F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
6	7.1.3	Bound field logbooks (if used) are assigned to Field Team Management and Team Leader.				*(I),(F)*
7	7.1.3	Each page of the field logbook is consecutively numbered, signed and dated by the field author(s). Pages are not removed. There are no blank lines on a page. The remainder of a page has a "Z" drawn across it with an initial and date placed in the middle of the "Z".				*(I),(F)*
8	7.1.3	Logbook corrections are made by drawing a single line through the error, entering the correct information, and initialing and dating the change.				*(I),(F)*
9	7.1.4	Field logbook information is recorded in chronological order.				*(I),(F)*
10	7.1.4	he following information has been recorded: • Team # and Team Leader Initials • Date • Site location • Time / description of meetings (i.e. safety meeting, tailgate meeting, etc.) • Personnel present • Equipment used • Results of daily equipment function checks • Field Team location (i.e. Grid identification or other location designation) • Description and time of field operations being conducted (i.e. surface sweep, analog intrusive, Digital Geographical Mapping [DGM] operations, target reacquisition, DGM target intrusive, MPPEH management, etc.) • Description of results of field operations (i.e. how many anomalies investigated, amount, type and description of MEC, amount of munitions debris, amount of other debris. Note that data recorded for surface sweep and analog intrusive operations will record results of field operations on a per grid basis or daily per partial grid • Field observations and events. • Visitors (including company affiliation)				*(I),(F)*
11	7.1.5	Pages of field data forms are numbered are to be numbered using the following format: "page 1 of 3, page 2 of 3, page 3 of 3"				*(I),(F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
12	7.1.5	Photocopies are maintained in the project files. Digital copies are maintained in the digital project files located on a data portal, FTP site, or other such data repository.				*(I),(F)*
13	7.1.6	Electronic files are downloaded to a designated location for project use.				*(I),(F)*
14	8.0	Chain of custody procedures are used to maintain the integrity of drums (or other such containers) that contain MDAS				*(I),(F)*
15	8.0	When shipping containers of MDAS the CoC process is used, and signatures are correctly affixed to the CoC forms.				*(I),(F)*
16	8.0	Completed CoC forms are sent to the Project Manager				*(I),(F)*
17	8.0	Completed CoC forms are placed in the project files and digital copies are maintained in the digital project files located on a data portal, FTP site, or other such data repository.				*(I),(F)*

Punch list Items	
No.	

Conducted by: ______________________________ Date: ______________________________

Approved by: ______________________________ Date: ______________________________

FIELD SOP 2
ENVIRONMENTAL PROTECTION

Field SOP 2: Environmental Protection

Document Number	Field SOP 2: Environmental Protection
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28, 2025

Approvals

February 28, 2025

Christopher Ohland Date
Southwest Environmental Quality Assurance and Compliance Program Manager

February 28, 2025

Bruce Wilcer Date
Southwest Environmental Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LLC
BLL	black legless lizard
BMP	Best Management Practice
BRAC	Base Realignment and Closure
CTS	California Tiger Salamander
CQCS	Contractor Quality Control Supervisor
DGM	Digital Geophysical Mapping
GIS	Geographic Information System
GPS	Global Positioning System
HMP	Habitat Management Plan
MEC	Munitions and Explosives of Concern
PBO	Programmatic Biological Opinion
QAPP	Quality Assurance Project Plan
QC	Quality Control
SOP	Standard Operating Procedure
USACE	United States Army Corps of Engineers
USFWS	United States Fish and wildlife Service
UXOQCS	Unexploded Ordnance Quality Control Specialist

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this Standard Operating Procedure (SOP) for environmental protection during all field activities. This SOP must be distributed to and signed by all personnel performing activities related to this SOP (Appendix A). Personnel must adhere to these procedures as field activities are performed.

2.0 Purpose

The purpose of this SOP is to describe the approach, methods, and procedures to be employed to protect the natural environment during the removal action. Specifically, this SOP describes the procedures and methods that will be implemented during site activities to minimize pollution, protect and conserve natural resources, restore disturbed areas, and control noise and dust within reasonable limits. This SOP assumes that experienced personnel that will be using this SOP are familiar with the sensitive biological resources within the former Fort Ord and are competent in their identification.

This SOP is intended to address the protection of special-status biological resources and implement mitigation measures identified in Chapter 3 of the Installation-Wide Multispecies Habitat Management Plan (HMP; United States Army Corp of Engineers [USACE], 1997), and the Programmatic Biological Opinion for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California (PBO) (United States Fish and Wildlife Service [USFWS], 2017) and the amendment to the 2017 PBO (USFWS, 2019) for sites where Munitions and Explosives of Concern (MEC) response actions are planned. The HMP outlines mitigation measures needed to avoid significant impact to HMP target species. The PBO identifies mitigation measures to be implemented during remediation and predisposal activities.

Base closure and reuse activities conducted at the former Fort Ord are required to follow specific protocols approved by the USFWS, as detailed in the PBO (USFWS, 2017), amendment to the 2017 PBO (USFWS, 2019), and HMP (USACE, 1997).

3.0 Scope

The information presented in this SOP is generally applicable to MEC related project sites.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Responsibilities

The Senior Biologist is responsible for ensuring that activities performed at the former Fort Ord are conducted in accordance with the HMP (USACE, 1997), PBO (USFWS,2017), and amendment to the 2017 PBO (USFWS, 2019).

6.0 Personnel

The Senior Biologist is responsible for preparing a Site Habitat Checklist MEC Quality Assurance Project Plan [QAPP] Addendum, Attachment C Forms) for all field activities and ensuring that the precautions are followed. All field personnel are responsible for implementing the environmental protection measures identified in the Site Habitat Checklists (MEC QAPP Addendum, Attachment C Forms).

7.0 Equipment

- Global Positioning System (GPS)
- Flagging tape
- Camera
- Dipnet
- Nitrile gloves (or other non-latex gloves)
- Gram scale
- Ruler
- Bucket
- Digital data recording device (if used)

8.0 Types of Data

If a California tiger salamander (CTS) is found, it must be recorded and reported immediately to the Base Realignment and Closure (BRAC) Office (MEC QAPP Addendum, Attachment C Forms). Data collected when a CTS is encountered includes weight, total length and snout to vent length, disposition of individuals, and the encounter and release locations.

If a black legless lizard (BLL) is found, it must be recorded and reported to the BRAC Office (Site Specific MEC QAPP Addendum, Attachment C Forms). Data collected when a BLL is encountered includes length, disposition of individuals, and the encounter and release locations.

The location of HMP annual species identified in previously unknown locations prior to or during work activities will be mapped by the Senior Biologist using GPS equipment. The data will be provided to the BRAC Office. The data collected will include the species encountered and be formatted to flora_special_species_area_VEGMONITORING feature class.

9.0 Procedures

9.1 Protection of Natural Resources

Measures to reduce impacts to natural resources will be implemented in accordance with the HMP (USACE, 1997) and PBO (USFWS, 2017) and amendment to the 2017 PBO (USFWS, 2019) for base closure and reuse activities guidelines. In addition, all guidelines that minimize activities that could degrade lands through soil erosion or invasive weed problems will be followed. These considerations will be addressed in this section.

The Senior Biologist will conduct a preliminary environmental survey of the sites and research the Geographic Information System (GIS) database to identify locations of sensitive species and will prepare a Site Habitat Checklist (MEC QAPP Addendum, Attachment C Forms) prior to each activity that outlines specific avoidance and minimization measures to be implemented.

An overview of the Site Habitat Checklist will be discussed at the project preparatory meeting to review goals and expectations of this document. Completed Site Habitat Checklists with measures for project specific activities will be provided to the BRAC Office for approval at least two business days before scheduled preparatory meetings. Measures included in the Site Habitat Checklists will also be communicated to the Ahtna Site Project Manager prior to the project preparatory meeting. The Contractor will assume a policy of minimizing and avoiding disturbances to areas with sensitive species as much as possible without unreasonably disrupting removal activities. The Senior Biologist will be regularly present on work sites to ensure that these environmental directives are being followed and document and address any unforeseen environmental concerns, as they may occur. The Contractor will coordinate with BRAC Office on all environmental issues. It should be noted that this SOP only addresses the measures to be taken under normal circumstances and does not consider special-case areas, which will be reevaluated in coordination with the BRAC Office to determine if additional habitat protection or restoration requirements are required.

9.2 Environmental Training

The Senior Biologist will conduct site-specific environmental training for all field personnel prior to the beginning of project work. Topics covered in the training will include a description of HMP plant and wildlife species that could be encountered, environmental laws related to the conservation of these species, guidelines that personnel must follow to reduce or avoid impacts to HMP species, the appropriate contacts to report HMP species encounters and any unforeseen impacts on HMP species and awareness of the potential for currently unlocated resources and procedures for inadvertent discovery of cultural or Native American resources.

9.3 Fire Retardants and Foams

To reduce the likelihood that fire retardants and foams will contaminate wetlands and impact HMP wetland and annual species, fire retardants and foams that may be used on a unit or area will not contain sodium ferrocyanide, and the application shall not be closer than 300 feet from a vernal pool unless application is necessary to prevent a breach. Areas of retardant emergency application will be mapped for future monitoring.

9.4 Vegetation Cutting

Prescribed burning is the preferred method of vegetation removal in maritime chaparral areas. This approach clears as much vegetation as possible and reduces the need to cut maritime chaparral. The 2017 PBO (USFWS, 2017) lists areas where prescribed burns cannot be conducted safely due to difficult terrain, proximity to urban areas, or potential presence of large MEC, and where vegetation cutting will have to be conducted using mechanical and/or manual methods. In 2018 the Army requested reinitiating formal consultation with USFWS due to the results of a field evaluation which recommended no prescribed burning occur in several units (Army, 2018). USFWS concurred with Army's recommendation in a follow up letter that constitutes as an amendment to 2017 PBO (Army, 2018 and USFWS, 2019, respectively). If new information results in necessary changes to the planned mastication areas outlined in the PBO, Ahtna will communicate these changes to the BRAC Office. The BRAC Office will determine if these changes require consultation with USFWS.

Maritime chaparral within prescribed burn primary containment lines will be cut prior to prescribed burn operations. Maritime chaparral within prescribed burn secondary and primary containment lines will be cut as determined by the Presidio of Monterey Fire Department and the Burn Boss. To minimize impacts to the listed species and other natural resources, the mastication of containment lines occurs after June 1, unless otherwise coordinated with the USFWS (USFWS, 2017). Mechanical and manual vegetation removal will be completed for prescribed burn primary, secondary, and tertiary containment lines as required. Prescribed burn containment line trees are typically limbed up to 8 feet above ground surface (or another height as designated by the Burn Boss) to prevent fire from jumping from the ground into trees, with resulting tree crowning and potential airborne spread of embers beyond containment lines.

Following a prescribed burn remaining unburned/burned brush, and remaining standing stems and branches from maritime chaparral may need to be cut using mechanical or manual methods to accommodate instrument-aided surface MEC removal. Safety of personnel and environmental impacts will be considered when selecting the cutting method(s) for the remaining material. Depending on the amount of remaining material the BRAC Office will be consulted to determine the appropriate cutting method for that area. In general, and specifically in chaparral areas, masticated material will be left on the ground, however, large quantities of cut vegetation matter may require removal from the work area and chipping in designated areas. Chipping will be decided on a case-by-case basis. Chipped material will be used for erosion control where feasible and in coordination with the BRAC Office. Chipped material not used for erosion control will be stockpiled. Stockpile locations will be coordinated with the BRAC Office. Stockpiles will be inspected on a regular basis to monitor heat levels to avoid risks for combustion. Where feasible, stockpiles will be assembled into smaller piles versus one large pile. Usage of chipped material and stockpile locations will be identified in the Site Habitat Checklist.

Vegetation cutting will be performed such that impacts to sensitive species, particularly within the maritime chaparral, are minimized. For example, mature Toro manzanitas (approximately 6 feet in height or taller) shall be retained at intervals of approximately 50 feet. Masticator operators shall receive additional training from the Senior Biologist in Toro manzanita identification. Specific measures to reduce or avoid impacts to HMP species and habitats will be identified by the Senior Biologist, and approved by the BRAC Office, within the Site Habitat Checklists (MEC QAPP Addendum, Attachment C Forms). Additionally, the timing of vegetation cutting will be in accordance with dates specified in the PBO.

9.5 MEC Removal

During subsurface MEC removal anomaly excavations, the top 2-inches of soil will be saved to preserve the seed bank of maritime chaparral areas and HMP annual plants. Following backfilling of excavation holes, the top 2-inches of saved soil will be placed atop the surface of the excavation. The feasibility of replacing soil will be determined by the type of soil and whether HMP plant species are present. MEC removal activities will be monitored to minimize impacts to HMP-listed species to the greatest extent feasible.

For sifting operations, if a baseline survey has not already been collected, the Senior Biologist will assess the area prior to disturbance. The assessment will identify the vegetation community and locations of any HMP annual species and shrubs present. The data collected during the assessment will be used to establish if a baseline survey is required under the BRAC Habitat Restoration program.

9.6 Vehicle Access

Normal vehicle access will be restricted to the existing roads and fuel breaks as much as possible. If vehicle access is necessary within the interior portions of the work area, suitable access routes will be identified by the Senior Biologist prior to use. Interior access routes will be located within existing roads and trails, pre-existing paved, graded, or disturbed areas, and areas known to be unoccupied by HMP annual species (based on previous surveys). Interior access routes will avoid vernal pools and traveling parallel to steep slopes to prevent erosion. All interior access routes will be approved by the Senior Biologist, BRAC Biologist, and Contractor Quality Control Supervisor (CQCS) or Unexploded Ordnance Quality Control Specialist (UXOQCS) and will be identified within the Site Habitat Checklists. During mechanical brush removals and Digital Geophysical Mapping (DGM), tracked vehicles will be used to access interior portions of the work area.

9.7 Avoiding Impacts to Black Legless Lizards

If a BLL is encountered during site activities, the Senior Biologist will be responsible for ensuring that the protocol is followed: the encounter will be recorded using the Field (MEC QAPP Addendum, Attachment C Forms), the BLL lizard will be re-located to an appropriate location, and a written report of the encounter will be submitted to the BRAC Biologist.

9.8 Avoiding Impacts to California Tiger Salamanders (CTS)

The Senior Biologist will include measures in the Site Habitat Checklist to avoid or minimize impacts to CTS and their breeding habitat. Work activities necessary within vernal pools will be scheduled only when the vernal pools are dry in order to avoid impacts to CTS during their breeding season. An effort will be made to reduce impacts to vernal pools during work activities within these sensitive resources, such as use of manual equipment instead of heavy equipment for vegetation removal activities and DGM. Vernal pools will be delineated and boundaries staked to facilitate prevention of heavy equipment within these areas. Work activities that include dewatering of detention basins will be surveyed with a dipnet by a USFWS- authorized biologist to ensure no CTS are present or breeding within the detention basin prior to dewatering. If CTS or their eggs are detected within a detention basin, dewatering activities will not commence until eggs have hatched and individuals have gone through full metamorphosis and vacated the detention basin.

The Senior Biologist will ensure appropriate measures for the handling and storing of erosion control materials as described in the PBO to help avoid and minimize adverse effects to CTS (USFWS, 2017). Storage of erosion control materials will be minimized within 1.24 miles of known or potential CTS breeding ponds to the extent possible. If storage of erosion control materials near breeding ponds is unavoidable, the materials will either be kept in closed storage units such as Conex containers or elevated on pallets to prevent CTS from crawling under or into the materials. If erosion control activities must occur during periods when CTS may be active, the Senior Biologist will inspect all materials staged within 1.24 miles of potential breeding ponds weekly, and after each significant rain event. Inspections will include areas beneath pallets on which erosion control materials are stored. All unused erosion control materials will be removed from work sites and stored appropriately (USFWS, 2017).If a CTS is encountered during site activities, the established protocol, as stated in the PBO (USFWS, 2017), for avoiding impacts will be followed. If a CTS is found during work activities work must stop until the individual has been removed from the area for relocation. Only USFWS-authorized biologists can handle CTS. Procedures are in place to have an USFWS-authorized biologist available should an encounter and subsequent handling (to remove from harm's way) be required. These procedures include wearing nitrile or other non-latex gloves while handling CTS; documenting the weight, length, and disposition of individuals and the encounter and release locations; transporting CTS from the work site to a nearby area of appropriate habitat; and releasing the animal(s) into a vacant small mammal burrow of sufficient size and depth. If a CTS is found dead or injured immediate notification must be made by telephone and in writing to the BRAC Office . The report must include the date, time, location of the carcass, a photograph, cause of death or injury, if known, and any other pertinent information. Any CTS encountered must also be recorded and immediately reported using the Field Report Form for CTS to the BRAC Office (MEC QAPP Addendum, Attachment C Forms).

9.9 Erosion Control and Monitoring for Invasive Weeds

Initial erosion risks and prevention will be considered prior to the start of field operations. The Senior Biologist will assess and document areas prone to erosion, areas where erosion already exists that could be made worse by activities in support of MEC operations, and document measures to prevent or minimize these impacts in the Site Habitat Checklist Decisions for implementing appropriate erosion control mitigation will be developed in coordination with the BRAC Office. Erosion control measures can include the installation of jute netting, coir logs or straw wattles, silt fencing, woodchips from vegetation cutting, and other measures as needed. A UXO escort will be provided, as required, for erosion control work conducted prior to completion of the project.

Prior to work initiation, the Senior Biologist will evaluate the Unit for presence of invasive weed species. If invasive weed species are present, the Senior Biologist will include measures in the Site Habitat Checklist to avoid or minimize the spread of the invasive species, which will be implemented during work operations. To reduce the spread of invasive weed species known to occur on the former Fort Ord, proactive Best Management Practices (BMPs) can be implemented during cleanup activities. Such BMPs may include: washing all vehicles and equipment that come from outside of the former Fort Ord work areas, including those of subcontractors, before they are allowed to enter the site; finding weed-free sources for straw; using on-site sources for mulch; planning any off-road haul routes to avoid invasive weed populations; and cleaning boots, equipment, and vehicles that have been used in high infestation areas prior to moving to sites where invasive species populations are low or have not been identified.

The Senior Biologist will also perform final inspection and informal follow-up monitoring of the site for erosion or invasive weed problems throughout the surface and subsurface MEC removal. The Senior Biologist will inform the BRAC Office of the timing and results of the follow-up monitoring via verbal or electronic mail communication.

9.10 Protection and Conservation of Cultural and Archaeological Resources

The Final Environmental Impact Statement (USACE, 1993) and Supplemental Environmental Impact Statement (USACE, 1996) for the disposal and reuse of Fort Ord identified potential historical and cultural resources within Fort Ord. Project personnel will be made aware of the potential for currently unlocated resources and procedures for inadvertent discovery of cultural or Native American resources. In the event that these resources are encountered during remedial activities, the finds will be reported immediately to USACE and the BRAC Office who will notify the appropriate agencies. All sitework will cease, and the appropriate resources will be decided upon to address the find. Work will only be resumed upon approval of the USACE and the BRAC Office. Only a qualified archaeologist will be authorized to inventory, move, and preserve human remains, funerary objects, sacred objects, or objects of cultural patrimony found under or on the surface of Federal or tribal lands pursuant to Section 3(d) of the Native American Graves Protection and Repatriation Act [43 Code of Federal Regulations 10.2 (g)(4)].

10.0 Documentation

The Senior Biologist will conduct a preliminary environmental survey of the sites and research the GIS database to identify locations of sensitive species and will prepare a Site Habitat Checklist (Addendum to the MEC QAPP, Attachment C, Form E-1) prior to each activity that outlines specific avoidance and minimization measures to be implemented. The Senior Biologist will prepare an annual monitoring report that documents the results of biological monitoring performed by Ahtna and a description of the mitigations and avoidance measures, biological trainings, HMP species encounters, habitat and species protection measures required by the HMP (USACE, 1997) and the Programmatic Biological Opinion (USFWS, 2017), and other environmental protection measures implemented during project activities.

11.0 Quality Control

The Senior Biologist will coordinate closely with the BRAC Biologist on all environmental issues. The BRAC Biologist and CQCS or UXOQCS will review and approve all Site Habitat Checklists prior to commencement of work activities. Inspection checklists specific to this SOP are located at the end of this SOP (Appendix B, Three Phase Quality Control Checklist). Measurement Performance Criteria for environmental protection operations can be found in Worksheet #12 of the MEC QAPP Addendum. The MEC QAPP Addendum Worksheets #31, #32, and #33 identifies who conducts the Quality Control (QC) inspection for specific definable features of work and the frequency of the Follow-up Phase QC inspections.

12.0 Safety and Health

Safety and Health training requirements for on-site project personnel have been established in accordance with Occupational Safety and Health Administration requirements for hazardous site workers

(29 Code of Federal Regulations 1910.120) and Ahtna policies and procedures. These training requirements are specified in the Accident Prevention Plan and Site Safety and Health Plan to mitigate these hazards and are to be met before project personnel can begin site work.

13.0 References

Army, 2018. Army letter to U.S. Fish and Wildlife Service requestion re-initiation of formal consultation to address changes to effects of Army cleanup action described in the Reinitiation of Formal Consultation for Cleanup and Property Transfer Actions Conducted at the Form Fort Ord, Monterey County California (Original Consultation #8-8-09-F-17m 81440-2009-F-0334, June 2017). May. (BW-2747A.1)

USACE, 1993. *Fort Ord Disposal and Reuse Environmental Impact Statement, Final, June, Technical assistance from Jones & Stokes Associates, Inc. (JSA 90-214), Sacramento, CA*. (BW-1348)

USACE, 1996. *Fort Ord Disposal and Reuse Supplemental Environmental Impact Statement, Final, June, Technical assistance from Jones & Stokes Associates, Inc. (JSA 95-130), Sacramento, CA.* (BW-1538)

USACE, 1997. *Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California (HMP), With technical assistance from Jones and Stokes Associates, Sacramento, California*. (BW-1787)

USFWS, 2017. *Programmatic Biological Opinion for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California. Reinitiation of formal consultation (2017-F-0094)*. June 7, 2017. (BW-2747A)

USFWS, 2019. *Changes to Vegetation Clearance Activities Under the Programmatic Biological Opinion for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California (2017-F-0094).* (BW-2747A.2)

Appendix A: SOP Signature Page

Project Information
Field SOP 1 – Environmental Protection
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	**Date:**

Appendix B: Three Phase Quality Control Checklist

Project Information
Field SOP 2 – Environmental Protection
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
1	Signature Page	All personnel have signed the SOP Signature Page				*(P)*
2	7.0	Personnel have the required equipment. • GPS • Flagging tape • Camera • Dipnet • Nitrile gloves (or other non-latex gloves) • Gram scale • Ruler • Bucket • Digital data recording device (if used)				*(I), (F)*
3	8.0	If CTS is found has appropriate Field Report Form for CTS been filled out including all required data.				*(I),(F)*
4	8.0	If BLL is found has appropriate Field Report Form for BLL has been filled out including all required data.				*(I),(F)*
5	8.0	Have annual species identified in previously unknown locations been mapped by Senior Biologist using GPS. Has data been provided to BRAC Office? Does it include species encountered?				*(I),(F)*
6	9.1	Have measured to reduce impacts to natural resources been implemented in accordance with the HMP and PBO?				*(I),(F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
7	9.1	Have guidelines that minimize activities that could degrade lands through soil erosion or invasive weed problems been followed?				*(I),(F)*
8	9.1	Has Senior Biologist conducted a preliminary environmental survey of the sites and researched the GIS to identify locations of sensitive species, and prepared Site Habitat Checklist prior to each activity?				*(I),(F)*
9	9.1	Has a site habitat checklist been completed? And communicated to project supervisors prior to work initiation?				*(I),(F)*
10	9.1	Is the Senior Biologist regularly onsite? Has documentation of any unforeseen environmental concerns been made?				*(I),(F)*
11	9.2	Has the Senior Biologist conducted site-specific environmental training for all field personnel prior to the beginning of project work?				*(I),(F)*
12	9.3	Do any fire retardants and foams contain ferrocyanide? Verify that if used are not closer than 300 feet from vernal pool.				*(I),(F)*
13	9.3	Have areas of retardant emergency application been mapped for future monitoring?				*(I),(F)*
14	9.4	Have specific measures to reduce or avoid impacts to HMP species and habitats been identified by the Senior Biologist, and approved by BRAC Office within the Site Habitat Checklists?				*(I),(F)*
15	9.4	Is timing of vegetation clearance in accordance with dates specified in the PBO?				*(I),(F)*
16	9.4	In areas where prescribed burns cannot be conducted safely, has USACE gotten approval from USFWS to masticate those areas?				*(I), (F)*
	9.4	Has usage of chipped material and stockpile locations been coordinated with the BRAC Office and included in the Site Habitat Checklist?				
17	9.5	During anomaly excavations has the top 3 inches of soil been replaced at the surface after backfilling holes?				*(I), (F)*
18	9.5	Have MEC removal activities been monitored?				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
19	9.5	For sifting operations, has an evaluation been conducted by the Senior Biologist?				*(I), (F)*
20	9.6	Has vehicle access been restricted to the existing roads, fuel breaks, graded, or disturbed areas and areas known to be unoccupied by HMP annual species and vernal ponds?				*(I), (F)*
21	9.6	If necessary, have alternate vehicle routes been identified?				*(I), (F)*
22	9.6	Have interior access routes been approved by the Senior Biologist, BRAC Biologist, and CQCS or UXOQCS – and been identified within the site habitat checklists?				*(I), (F)*
23	9.6	Have tracked vehicles been used to access interior portions of the work area?				*(I), (F)*
24	9.7	If BLL is encountered has the Senior Biologist ensured that the protocol is being followed? Has the Field Report Form for BLL been filled out and BLL relocated to an appropriate location? Has written report of encounter been submitted to BRAC Biologist?				*(I), (F)*
25	9.8	Has Senior Biologist included measures in the Site Habitat Checklist to avoid or minimize impacts to CTS and their breeding habitat?				*(I), (F)*
26	9.8	Have work activities necessary within vernal pools been scheduled only when the vernal pools are dry?				*(I), (F)*
27	9.8	Have efforts been made to reduce impacts to vernal pools?				*(I), (F)*
28	9.8	Have work activities that include dewatering of detention basins been surveyed with a dipnet by USFWS authorized biologist to ensure no CTS are present or breeding within the detention basin prior to dewatering?				*(I), (F)*
29	9.8	If CTS are detected in detention basin, have dewatering activities been put on hold until the individuals have vacated the detention basin?				*(I), (F)*
30	9.8	If CTS is encountered during site activities, have established protocols been followed?				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
31	9.8	Have only USFWS-authorized biologists handled CTS using appropriate PPE? And documented the weight, length and disposition of individuals, including encounter and release locations?				*(I), (F)*
32	9.8	Has CTS been transported from work site to nearby area of appropriate habitat. Has animal been released into vacant small mammal burrow of sufficient size and depth?				*(I), (F)*
33	9.8	If CTS is found has it been recorded on the Field Report Form for CTS?				*(I), (F)*
34	9.9	Has Senior Biologist assess need for site restoration, and inform BRAC of any erosion concerns and coordinate work with Ahtna Site Project Manager?				*(I), (F)*
35	9.9	Has Senior Biologist evaluated the MRS for presence of invasive weed species?				*(I), (F)*
36	9.9	If invasive weed species are present, has Senior Biologist performed final inspection and informal follow-up monitoring of the site for erosion or invasive weed problems?				*(I), (F)*
37	9.9	Has Senior Biologist informed BRAC of the timing and results of the follow- up monitoring via verbal or email?				*(I), (F)*
38	9.10	Have cultural and/or archaeological resources been identified? If so has this been reported immediately to USACE and BRAC? Has work in this area been stopped? Has a qualified archaeologist been authorized to deal with archaeological resources?				*(I), (F)*
39	10	Has Senior Biologist conducted preliminary survey of sites and researched GIS Database to identify locations of sensitive species. And prepared a Site Habitat Checklist prior to each activity that outlines specific avoidance and minimization measures to be implemented.				*(I), (F)*
40	10	Has Senior Biologist prepared an annual monitoring report that documents the work activities and environmental protection measures implemented during each year, the number of staff provided env training, and any CTS or BLL encounters.				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
41	11	Has the BRAC Biologist and CQCS or UXOQCS reviewed and approved all site habitat checklists prior to the commencement of work activities?				*(I), (F)*

Punch list Items	
No.	

Conducted by: ____________________________ Date: ____________________________

Approved by: ____________________________ Date: ____________________________

FIELD SOP 3
GRID AND BORDER SURVEY

Field SOP 3:
Grid and Border Survey

Document Number	Field SOP 3: Grid and border Survey
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28, 2025

Approvals

Christopher Ohland — February 28, 2025

Christopher Ohland — Date

Southwest Environmental Quality Assurance and Compliance Program Manager

Bruce Wilcer — February 28, 2025

Bruce Wilcer — Date

Southwest Environmental Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LLC
GIS	Geographical Information System
GPS	Global Positioning System
MEC	Munitions and Explosives of Concern
QAPP	Quality Assurance Project Plan
QC	Quality Control
RTK	Real-Time Kinematic
SOP	Standard Operating Procedure
UXO	Unexploded Ordnance

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this Standard Operating Procedure (SOP) for work related to grid and/or border survey. This SOP must be distributed and signed by all personnel performing activities related to this SOP (Appendix A). Personnel must adhere to these procedures.

2.0 Purpose

The purpose of this SOP is to describe the equipment and general methodologies that are to be used by the survey team when completing a grid and/or border survey. This SOP does not detail the use of the equipment that is described herein. This SOP assumes that experienced personnel who will be using this SOP are familiar with the equipment and are competent in their use.

3.0 Scope

The information presented in this SOP applies to munitions and Military Munitions Response Program project sites. Positional accuracy specifications may vary depending on equipment and contract requirements.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Equipment

- Real-Time Kinematic (RTK) Global Positioning System (GPS) [RTK-GPS]
- Wooden stakes (lath)
- Hammer
- 100 foot tape measure (3 each)
- Compass
- Black marker (sharpie)
- Colored flagging tape
- Schonstedt or White DFX 300 hand-held metal detector (or equivalent)

6.0 Personnel

The staff that is responsible for grids and/or boundary installation will include a GPS Technician and a minimum of one Unexploded Ordnance (UXO) Technician II or above to conduct anomaly avoidance.

7.0 Procedures

Grids and boundaries are to be delineated in the field to ensure that the extent of the investigation/remediation area are identified. Grids are to be 100 ft x 100 ft in size and will be based on the former Fort Ord Master Grid System. Grid corners and/or grid border points will be pre-generated by the Geographical Information System (GIS) Manager and will be loaded onto the RTK-GPS units by the survey team prior to the commencement of field work.

Wooden stakes will be placed at grid corners and along borders where necessary to define each grid. Each grid will be identified by the grid number on its southwest corner stake. In areas that have good GPS coverage (i.e. no canopy cover) RTK-GPS units will be used to locate the predetermined stake locations. In areas that do not have good GPS coverage due to canopy cover the GPS receiver may be raised up using a telescopic pole to get good GPS coverage. If GPS coverage is still not able to be achieved, tape measurements from adjacent grid corner points will be used to establish grid stake locations.

Once a location has been selected for installation of a wooden stake the area surrounding the location is to be inspected by the UXO Technician using a Schonstedt or White DFX 300 hand-held metal detector (or equivalence) to ensure that no metallic objects are present. If a metallic object is found to exist in the subsurface the location of the stake will be offset, and the offset distance and direction of the offset will be noted on the stake. All stakes will have their Grid Identification number (or other predetermined stake identification number) written legibly on the north side of the stake, so they are visible from within the grid, using black indelible ink.

8.0 Documentation

There is no documentation associated with grid and border survey operations.

9.0 Quality Control

Inspection checklists specific to this SOP are located at the end of this SOP (Appendix B). Measurement Performance Criteria for grid and border survey can be found in Worksheet #12 of the Munitions and Explosives of Concern (MEC) Quality Assurance Project Plan (QAPP) Addendum. The MEC QAPP Addendum Worksheets #31, #32 and #33 identify who conducts the Quality Control (QC) inspection for specific definable features of work and the frequency of the Follow-up Phase QC inspections.

10.0 Safety and Health

Safety and Health training requirements for on-site project personnel have been established in accordance with Occupational Safety and Health Administration requirements for hazardous site workers (29 Code of Federal Regulations 1910.120), United States Army Corps of Engineers Engineering Manual 385-1-1, and Ahtna policies and procedures. These training requirements are specified in the Accident Prevention Plan and Site Safety and Health Plan to mitigate these hazards and are to be met before project personnel can begin site work.

11.0 References

United States Army Core of Engineers (USACE), 2024. *Environmental Quality – Technical Guidance Military Munitions Response Actions, EM 200-1-15.* Washington, D.C. March.

USACE, 2024. Safety and Occupational Health Requirements, EM 385-1-1. March.

Appendix A: SOP Signature Page

Project Information
Field SOP 3 – Grid and Border Survey
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	**Date:**

Appendix B: Three Phase Quality Control Checklist

Project Information
Field SOP 3 – Grid and Border Survey
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	**Section**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
1	Signature Page	Verify that all personnel have signed the SOP Signature Page				*(P)*
2	5.0	Is the required equipment available? • RTK-GPS • Wooden stakes (lath) • Hammer • 100 foot tape measure (3 each) • Compass • Black marker (sharpie) • Colored flagging tape • Schonstedt or White DFX 300 hand-held metal detectors (or equivalent)				*(I),(F)*
3	7.0	Have grid corners and/or grid border points been pre-generated by the GIS Manager and been loaded onto the RTK-GPS units by the survey team prior to the commencement of field work?				*(I),(F)*
4	7.0	Have hand-held metal detectors been checked at the Function Check Area in accordance with Measurement Performance Criteria listed in MEC QAPP Addendum Worksheet #12?				*(I),(F)*
5	7.0	Have wooden stakes been installed? Has each stake been identified by a grid number? Is the grid identified by the southwest corner stake?				*(I),(F)*
6	7.0	If good GPS coverage has RTK-GPS been used to locate stake placement?				*(I),(F)*

Checklist						
Item	**Section**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
7	7.0	If poor GPS coverage has the GPS receiver been raised? If still poor coverage, have tape measurements from adjacent grid corners been used to establish grid stake locations?				*(I),(F)*
8	7.0	Has the area around the stake location been inspected by a UXO Technician using a hand-held metal detector to ensure that no metallic objects are present?				*(I),(F)*
9	7.0	If a metallic object is found to exist in the subsurface has the stake been offset and has offset distance and direction of offset been noted on the stake?				*(I),(F)*
10	7.0	Do all stakes have their grid number written legibly on the north side of the stake using black indelible ink?				*(I),(F)*

Punch list Items	
No.	

Conducted by: ______________________________ Date: ______________________________

Approved by: ______________________________ Date: ______________________________

FIELD SOP 4
VEGETATION REMOVAL

Field SOP 4:
Vegetation Removal

Document Number	Field SOP 4: Vegetation Removal
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28, 2025

Approvals

February 28, 2025

Christopher Ohland — Date

Southwest Environmental Quality Assurance and Compliance Program Manager

February 28, 2025

Bruce Wilcer — Date

Southwest Environmental Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LLC
BRAC	Base Realignment and Closure
CQCS	Contractor Quality Control Supervisor
HFD	Hazard Fragmentation Distance
MEC	Munitions and Explosives of Concern
MGFD	Munitions with Greatest Fragmentation Distance
MPPEH	Material Potentially Presenting an Explosive Hazard
MSD	Minimum Separation Distance
PBO	Programmatic Biological Opinion
POMFD	Presidio of Monterey Fire Department
QAPP	Quality Assurance Project Plan
QC	Quality Control
SOP	Standard Operating Procedure
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
UXO	Unexploded Ordnance

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this Standard Operating Procedure (SOP) for mechanical and manual vegetation removal during field activities. This SOP must be distributed and signed by all personnel performing activities related to this SOP (Appendix A). Personnel must adhere to these procedures.

2.0 Purpose

The purpose of this SOP is to describe the equipment and general methodologies that are to be used by the vegetation removal team(s). This SOP does not detail the use of the equipment that is described herein. This SOP assumes that experienced personnel that will be using this SOP are familiar with the equipment and are competent in their use.

3.0 Scope

The information presented in this SOP is applicable to munitions and explosives of concern (MEC) related project sites.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP. Per the Programmatic Biological Opinion (PBO), spill control materials such as absorbent pads, noncombustible granular absorbent material, and polyethylene sheeting, should be available to all refueling crews (USFWS, 2017).

5.0 Equipment

- Manual vegetation removal equipment
- Mechanical vegetation removal equipment
- Schonstedt or All Metals hand-held metal detector (or equivalent)
- Appropriate PPE
- Spill kit, to include absorbent pads, noncombustible granular absorbent material and polyethylene sheeting

6.0 Personnel

The staff that is responsible for vegetation removal includes the vegetation removal team(s), and at a minimum one Unexploded Ordnance (UXO) Technician II or above escort performing anomaly avoidance (to avoid contact with potential surface explosive hazards) for the vegetation removal team.

7.0 Vegetation Removal – Operational Information

The Army has historically conducted manual and/or mechanical vegetation removal operations for the following reasons:

- To create containment lines for prescribed burns, including manual tree limbing and brush cutting in areas inaccessible to mechanical masticators
- When prescribed burns cannot be done safely, due to the potential hazard of large subsurface MEC items very near the surface
- When the height of vegetation and/or proximity to urban areas pose potential wildfire or smoke impacts
- When prescribed burns cannot be reasonably conducted, because the size of the area is too small, or in areas lacking existing fuel breaks and/or access roads
- When areas have high vegetation moisture content, did not burn, or burned incompletely during a prescribed burn
- To complete the vegetation removal process in prescribed burn areas, following a burn, by removing vegetation in partially burned or unburned areas and removing plant skeletons which often remain in burned areas

In areas where prescribed burns cannot be conducted safely due to difficult terrain, proximity to urban areas, or where the potential for large MEC items exist, the Army has received approval from the United States Fish and Wildlife Service (USFWS) to remove vegetation in those areas using manual or mechanical methods. The current approved areas are described in the *Reinitiation of Formal Consultation for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord* , PBO (USFWS, 2017), and its amendment Changes to Vegetation Clearance Activities Under the *Changes to Vegetation Clearance Activities Under the Programmatic Biological Opinion for Cleanup and Property Transfer Action Conducted at Former Fort Ord, Monterey County, California* (USFWS, 2019).

8.0 Procedures

Vegetation removal will be conducted in such a matter that impacts to endangered and/or sensitive plant species, including the central maritime chaparral habitat, are minimized. Specific measures to reduce or avoid impacts to species and/or habitats described in the Habitat Management Plan and PBO will be identified by the Senior Biologist using the site habitat checklists (Addendum to the MEC Quality Assurance Project Plan [QAPP], Attachment C Forms) and will be approved by the Base Realignment and Closure (BRAC) Biologist and Contractor Quality Control Supervisor (CQCS) or Unexploded Quality Control Specialist unless coordinated otherwise with USFWS. Timing of vegetation removal operations will be conducted in accordance with dates specified in the PBO (USFWS 2017). Vegetation will be removed using manual and/or mechanical removal methods, or by prescribed burn.

8.1 Vegetation Removal Using Mechanical and/or Manual Methods

Mechanical vegetation removal will be completed in chaparral vegetation or other areas (such as coastal scrub) as required. Mechanical equipment used for vegetation removal may include the use of brush hogs, tractor accessorized Zerriest, Feller Bunchers (such as a Timber Pro, Timber King, or equivalent), with drum type mastication head. Following mechanical mastication, vegetation will be allowed to regrow once MEC removal operations have been completed.

Manual vegetation removal operations will include the use of chain saws, hand saws, trimmers, loppers, etc. in oak and grassland areas. Manual vegetation removal may be conducted in areas where mechanical removal methods cannot gain access, or to trim low hanging tree branches in containment lines. MEC removal area trees are typically limbed up to 6 feet above ground surface to accommodate MEC removal access. Trees within containment lines of prescribed burn units are typically limbed up to 8 feet above ground surface (or another height as designated by the Prescribed Burn Boss) to prevent fire from jumping from the ground into trees, with resulting tree crowning and potential airborne spread of embers beyond containment lines. Grass and oak woodland areas will receive only the minimal amount of vegetation removal that is necessary to facilitate technology-aided surface MEC removal operations. Following manual vegetation removal, vegetation will be allowed to regrow once MEC removal operations have been completed.

A UXO Technician II or above will provide anomaly avoidance (to avoid contact with potential surface explosive hazards) prior to the commencement of vegetation removal operations to inspect the ground surface for MEC/material potentially presenting an explosive hazard (MPPEH) and potential obstructions that could interfere with the mastication process (e.g., barbed wire, range-related debris, etc.). Depending on the density of the vegetation, a hand-held metal detector may be used in conjunction with the visual inspection of the ground surface. Following completion of the visual inspection, and prior to the commencement of vegetation removal operations, the UXO Technician will move outside of the predetermined minimum separation distance (MSD). The MSD for vegetation cutting is the safe distance to avoid flying debris from the mastication equipment (e.g. 450 feet for Feller Bunchers with drum-type mastication heads). If an explosives safety exclusion zone is also applicable to the work area, the MSD is the Hazard Fragmentation Distance (HFD) for the munitions with the greatest fragmentation distance (MGFD), or the MSD for vegetation cutting (e.g., 450 feet for Feller Bunchers with drum-type mastication heads), whichever is greater. Masticators are armored as needed, based on ordnance known to exist in the Unit.

For mastication in areas where surface MEC removal has already occurred, the MSD is 450 feet or based on the equipment in use. If during vegetation removal operations a MEC or an unknown item is encountered, vegetation removal operations will stop and the UXO Technician will investigate the item. Should a MEC item(s) be encountered, it will be managed in accordance with the MEC QAPP Addendum, Attachment B UXO SOP 5 (MEC and MPPEH Management).

Areas with light to medium vegetation (i.e., where the ground surface can be readily observed) will be cut in one stage to a height of no more than six inches above the ground surface. For areas where surface MEC removal has not been completed with dense vegetation that obscures the visual inspection of the ground surface, a first cut will be made to a height between 18 and 24 inches above the ground. Following technology-aided visual inspection a second cut will be made to a height of no more than six inches above ground surface. In areas where surface (or subsurface) MEC removal has been conducted, the decision to use the two-stage method will be identified in the Site-Specific Work Plan based on site-specific information.

Vegetation removal will be conducted in a manner that avoids damage to the plant's root structure. Trees will not be removed without prior authorization. Special status shrubs, such as Toro Manzanitas, may be flagged for vegetation removal avoidance by the Senior Biologist. Branches and low-lying limbs smaller than 4 inches in diameter of oak trees may be trimmed to increase accessibility to the ground surface.

Branches larger than 4 inches in diameter will not be cut. In general, and specifically in chaparral areas, masticated materials will be left on the ground, however, large quantities of cut vegetation matter may require chipping and removed from the work area. Chipping will be decided on a case-by-case basis. Chipped material will be used for erosion control where feasible and in coordination with the BRAC Office. Chipped material not used for erosion control will be stockpiled. Stockpile locations will be coordinated with the BRAC office. Stockpiles will be inspected on a regular basis to monitor heat levels to avoid risks for combustion. Where feasible, stockpiles will be assembled into smaller piles versus one large pile. Usage of chipped material and stockpile locations will be identified in the Site Habitat Checklist.

Quantities of poison oak will also be assessed to determine the feasibility of chipping. Site-specific vegetation removal operations will be described in the SSWPs.

Fencing around or within a site requiring manual and/or mechanical vegetation removal will be removed (as needed) prior to the commencement of vegetation removal activities. Site security will be established for the area while the fencing is removed. Following the vegetation removal operation(s), fencing will be re-installed.

8.2 Vegetation Removal Using Prescribed Burn

Prescribed burns will be conducted in conjunction with Presidio of Monterey Fire Department (POMFD). POMFD will act as the Incident Commander during prescribed burn operations. The POMFD Chief (or designee) will act as the Incident Commander during prescribed burn operations, working closely with the Ahtna team's Prescribed Burn Boss. Ahtna will provide prescribed burn support activities that include the following tasks:

- Removal and replacement of fencing
- Burn containment line preparation, including mastication and, where necessary, surface MEC removal
- Prescribed burn support (See Section 8.2.3 below)

Following the prescribed burn burned shrubs and other remaining burned wood may need to be removed using mechanical or manual equipment as necessary. Safety of personnel and environmental impacts will be considered when selecting the appropriate vegetation removal method(s) to be used. Additionally, depending on the amount of unburned brush in an area, Ahtna may seek guidance from BRAC to determine the appropriate vegetation removal method for that area.

8.2.1 Removal and Replacement of Fencing

Fencing around or within a site that will undergo a prescribed burn will be removed (as needed) prior to the commencement of burn activities. Site security will be established for the area while the fencing is removed. Following the prescribed burn operation(s), fencing will be re-installed as needed.

8.2.2 Planned Prescribed Burn Area Preparation

Vegetation removal within the prescribed burn primary containment line will be conducted using either manual and/or mechanical methods. The width of the containment line is to be based on coordination with POMFD and the Burn Boss. Vegetation removal may need to be completed for prescribed burn secondary and tertiary containment lines. Planned burn area preparation will include the removal of combustible materials (e.g. tires, structures, targets, etc.) as necessary and if deemed safe to remove. Structures that are not to be burned will be protected prior to conducting the burn operation. If surface MEC removal has not been conducted in the prescribed burn containment lines, a UXO Technician II or above will conduct anomaly avoidance (to avoid contact with potential surface explosive hazards) for the vegetation removal team. Prescribed burn containment line preparation will include technology-aided surface MEC removal if determined necessary based on site-specific information.

8.2.3 Prescribed Burn Support

The prescribed burn(s) will be supported by Ahtna through the following efforts:

- Ground setup for dip tanks, intermediate tanks, pumps, and hoses
- Provision of staff to manage each dip tank location and the water transport and transfer at these sites on burn days.
- Setup of air monitoring equipment at various area locations designated in the Burn Plan.
- Provision of staff to manage the air monitor operations on burn days
- Provision of helicopters for both the ignition and suppression phases of the prescribed burns
- Provision of water trucks and operators
- Provision of burn equipment
- Provision of wildfire fighting ground support team and equipment
- Provision of Prescribed Burn Boss, Air Ground Support Supervisor, and Burn Safety Officer (for both planning and operations)
- Provision of heavy equipment operators on burn days
- Provision of UXO supervisory staff for ordnance safety and other ordnance issues on burn days
- Provision of security staff at Impact Area and/or Bureau of Land Management (BLM) Area B road gates and/or other access points to assure public safety on burn days.
- Provision of other support staff at the project field office as necessary on burn days

8.2.4 Post Prescribed Burn Vegetation Removal

Following a prescribed burn remaining unburned/burned brush, and remining standing stems and branches from maritime chaparral may need to be cut using mechanical or manual methods to accommodate instrument-aided surface MEC removal. Safety of personnel and environmental impacts will be considered for selecting the cutting method(s) for the remaining material. Depending on the amount of remaining material the BRAC Office will be consulted to determine the appropriate cutting method for that area.

9.0 Documentation

After burns are conducted, if directed, Ahtna will document areas that did or did not burn.

10.0 Quality Control

Inspection checklists specific to this SOP are located at the end of this SOP (Appendix B). Measurement Performance Criteria for vegetation removal operations can be found in Worksheet #12 of the MEC QAPP Addendum. The MEC QAPP Addendum Worksheets #31, #32 and #33 identifies who conducts the Quality

Control (QC) inspection for specific definable features of work and the frequency of the Follow-up Phase QC inspections.

11.0 Safety and Health

Safety and Health training requirements for on-site project personnel have been established in accordance with Occupational Safety and Health Administration requirements for hazardous site workers (29 Code of Federal Regulations 1910.120) and Ahtna policies and procedures. These training requirements are specified in the Accident Prevention Plan and Site Safety and Health Plan to mitigate these hazards and are to be met before project personnel can begin site work.

12.0 References

Unites States Fish and Wildlife Service (USFWS), 2017. *Reinitiation of Formal Consultation for Cleanup and Propety Transfer Actions Conducted at the Former Fort Ord. Monterey County California (Original Consultation #8-8-09-F-74, 81440-2009-F-0334)*. June. (BW-2747A)

USFWS, 2019. *Changes to Vegetation Clearance Activities Under the Programmatic Biological Opinion for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California (2017-F-0094)*. February. (BW-2747A.2)

United States Army Corps of Engineers (USACE), 2024. Engineering Manual 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions*. December

Appendix A: SOP Signature Page

Project Information
Field SOP 4 – Vegetation Removal
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	Date:

Appendix B: Three Phase Quality Control Checklist

Project Information
Field SOP 4 – Vegetation Removal
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	**Section Reference**	**Inspection Point Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
1	Signature Page	Verify that all personnel have signed the SOP Signature Page				*(P)*
2	5.0	Is the necessary equipment available? • Manual vegetation removal equipment • Mechanical vegetation removal equipment • Schonstedt or All Metals hand-held metal detector(s) • Appropriate PPE • Spill kit				*(I), (F)*
3	6.0	Is one UXO Technician II or above escort performing anomaly avoidance for each vegetation removal team?				*(I),(F)*
4	8.0	Is vegetation removal being performed to minimize impacts to endangered and/or sensitive plant species?				*(I),(F)*
5	8.0	Have specific measures been identified by the Senior Biologist using the site habitat checklist to reduce or avoid impacts to species and/or habitats?				*(I),(F)*
6	8.0	Has the Senior Biologist used the site habitat checklists and have they been approved by BRAC?				*(I),(F)*

Checklist						
Item	**Section Reference**	**Inspection Point Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
7	8.0	Has timing of vegetation removal been conducted in accordance with dates specified in the PBO?				*(I),(F)*
8	8.1	Have trees been limbed up to 8 ft above ground?				*(I),(F)*
9	8.1	Have grass and oak woodland areas received minimal amount of vegetation removal to facilitate technology-aided surface MEC removal operations?				*(I),(F)*
10	8.1	Has vegetation been allowed to regrow once MEC removal operations have been completed?				*(I),(F)*
11	8.1	Has mechanical vegetation removal been completed in chaparral vegetation or other areas?				*(I),(F)*
12	8.1	Has a UXO Technician II or above provided anomaly avoidance (to avoid contact with potential surface explosive hazards) for the vegetation removal team prior to the start of vegetation removal operations?				*(I),(F)*
13	8.1	Has the UXO Technician moved outside the MSD prior to the start of vegetation removal operations?				*(I),(F)*
14	8.1	If a MEC item is located during vegetation removal operation, have vegetation removal operations stopped?				*(I),(F)*
15	8.1	If a MEC item is encountered, is it managed in accordance with UXO SOP 5?				*(I),(F)*
16	8.1	In areas with light to medium vegetation has the vegetation been cut to a height of no more than 6 inches?				*(I),(F)*
17	8.1	In areas with dense vegetation, has a first cut been made to a height between 18 and 24 inches? Following a technology- aides surface MEC removal operation has a second cut to a height of no more than 6 inches been completed?				*(I),(F)*

Checklist						
Item	**Section Reference**	**Inspection Point Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
18	8.1	Is vegetation being removed in such a manner as to not damage the root of the plant?				*(I),(F)*
19	8.1	If trees are to be removed has proper authorization been given?				*(I),(F)*
20	8.1	Are masticated materials being left on the ground? Are large quantities of cut vegetation chipped and removed from the work area and used for erosion control where feasible? (case by case basis)				*(I),(F)*
21	8.1	Are site-specific vegetation removal operations described in the SSWPs?				*(I),(F)*
22	8.1 and 8.2.1	Has fencing been removed (if applicable) prior to vegetation removal operations? If so, has security been established while fencing is removed? Has fencing been reinstalled following vegetation removal operations?				*(I),(F)*
23	8.2	Are prescribed burns being conducted in conjunction with the POMFD?				*(I),(F)*
24	8.2	After the burn has the remaining wood been removed?				*(I),(F)*
25	8.2	Has Ahtna sought guidance from BRAC to determine the appropriate vegetation removal method for that area?				*(I),(F)*
26	8.2.2	Has vegetation removal within the prescribed burn primary containment line been conducted? Note that vegetation removal may also be required in secondary and tertiary containment lines.				*(I),(F)*
27	8.2.2	Is the width of the containment line based on munition with the greatest fragmentation distance expected and the associated HFD (as specified in the ESS)?				*(I),(F)*
28	8.2.2	Has burn area preparation been conducted as necessary? i.e. removal of combustible materials.				*(I),(F)*
29	8.2.2	Have structures not to be burned been protected prior to the burn?				*(I),(F)*

Checklist						
Item	**Section Reference**	**Inspection Point Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
30	8.2.2	Has anomaly avoidance (to avoid contact with potential surface explosive hazards) for the vegetation removal team been conducted in containment lines where surface MEC removal has not previously been completed?				*(I),(F)*
31	8.2.2	Where required to support a prescribed burn, has a technology-aided surface MEC removal been conducted in containment lines?				*(I),(F)*
32	8.2.3	Has Ahtna provided burn support activities as listed in Section 8.2.3 of this SOP?				*(I),(F)*
33	9.0	If requested, has Ahtna documented areas that did or did not burn?				*(I),(F)*

Punch list Items	
No.	

Conducted by: ______________________________ Date: ______________________________

Approved by: ______________________________ Date: ______________________________

GEO SOP 1
IVS INSTALLATION AND USE

GEO SOP 1

Standard Operating Procedure

Instrument Verification Strip (IVS) Installation and Use

Original Issue Date: August 2024
Last Review/Implementation Date: August 2024

InDepth Corporation

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Table of Contents

Appendices

Acronyms

ASTM	American Society for Testing and Materials
bgs	Below Ground Surface
BRAC	Base Realignment and Closure
ISO	Blind Seed Items
DGM	Digital Geophysical Mapping
GPS	Global Positioning System
ISO	Industry Standard Object
IVS	Instrument Verification Strip
MEC	Munitions and Explosives of Concern
MEC QAPP	Munitions and Explosives of Concern Quality Assurance Project Plan
MQO	Measurement Quality Objective
QC	Quality Control
RTK	Real-Time Kinematic
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
UXO	Unexploded Ordnance

1. POLICY

InDepth and subcontractor personnel will follow procedures established in this Standard Operating Procedure (SOP) for all work related to the installation of an Instrument Verification Strip (IVS) and its use. This SOP must be distributed to and signed by all personnel performing activities related to this SOP and must be adhered to during the performance of all field activities.

2. PURPOSE & SCOPE

2.1 PURPOSE

The purpose of this SOP is to describe the equipment and general methodologies that are to be used by the Quality Control (QC) Geophysicist and site personnel when installing an IVS. Additionally, this SOP describes the use of an IVS during testing. This SOP does not detail the use of the equipment that is described herein as it is described in equipment-specific SOPs. This SOP assumes that experienced personnel that will be using this SOP are familiar with the equipment and are competent in their use.

2.2 SCOPE

The information presented in this SOP is applicable to all Munitions and Explosives of Concern (MEC) related project sites. The Instrument Verification Strip (IVS) is constructed of a series of buried inert munitions and/or Industry Standard Objects (ISOs). During the IVS process, the electromagnetic induction sensor system measures the response of each item in the IVS and these responses are compared to theoretical responses to ensure and document proper functioning of the system. Positional accuracy specifications may vary depending on equipment and contract requirements.

3. MAINTENANCE

InDepth personnel are responsible for the maintenance of this SOP.

4. PERSONNEL, EQUIPMENT & MATERIALS

4.1 PERSONNEL

The following individuals will be involved in verifying correct installation and operation of the DGM systems at the IVS:

- Senior Geophysicist
- QC Geophysicist
- Field Geophysicists
- InDepth Data Processor
- Field Technician

The Senior Geophysicist and QC Geophysicist will be responsible for ensuring that the installation of the IVS and the results of the initial and daily IVS meet the project objectives. Field Geophysicists will be responsible for overall daily IVS activities, in field review of the IVS results, reporting all results to the Senior Geophysicist and QC

Geophysicist. The qualifications of the key personnel implementing this SOP are documented in the MEC Quality Assurance Project Plan (QAPP) Addendum Worksheets 4, 7, and 8. Unexploded Ordnance (UXO) personnel will be responsible for overall daily site access, anomaly avoidance, safety aspect of the project compiling subcontractor health and safety documents, conduction 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 Site-Specific Accident Prevention Plan and Health and Safety Plan.

4.2 EQUIPMENT

Equipment required for installation of the IVS includes the following:

- EM61 Mk2 coupled with a Real-Time Kinematic Global Positioning System (RTK GPS).
- Transport mechanisms (e.g., all-terrain utility vehicle, wheeled cart, litter, etc.) used to move the sensor during data acquisition.
- Digital Tablet or whiteboard.
- Measuring tape and non-metallic markers (e.g., pin flags, stakes, tent pegs, spray paint, etc.) to mark the positions of the test items and the beginning and end of the IVS.
- Hand tools including shovels, picks, breaker bars, etc. to construct the IVS.
- Schonstedt GA-52Cx gradiometer and Minelab Vanquish 540 Detector all-metals hand-held metal detectors or equivalent.
- Serialized reference items for operational testing.
- A data processing computer suitable for and equipped to run the processes provided in the UX-Analyze module of Oasis Montaj geophysical processing environment.

4.3 MATERIALS

Materials required for installation of an IVS consist of Industry Standard Object(s) (ISO)s and/or inert ordnance items. ISOs are schedule 40 pipe nipples, threaded on both ends, made from black welded steel, manufactured to an American Society for Testing and Materials (ASTM) specification. Three sizes of ISOs exist and are described in Table 4-1 and shown in Figure 4-1 below.

Table 4-1. ISO Specifications

Item	Nominal Pipe Size	Outside Diameter	Length	Part Number[1]	ASTM Specification
Small ISO	1"	1.315" (33 mm)	4" (102 mm)	44615K466	A53/A773
Medium ISO	2"	2.375" (60 mm)	8" (204 mm)	44615K529	A53/A773
Large ISO	4"	4.500" (115 mm)	12" (306 mm)	44615K137	A53/A773

[1] Part number from the McMaster-Carr catalog.

Figure 4-1. Visual Representation of ISOs.

5. PROCEDURES

Figure 5-1 illustrates the overall IVS process and the procedures to be followed during the site selection, emplacement, and use of the IVS.

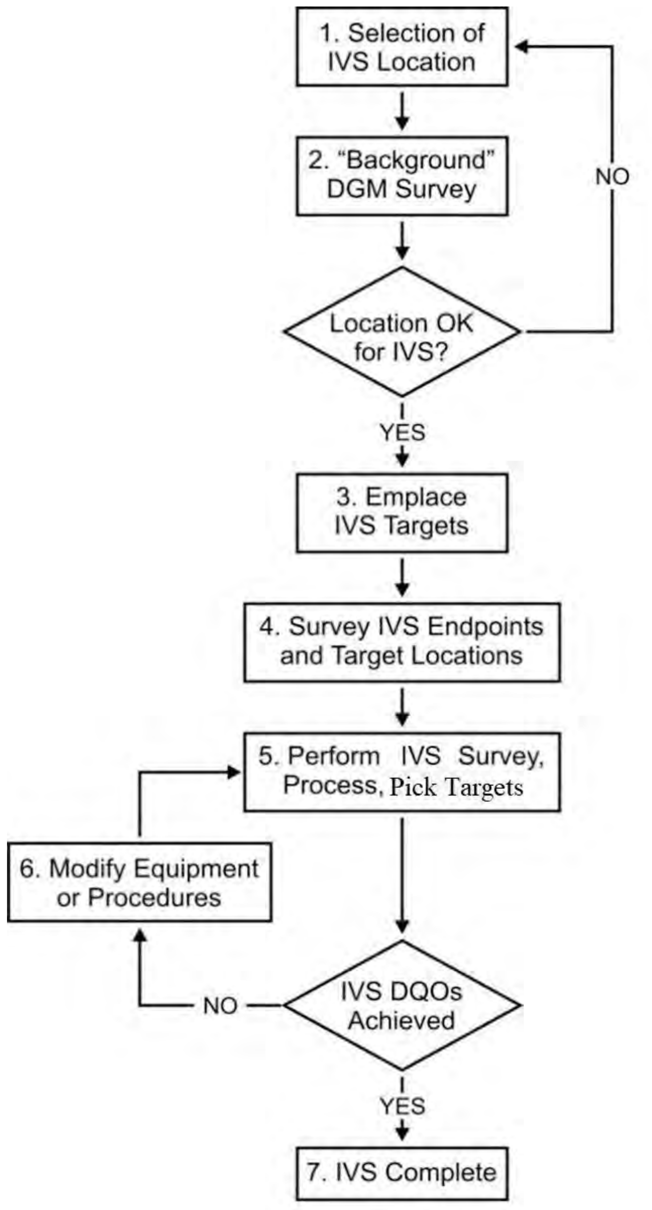

Figure 5-1. IVS Site Selection, Emplacement, and Use

5.1 IVS LOCATION AND INSTALLATION PROCEDURES

An IVS location will be selected with preference for the following (although none of the conditions are vital for IVS success):

- The proposed IVS location(s) will be submitted to the Project Delivery Team and coordinated with the Base Realignment and Closure (BRAC) office for approval prior to initiation of field activities.
- Terrain, geology, and vegetation similar to that of a majority of the DGM survey area.
- Geophysical noise conditions similar to those expected across the survey area.
- Large enough site to accommodate all necessary IVS tests and equipment and for adequate spacing (usually, a minimum of 3-5 m separation) of the ISOs and background reading location to avoid ambiguities in data evaluation.
- Readily accessible to project personnel.
- Close proximity to the actual survey site (if not within the site).

A background DGM survey will be performed with the DGM sensor using RTK-GPS or an equivalent system. The purpose of this step is to document the appropriateness of the location (e.g., few existing anomalies) and will verify that IVS targets are not seeded near existing anomalies. The data from this IVS pre-survey will be processed and provided to the Project and QC Geophysicists for evaluation. Once the IVS area is deemed suitable for use (i.e., free of significant subsurface anomalies or containing anomalies that are clearly identified so that they can be avoided during seeding), targets will be buried at depths below ground surface of approximately 3 to 5 times their diameter. These depths are intended to provide adequate signal to noise ratio for detecting the targets. The generalized diagram of the seeded IVS transect is presented as Figure 5.2, showing only one IVS target location. A table presenting the proposed IVS item layout is presented in Table 5.1. The IVS point descriptions presented in this table are generic. To avoid confusion with previous IVS layouts, and successive IVS layouts during this process each point will include a unique label including the following information: point type (IVS or ISO), IVS location designation (A, B, C, etc.), point number (1, 2, 3, etc) (e.g., IVSA-1, or ISOA-1). This is the minimum requirement for an IVS; local custom, stakeholder comfort, or other similar reasons may lead to a greater number of items in the IVS. Details regarding the as-built construction layout of the IVS will be presented in the IVS memorandum.

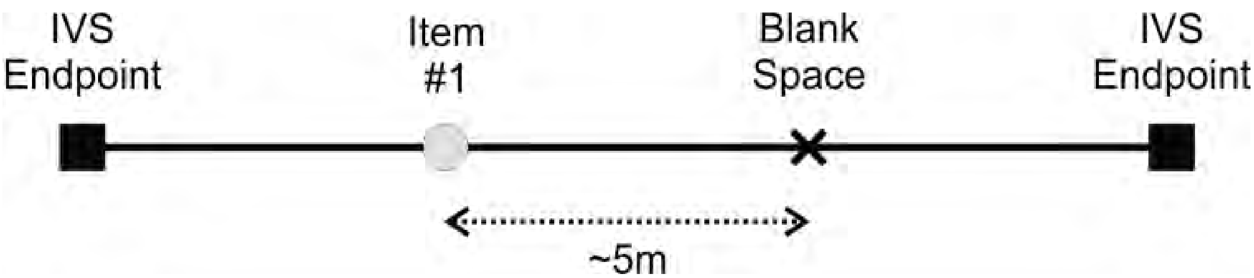

Figure 5-2. Example Layout of the IVS

Table 5.1 IVS Item Layout, Depths, and Orientations

Point ID	Downline distance (ft)	Crossline Offset (ft)	Type	Depth to Center of Mass (inches)	Depth to Center of Mass (cm)	Orientation
IVS 1 / Blank	0	0	IVS Endpoint	n/a	n/a	n/a
ISO 1	10	0	Small ISO 40	6	15.2	Horizontal
ISO 2	20	+1.64	Small ISO 40	6	15.2	Horizontal
ISO 3	30	-1.64	Small ISO 40	6	15.2	Horizontal
ISO 4	40	0	Small ISO 40	11	27.9	Vertical
ISO 5	50	+1.64	Small ISO 40	11	27.9	Vertical

ISO 6	60	-1.64	Small ISO 40	11	27.9	Vertical
IVS 1	70	0	IVS Endpoint	n/a	n/a	n/a

Measurements of the item depths will be to the center of mass for each item. Onsite personnel will bury the IVS targets using shovels to dig the holes to the appropriate depths for burial of the seed items in coordination with the QC Geophysicist. UXO personnel will implement MEC avoidance procedures using analog instruments during installation. The background survey data and anomaly avoidance techniques will be reviewed so that transect start and end stakes and the seed items are not placed on top of or near existing anomalies.

Prior to ISO placement or installation, each ISO is assigned a unique identification number. For ISOs that are to be placed below the ground surface, once the ISO has been installed in accordance with the plan, IVS construction personnel will record the following information using a digital tablet or whiteboard for each ISO before covering:

- ISO unique identification number
- BSI Type (Inert ordnance or ISO)
- Nomenclature (if inert ordnance)
- Diameter (if inert ordnance)
- Length (if inert ordnance)
- Depth bgs of ISO (center of mass) [if buried]
- Orientation of ISO
- Azimuth of ISO
- Date Installed
- RTK-GPS coordinate in coordinate system defined in the MEC QAPP Addendum.
- Photo of emplaced ISO

The holes will then be filled with soil and a wooden survey stake or other suitable non-metallic marker will be placed at each buried item location, as well as the start and end location of the IVS. Wooden stakes will not extend above the ground surface such that it interferes with the DGM sensor when passing over them.

5.2 IVS Data Acquisition Procedures

Upon successful completion of the IVS installation, data acquisition can be performed to establish the site-specific response characteristics for use with the Measurement Quality Objectives (MQO)s. After the site-specific response characteristics have been determined the IVS will be used for daily function tests.

During the first four days of DGM operation, a series of dynamic IVS measurements will be digitally collected over the IVS using the EM61 system(s) for both the person-portable and towed-array systems. The IVS background reading will be collected over the established noise line during the first four days of DGM operation. The expected baseline mV response for each individual IVS item and the background response will be based on the average EM61 response observed during these first 4 days of operation.

Prior to production data acquisition and each morning before beginning field operations, a static function test will be performed as described in the appropriate MEC QAPP Addendum, Attachment B Person-Portable or Towed-Array SOPs, GEO-SOP-3 and GEO-SOP-4, respectively. After the static function tests are completed a minimum of two data lines will be acquired in opposite directions directly over the center of the IVS seed items for the initial IVS and one data line will be acquired over the noise line.

For each day when data are collected, an opening IVS will be performed before production data are acquired and a closing IVS will be performed after the end of production data acquisition. A minimum of two data lines will be acquired in opposite directions directly over the center of the IVS seed items for both the opening and closing IVS.

Following the closing IVS run, a closing static function test will be performed and then the raw data will be downloaded to an external memory device for delivery to the data processor.

5.3 IVS Data Processing Procedures

Upon successful completion of the IVS data acquisition, the data will be analyzed by the data processor who will evaluate the data for compliance to the site-specific MQOs.

5.3.1 IVS Data Processing Procedures

i. Review Data Delivery to ensure it is complete and import all data into the processing software.

ii. Import the static function test(s), and IVS data.

iii. Verify the data collected over the IVS is suitable for use representing the survey area as a whole.

iv. Verify that the static function tests are within MQO thresholds.

v. Process filtered data to select ISO locations within the IVS data set.

vi. Verify that all results of the IVS data meet the project specific MQOs established in the MEC QAPP Addendum.

vii. Record results of tests in the project database.

5.3.2 IVS Data Review Procedures

The objective of the IVS data review is to verify that all targets within the IVS data meet the project specific MQOs established in the MEC QAPP Addendum. If the initial MQOs have not been met, the QC Geophysicist will initiate a root cause analysis to determine the source of the discrepancies. If modifications to the instrument or procedures can be made so that the MQOs can be met, these modifications will be made. If the MQOs cannot be met, for example, if the initial background survey is too noisy to reliably detect site-specific MEC, the Project and QC Geophysicist will meet with the project team to discuss potential resolutions.

Once the initial (or modified) MQOs have been met, the initial IVS survey will be complete, and the system and operators verified for field data acquisition. The results of the initial IVS survey will be documented in the IVS Memorandum.

6. DATA MANAGEMENT

6.1 DATA INPUTS

Input data required for this SOP are the locations, depths, orientations, and identities of the emplaced ISOs.

6.2 DATA OUTPUTS

The test measurements over the IVS items will be saved in the project database. Also, the QC checklists in Attachment B Three Phase QC Checklist GEO SOP 1 will be completed, signed, and filed as proof of performance. Performance and acceptability of the initial IVS data will be documented in an IVS Memorandum.

7. QUALITY CONTROL

7.1 IVS QUALITY CONTROL

This procedure is performed at the beginning and throughout the project and, therefore, has Preparatory, Initial, and Follow-on QC checks. Performance of the required QC checks will be documented by the Project Geophysicist on the Preparatory, Initial, and Follow-on QC checklists in Attachments 1 through 3 to this SOP. The QC Geophysicist will verify and document successful completion of the following procedures in the Geophysics Daily QC Report:

i. The Preparatory QC Checklist covers the construction of the IVS and preparation of the DGM sensor prior to the first IVS tests. This checklist is completed once per project.

ii. The Initial QC Checklist covers the initial IVS tests to demonstrate proper functioning of the DGM system prior to performing production data acquisition.

iii. The Follow-on QC Checklist documents the IVS tests that are performed at least twice per day throughout the project, each morning prior to starting production data acquisition, and at the conclusion of data acquisition. These tests include the instrument start-up tests, static function tests, IVS line data and noise line data for each sensor being deployed that day.

iv. Achievement of the IVS MQOs will be verified by the Project and QC Geophysicist on their QC checklists.

v. During review of the initial and follow-on data packages, the Data Processor will overlay the responses and offsets of each IVS target from all measurements to observe the time variation of the processed results. Should an issue be detected (such as a data trend indicating an MQO limit is being approached) or an MQO is not met, a comprehensive root-cause analysis will be performed, and a corrective action determined.

7.2 Measurement Quality Objectives

The MQOs for the IVS are presented in Worksheet #22 of the MEC QAPP Addendum. The DGM sensor will not be used for field data acquisition until it is able to meet these MQOs or until the project team agrees on modifications to these MQOs.

8. REPORTING

This procedure will be documented through the completion of the Three Phase QC Checklist GEO SOP 1 Installation and Use, in Appendix B. The IVS construction and implementation will be documented in an IVS Memorandum and a copy of the completed Three Phase Quality Control Checklist GEO SOP 1 IVS Installation and Use will be included with all appropriate elements completed. A Three Phase GEO SOP 1 IVS Installation and Use QC Checklist will be completed by the Project Geophysicist each day IVS data is collected during the production survey and a copy of these completed checklists will be included with the Remedial Action Report at the end of the project.

9. HEALTH & SAFETY

The installation of ISOs in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items.

10. REFERENCES

- 2009, ESTCP (Environmental Security Technology Certification Program), Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response, July.
- USACE, 2024, Environmental Quality – Technical Guidance Military Munitions Response Actions, EM 200-1-15, Washington, D.C.
- Sequent Oasis Montaj, Standard Edition, with UXO Land and DoD UX-Analyze Custom Tools extensions, Versions 9.2, and later.

11. REVISION HISTORY

Version	Change Summary	Change Reason	Prepared By	Approved By	Published
rev-1.00	Initial Release	No Change	Hecker	Smith, Welk	20240819

Appendix A
SOP Signature Page

The following individuals have read and understand this SOP:

Signature:	Date:

Appendix B
QC Checklist

Three Phase Quality Control Checklist

GEO SOP 1 – IVS Installation and Use

Team Information		
Team:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	Reference	Inspection Point	Yes	No	NIA	Comments
1	Signature Page	Verify that all personnel have signed the SOP Signature Page				*(P)*
2	5.0	Verify that RTK-GPS is being used (if employed)				*(I),(F)*
3	5.0	Verify digital tablets are being used				*(I),(F)*
4	5.0	Verify the following equipment is available for use (if to be used): • 100 ft tape measure (3 each) • Shovel (or similar device for installing BSIs) • Schonstedt and White DFX 300 • ISOs (small size)				*(I),(F)*
5	5.0	Verify that the QC Geophysicist is escorted by a UXO technician during IVS installation.				*(I),(F)*
6	7.0	Verify that hand-held metal detectors and RTK-GPS are verified to be functioning properly at an FCA at the beginning of each day.				*(I),(F)*
7	7.0	Verify that the EM61 is functioning properly through the use of standard static QC tests in accordance with Geo SOP 3 and MQOs located in WS #12 of the MEC QAPP Addendum.				*(I),(F)*
8	7.0	Verify IVS location is inspected by a UXO Technician using a hand-held metal detector prior to installation				*(I),(F)*
9	7.0	If anomaly is found to exist has item been removed or has new location been chosen?				*(I),(F)*
10	7.0	Have IVS items had their depth and inches bgs (center of mass) been recorded? Has horizontal position been recorded using RTK GPS?				*(I),(F)*
11	7.0	Have instrument response curves for buried ISOs been used to initially verify that EM61 is functioning properly?				*(I),(F)*

Three Phase Quality Control Checklist

GEO SOP 1 – IVS Installation and Use

12	7.0	Is background strip clear of anomalies? Has background strip data been used to determine background noise level and assess if TOI can be detected under site conditions?				*(I),(F)*
13	7.0	At start of task order were items in the 2 IVSs excavated and items reinstalled?				*(I),(F)*
14	7.0	Have all IVSs that are installed use small ISOs placed at a depth of 6 inches (center of mass) in a vertical orientation? Are all IVS items a minimum of 5 ft from each other? Has position of IVS items been located using RTK-GPS?				*(I),(F)*
15	7.0	Have IVS items been installed in accordance with Table 2 of this SOP?				*(I),(F)*
16	7.0	Have series of IVS measurements been digitally collected over the IVS using the EM61 during the first 4 days of DGM operation? Has series of background readings been collected during first 4 days of DGM operation? Has baseline mV response for each individual IVS item been calculated based on average of first 4 days of DGM operation?				*(I),(F)*
17	7.0	Have all EM61 systems to be used that day made a pass over the IVS and background strip twice daily (am/pm)? Have passes over IVS been completed in a consistent manner from day to day? Are MQOs (WS #12 of MEC QAPP Addendum) being met?				*(I),(F)*
18	7.0	Has IVS report been generated? For every time new sensor is used onsite? Does IVS report include geo maps and complete analysis of results to verify that EM61 is functioning as designed?				*(I),(F)*
19	8.0	Has the following information been recorded for each IVS item? • IVS unique identification number • GPS coordinate (X,Y) • Seed Type (ISO type or inert ordnance type) • Depth (center of mass (inches and cm)) • Orientation • Date Installed				*(I),(F)*

Three Phase Quality Control Checklist

GEO SOP 1 – IVS Installation and Use

Punch list Items	
No.	

Conducted by: ________________________________ DATE: ____________________________

Approved by: ________________________________ DATE: ____________________________

GEO SOP 2
BLIND SEED ITEM INSTALLATION

GEO SOP 2

Standard Operating Procedure

Blind Seed Item Installation

Original Issue Date: August 2024
Last Review/Implementation Date: August 2024

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Table of Contents

Appendices

Acronyms

ASTM	American Society for Testing and Materials
bgs	Below Ground Surface
BSI	Blind Seed Items
DGM	Digital Geophysical Mapping
FCA	Function Check Area
GPS	Global Positioning System
ISO	Industry Standard Object
IVS	Instrument Verification Strip
MEC	Munitions and Explosives of Concern
MEC QAPP	Munitions and Explosives of Concern Quality Assurance Project Plan
QC	Quality Control
RTK	Real-Time Kinematic
SOP	Standard Operating Procedure
SSWP	Site Specific Work Plan
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist

1. POLICY

InDepth and project personnel will follow procedures established in this Standard Operating Procedure (SOP) for all work related to the installation and positioning of Blind Seed Item (BSI)s. This SOP must be distributed to and signed by all personnel performing activities related to this SOP and must be adhered to as field activities are performed.

2. PURPOSE & SCOPE

2.1 PURPOSE

The purpose of this SOP is to describe the equipment and general methodologies that are to be used by the Unexploded Ordnance Quality Control Specialist **(**UXOQCS**)** Quality and Control (QC) Geophysicist when installing BSIs either on the surface or in the subsurface of an area that is to be investigated / remediated. This SOP does not detail the use of the equipment that is described herein. This SOP assumes that experienced personnel that will be using this SOP are familiar with the equipment and are competent in their use.

2.2 SCOPE

The information presented in this SOP is applicable to all Munitions and Explosives of Concern (MEC) related project sites. Positional accuracy specifications may vary depending on equipment and contract requirements.

3. MAINTENANCE

InDepth personnel are responsible for the maintenance of this SOP.

4. PERSONNEL, EQUIPMENT & MATERIALS

4.1 PERSONNEL

The QC Staff that is responsible for the installation of BSIs is the UXOQCS and the QC Geophysicist. During the installation of BSIs these persons may work together or separately however the QC Geophysicist will always be accompanied by an Unexploded Ordnance (UXO) qualified technician / escort and the two-man rule is to always be followed. The qualifications of the personnel implementing this SOP are documented in the MEC Quality Assurance Project Plan (QAPP) Addendum Worksheets 4, 7, and 8.

4.2 EQUIPMENT

Equipment required for installation of the IVS includes the following:

- Global Positioning System (RTK GPS) or Simultaneous Localization and Mapping (SLAM) system, as required.
- Tape measure
- Digital Tablet or whiteboard.
- Hand tools including shovels for placing BSIs in the subsurface.
- Schonstedt GA-52Cx gradiometer and Minelab Vanquish 540 Detector all-metals hand-held metal detectors or equivalent.

- Camera

4.3 MATERIALS

Materials required for BSI installation consist of Industry Standard Object(s) (ISO)s. ISOs are schedule 40 pipe nipples, threaded on both ends, made from black welded steel, manufactured to an American Society for Testing and Materials (ASTM) specification. Three sizes of ISOs exist and are described in Table 4-1 and shown in Figure 4-1 below.

Table 4-1. ISO Specifications

Item	Nominal Pipe Size	Outside Diameter	Length	Part Number[1]	ASTM Specification
Small ISO	1"	1.315" (33 mm)	4" (102 mm)	44615K466	A53/A773
Medium ISO	2"	2.375" (60 mm)	8" (204 mm)	44615K529	A53/A773
Large ISO	4"	4.500" (115 mm)	12" (306 mm)	44615K137	A53/A773

[1] Part number from the McMaster-Carr catalog.

Figure 4-1. Visual Representation of ISOs.

5. PROCEDURES

Hand-held metal detectors, and RTK-GPS or SLAM system (if employed) are to be checked at the function check area (FCA) prior to use for BSI installation verify that the equipment is functioning properly. Team will navigate to the desired BSI installation locations uploaded to RTK GPS or SLAM systems as required. When at the desired location is found, the installation point and area surrounding the location is to be inspected by a UXO Technician using a hand-held metal detector to ensure that no metallic objects are present. If a metallic object is found to exist (either on the surface or in the subsurface) in the desired location the QC staff will select another location near the area. Once the location has been verified to be clear of metallic objects the BSIs will then be installed at depths (or on the surface for Technology-Aided Surface MEC Removal operations) in accordance with the MEC QAPP Addendum and/or Site-Specific Work Plan (SSWP), with the SSWP taking precedence.

Prior to BSI placement or installation, each BSI is assigned a unique identification number. Measurements of the item depths will be to the center of mass for each item. A shovel will be used to dig the hole to the appropriate depth for burial of the BSI in coordination with the QC Geophysicist. UXO personnel will implement MEC avoidance procedures using analog instruments during installation.

Once the BSI has been installed at the correct depth, orientation, and azimuth in accordance with the Blind Seeding Plan, BSI installation personnel will record the following information using a digital tablet or whiteboard for each BSI before covering:

- BSI unique identification number
- BSI Type (Inert ordnance or ISO)
- Nomenclature (if inert ordnance)
- Diameter (if inert ordnance)
- Length (if inert ordnance)
- Depth bgs of BSI (center of mass) [if buried]

- Orientation of BSI
- Azimuth of BSI
- Date Installed
- RTK-GPS or SLAM coordinate in the coordinate system defined in the MEC QAPP Addendum and SSWP.
- Photo of emplaced BSI

6.DATA MANAGEMENT

6.1 DATA INPUTS

Input data required for this SOP are the locations, depths, orientations, and identities of the emplaced BSIs from the Blind Seeding Plan.

6.2 DATA OUTPUTS

All BSI data related to DGM operations will be kept confidential by the QC Geophysicist until the DGM data for that area/Unit has been collected, processed, targeted and the BSI locations have been verified by the QC Geophysicist to have been accurately identified and correctly targeted. Once this has been verified, DGM related BSI data will be provided to the Site Specific Data Manager. DGM related BSI data will not be provided to the Target Reacquisition or Intrusive Investigation of DGM Targets Teams without the express written (or email) consent of the client.

7.QUALITY CONTROL

Inspection checklists specific to this SOP are located at the end of this SOP. Measurement Performance Criteria for BSI installation can be found in Worksheet #12 of the MEC QAPP Addendum. See Worksheets #31, 32, 33 of the MEC QAPP Addendum for a description of who will conduct the QC inspection for this Definable Feature of Work and the frequency of the Follow-up Phase QC inspections.

8.REPORTING

The Blind Seed Installation details will be documented in the Production Area Seeding Report (PASR) and presented to all individuals who have signed the Blind Seeding Firewall Plan. This report will remain behind the firewall until all field activities have been completed and release has been approved in writing by the USACE client representative.

9.HEALTH & SAFETY

The installation of BSIs in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items.

10. REFERENCES

- ESTCP (Environmental Security Technology Certification Program), July 2009, Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response.
- USACE, 2024, Environmental Quality – Technical Guidance Military Munitions Response Actions, EM 200-1-15, Washington, D.C.

11. REVISION HISTORY

Version	Change Summary	Change Reason	Prepared By	Approved By	Published
Rev-1.01	Initial Release	No Change	Hecker	Smith, Welk	20240819

Appendix A
SOP Signature Page

The following individuals have read and understand this SOP:

Signature:	Date:

Appendix B
QC Checklist

Three Phase Quality Control Checklist

GEO SOP 2 – Blind Seed Item Installation

Team information		
Team:	Location:	Date:
Personnel Present:		
Phase of inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
item	Reference	inspection Point	Yes	No	NIA	Comments
I	Signature Page	Verify that all personnel have signed the SOP Signature Page				*(P)*
2	5.0	Verify that RTK-GPS or SLAM system is being used				*(I),(F)*
3	5.0	Verify digital tablets or whiteboard are being used				*(I),(F)*
4	5.0	Verify the following equipment is available for use (if to be used): • Tape measure • Shovel (or similar device for installing BSIs) • Schonstedt, or Minelab Vanquish 540 Detector all-metals, equivalent • ISOs				*(I),(F)*
5	5.0	Verify that the QC Geophysicist is escorted by a UXO technician during emplacement of BSIs				*(I),(F)*
6	7.0	Verify that hand-held metal detectors, and RTK-GPS or SLAM system are verified to be functioning properly at the beginning of each day.				*(I),(F)*
7	7.0	Verify area surrounding the BSI location is inspected by a UXO Technician using a hand-held metal detector prior to installation				*(I),(F)*
8	7.0	Verify that BSIs are installed at depths and densities specified in the MEC QAPP Addendum and SSWP.				*(I),(F)*
9	7.0	Verify that BSIs are assigned (marked) with a unique identification number.				*(I),(F)*
I0	7.0	Verify vertical depth to BSI center of mass is recorded in inches below ground surface.				*(I),(F)*
II	7.0	Horizontal position for DGM BSI is recorded using RTK-GPS.				*(I),(F)*
I2	7.0	Horizontal position for surface sweep or analog intrusive may use GPS that is an extension of the digital tablet.				*(I),(F)*

I4	7.0	Verify BSI integrity is in compliance with Blind Seed Firewall Plan (MEC QAPP Addendum, Attachment A)				*(I),(F)*
I5	8.0	Verify the following documentation has been filled out properly: • BSI unique identification number • Seed Type (inert ordnance or ISO) • Nomenclature (if inert ordnance) • Diameter (if inert ordnance) • Length (if inert ordnance) • Max Depth (if inert ordnance) • Depth of BSI (center of mass) [if buried] • Date installed • GPS or SLAM coordinate				*(I),(F)*

Punch list items	
No.	

Conducted by: ______________________________ DATE: ____________________________

Approved by: ______________________________ DATE: ____________________________

GEO SOP 3
DGM USING PERSON-PORTABLE SYSTEM

GEO SOP 3

Standard Operating Procedure

DGM Using a Person-Portable System

Original Issue Date: August 2024
Last Review/Implementation Date: August 2024

InDepth Corporation

10954 Via Frontera
San Diego, California 92127
(858) 716 -0299

Table of Contents

Appendices

Appendix A - SOP Signature Page

Appendix B – QC Log

Appendix C – QC Checklist

Acronyms

cm	Centimeter(s)
DGM	Digital Geophysical Mapping
Ft	Feet
GPS	Global Positioning System
in	Inches
IVS	Instrument Verification Strip
LEM	Litter EM
m	Meter(s)
MQO	Measurement Quality Objective
MEC	Munitions and Explosives of Concern
MEC QAPP	Munitions and Explosives of Concern Quality Assurance Project Plan
QC	Quality Control
RTK	Real-Time Kinematic
SLAM	Simultaneous Localization and Mapping
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SSWP	Site Specific Work Plan
UXO	Unexploded Ordnance
VMS	Visual Marking System

1. POLICY

InDepth and project personnel will follow procedures established in this Standard Operating Procedure (SOP) for all Digital Geophysical Mapping (DGM) operations that are to be conducted using person-portable methods in support of Munitions and Explosives of Concern (MEC) remediation projects. This SOP must be distributed to and signed by all personnel performing activities related to this SOP and must be adhered to as field activities are performed.

2. PURPOSE & SCOPE

2.1 PURPOSE

The purpose of this SOP is to detail the procedures and operational methodologies associated with the acquisition of DGM data in areas that are potentially contaminated with MEC using person-portable methods. Equipment to be used includes the Geonics EM61-MK2 system(s) for the detection of metallic objects and Real-Time Kinematic (RTK) Global Positioning Systems (GPS) or Simultaneous Localization and Mapping (SLAM) systems for navigational positioning and control. Procedures outlined in this SOP will be conducted in accordance with the MEC QAPP Addendum and Site Specific Work Plan (SSWP). This SOP does not detail the use of positioning equipment that is described herein. This SOP assumes that experienced personnel that will be using this SOP are familiar with the equipment and are competent in their use.

2.2 SCOPE

The information presented in this SOP is applicable to all Munitions and Explosives of Concern (MEC) related project sites. Positional accuracy specifications may vary depending on equipment and contract requirements.

3. MAINTENANCE

InDepth personnel are responsible for the maintenance of this SOP.

4. PERSONNEL, EQUIPMENT & MATERIALS

4.1 PERSONNEL

EM61 person-portable DGM data acquisition will be performed by a two-person team consisting of a Field Geophysicist and UXO Technician, and the two-man rule is to always be followed. Additional personnel required for this operation include the Senior Geophysicist, Quality Control (QC) Geophysicist and InDepth Data Processor. The qualifications of the personnel implementing this SOP are documented in the MEC QAPP Addendum Worksheets 4, 7, and 8.

4.2 EQUIPMENT

Equipment required for Person-Portable EM61 data acquisition includes the following:

- Geonics EM61-MK2 person-portable DGM system.
- TK6000 data logger, or equivalent, with EM61MK2a data acquisition software installed.
- Reference item (3/8” carriage bolt) for operational testing.
- InDepth Litter EM (LEM) carrying structure for use when deploying in litter-mode.
- Global Positioning System (RTK-GPS) or Simultaneous Localization and Mapping (SLAM) system, as required. System will be equipped with InDepth’s Visual Marking System (VMS) when conditions dictate.

4.3 MATERIALS

Materials required for data acquisition include non-metallic pin flags, VMS biodegradable marking paint as necessary to aid in the acquisition process.

5.PROCEDURES

Data can be collected in wheeled-mode or in litter-mode (system carried by two operators) with readings being collected at 10Hz when RTK-GPS or SLAM position is used. In wheeled-mode, one person operates the EM61-MK2 at a walking pace. If RTK-GPS positioning is not feasible due to overhead obstructions, SLAM positioning can be used. Selection of the appropriate method (wheeled or litter-mode) is based primarily on local terrain conditions, with the wheeled configuration favored whenever possible.

5.1 Site Preparation

Site preparation involves marking the site boundaries, production grids, and survey transects as required to achieve the specified coverage objectives. The site will be subdivided into grids depending upon the site conditions such that the sensor can be precisely navigated along the desired transect. Survey transect locations will be generated using the "survey layout" function in Unexploded Ordnance (UXO)-Land or within the project geographic information system (GIS).

5.2 Instrument Setup, Wheeled-Mode

When the instrument is operated in wheeled-mode, the instrument is set up according to the Geonics EM61-MK2 Manual. The wheels maintain the bottom coil at a consistent height of 40 cm (15.75 in) above the ground surface and allow the instrument to be towed over the survey area by a single operator. System electronics are mounted on a backpack worn by the operator who also carries the instrument's data logger. To the extent possible, all cables are secured to the instrument using zip ties to keep them from getting tangled, minimize cable movement and reduce the potential for snagging vegetation.

5.3 Instrument Setup, Litter-Mode

When the instrument is operated in litter-mode, the EM61 coils and electronics are housed in InDepth's LEM carbon fiber deployment system, where coils are suspended and carried by a two-person team. The carrying handles are adjustable and will be adjusted to each operator's individual heights to maintain the bottom coil at a consistent height of 40 cm (15.75 in) above the ground surface, as in the wheeled-mode. Webbed suspension harnesses are worn by the operators to share the weight and reduce fatigue. The EM61 battery, system electronics and data logger are mounted on a console attached to the rear handles. As in the wheel mode configuration, all cables are secured using zip ties prior to the start of data collection to minimize cable movement and to reduce the potential for snagging vegetation.

5.4 Navigation

Navigation of the person-portable system is accomplished through a combination of the integration of RTK-GPS or SLAM system combined with VMS. When performing a 100% coverage survey using either wheeled or litter mode deployment, once a baseline is set the VMS is used to spray paint marks on the ground providing a visual ground-based means of navigation to reduce/prevent data gaps and provide increased production. RTK-GPS or SLAM positions systems are mounted over the center of the EM61-MK2 coil to provide real time positional tracking of data during acquisition and recorded along with the EM61-MK2 data.

5.4.1 Across-Lane Positional Accuracy

Using the person-portable EM61-MK2 system in conjunction with RTK-GPS or SLAM positioning methodologies and using lanes that have an overlap of approximately 0.5 feet (ft) (15 cm); then based on a 2-ft (0.6-meter) line spacing, this system has an across-lane positional precision of approximately +/- 1.1 ft (13 inches). Across-lane accuracies for anomalies may be negatively impacted by sensor tilt. To mitigate this, a search radius of 3 ft is used during target reacquisition.

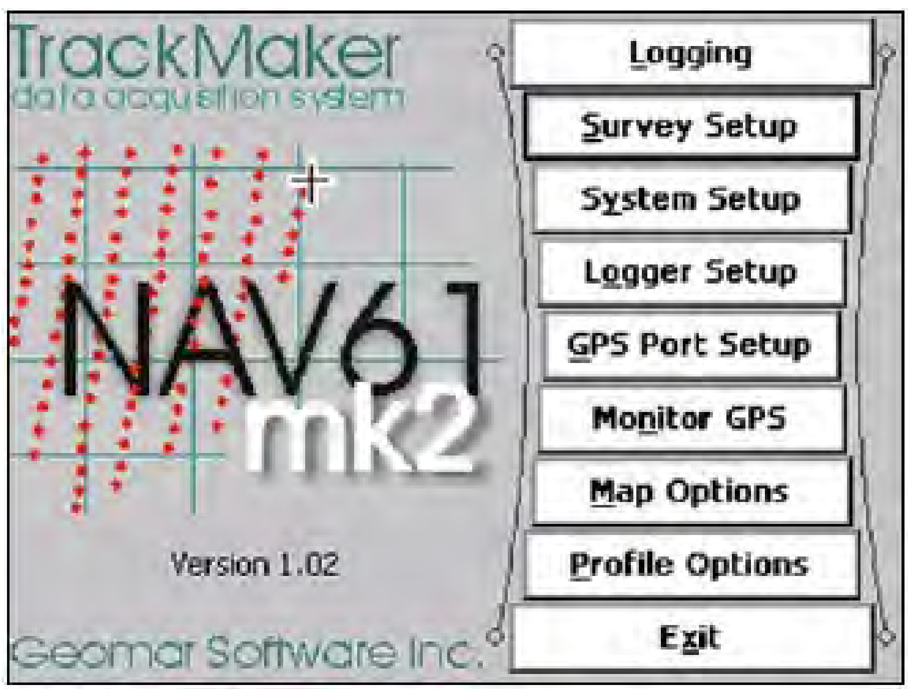
5.4.2 Down-Lane Positional Accuracy

Using the person-portable EM61-MK2 system in conjunction with RTK-GPS positioning methodologies, the RTK-GPS is set to output GPS data at a rate of 1 Hz and the EM61-MK2 is set to output data at a rate of 10 Hz. During data processing positional data is interpolated for the EM61-MK2 data points that exist between each of the 1Hz GPS readings. Using a maximum speed of 4 miles per hour (70 inches per second) [as stated in MEC QAPP Addendum Worksheet #12 (Definable Feature of Work: DGM Using a Person-Portable System) this equates to one reading every 7 inches. Thus, the down lane positional accuracy for the person-portable system using RTK-GPS is +/- 7 inches. Down-lane accuracies for anomalies may be negatively impacted by sensor tilt. To mitigate this, a search radius of 3 ft is used during target reacquisition.

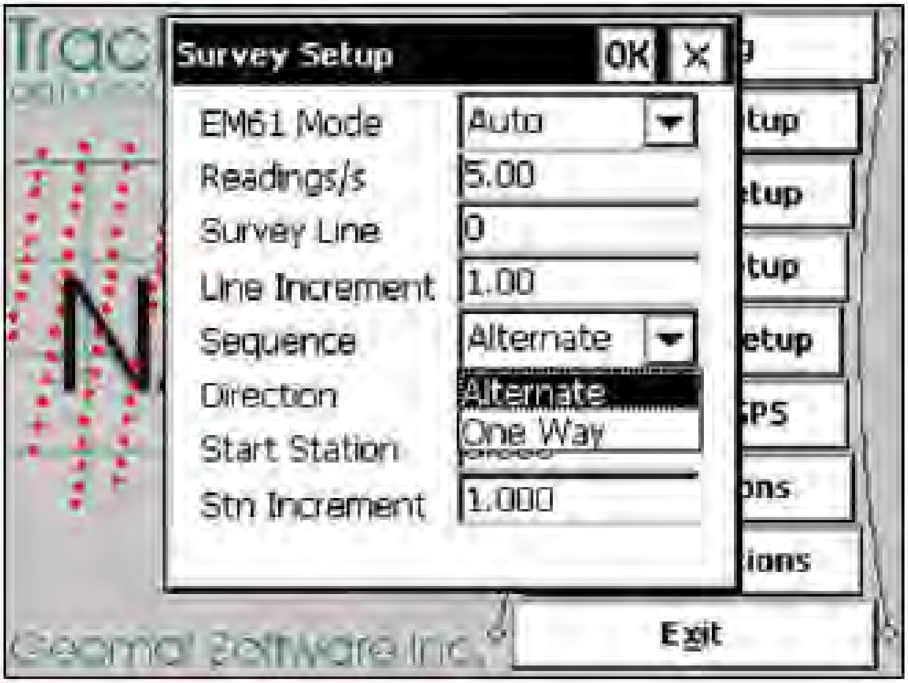
5.5 PREPARE EM61-MK2A FOR DATA ACQUISITION

The following steps will be followed to prepare the EM61-MK2 with RTK-GPS positioning prior to data acquisition:

1. Perform inspection of physical system components to include, the sensor components, the positioning systems, and the VMS if required.
2. Turn on instrument.
3. Allow the instrument to warm up for at least 15 minutes.
4. Turn on Juniper Systems TK6000 and open NAV61MK2 program. The screen below will be displayed.



5. Click on “Survey Setup” and the following screen will be displayed.



Select the following options to set up the sensor for data acquisition:

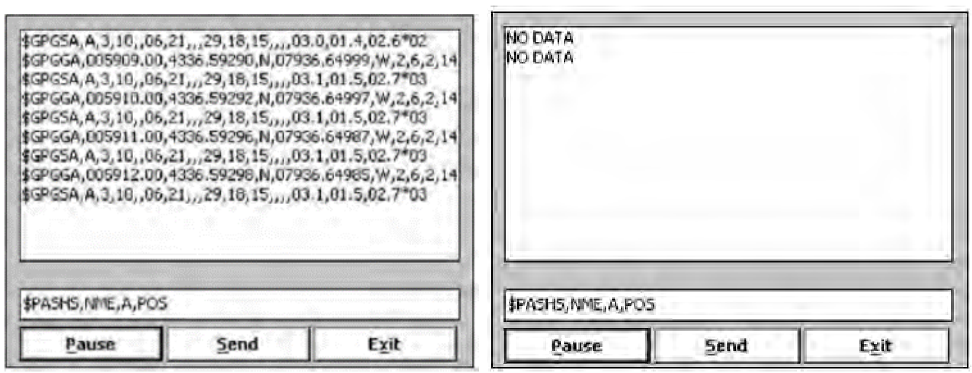
- EM61 Mode = Auto
- Readings/s =12
- Survey Line = 0
- Line Increment = 1
- Sequence = One Way
- Direction = North
- Start Station = 0.000
- Station Increment = 1.000
- Null Values: Apply = Last Survey

6. On the main screen, click on “System Setup” and specify the below options. These settings will usually remain the same throughout the project.

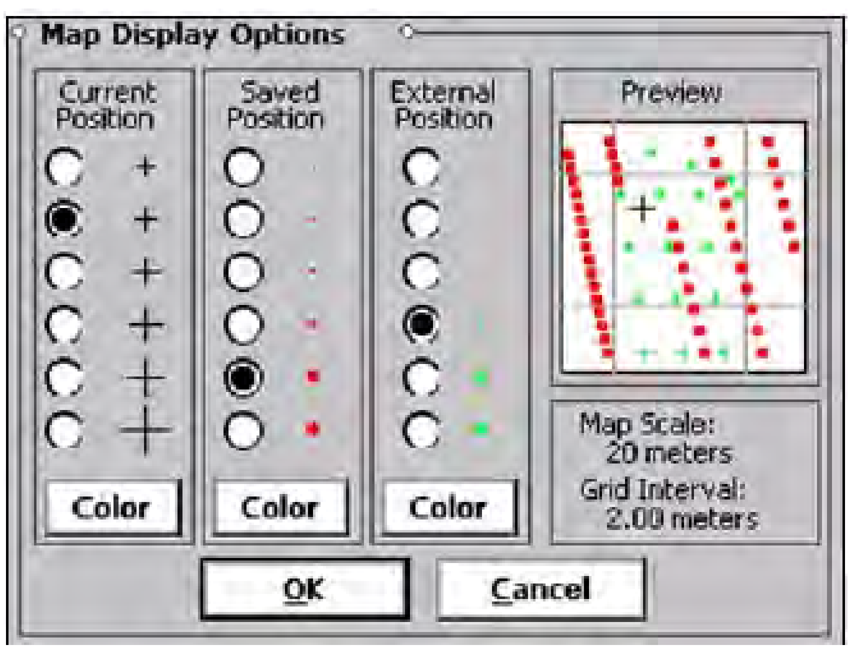
7. On the main screen, click on "Logger Setup" and specify the below options. These settings will remain the same throughout the project.

8. On the main screen, click on “GPS Port Setup” and specify the below options. On the left side of the screen, parameters can be set for alerts to go off if the GPS string is inadequate.

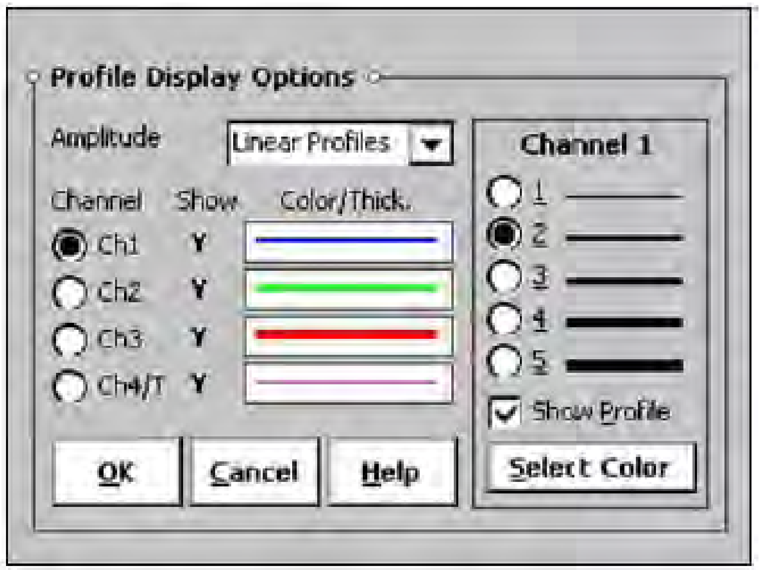
9. On the main screen, click on "Monitor GPS" and the below window will open. If the NMEA string is coming in correctly, the screen will appear like the one on the left. If there is a problem with the baud rate, "No Data" will appear once a second. If there is nothing coming through "No Data" will flash once every 6 seconds.



10. On the main screen, click on "Map Options" and specify the below options. These are more operator preferences for aesthetics than for performance of the software.



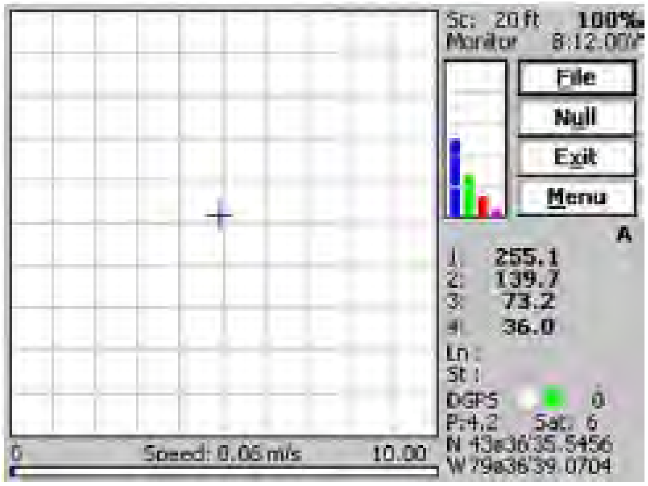
11. On the main screen, click on "Profile Options" and specify the below options. These are more operator preferences for aesthetics than for performance of the software.



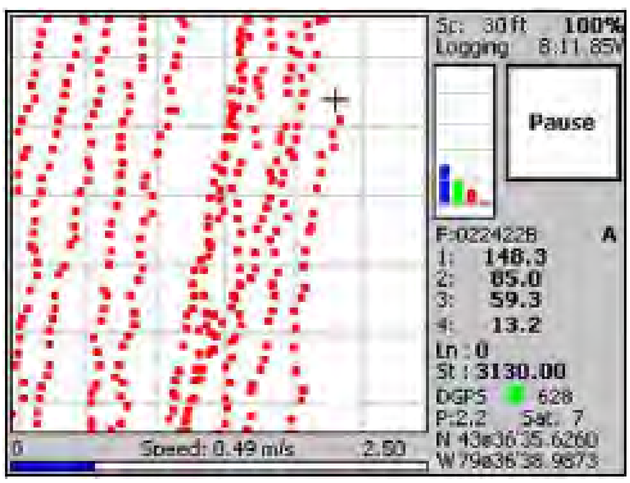
5.6 DATA ACQUISITION

After data acquisition parameters have been set, data acquisition can begin following the daily IVS QC activities.

1. To begin IVS and logging, on the main screen click on "Logging" and the following screen will be displayed.



2. Find a quiet spot (low mV reading consistent with local background) and null the instrument, then click on File, name your file, and save it. Once the file is saved the following screen is displayed with a large “Go” or “Pause” button on the right side of the screen.



File naming should conform to the following standards:

- Filename = YYYYMMDDFSS.N61
- YYYYMMDD = Date as Year, Month and Day,
- F = File Designator sequentially as A through Z,

- SS = Sensor Number as, 1 through 99 (numeric designator of the sensor identifies both the specific sensor and members of the data acquisition team,
- Example: 20141108A1.N61 is the first file A, collected by Team 1, on November 8, 2014.

3. To perform IVS activities or grid/transect data acquisition, line up on the IVS, grid or transect and click “Go.” Navigation along transects is accomplished by following the survey lines plotted on the EM61 navigation computer screen and/or using InDepth’s VMS
4. The software will start logging the readings and a large “Pause” button will appear on the right side of the screen. At the end of the line, tap the “Pause” button or click enter on the keypad to pause logging.
5. On the above screens, both the EM61-MK2 data and the GPS/RTK data are monitored. The data coverage is shown in the form of a “bread crumb trail.”
6. At the end of the file, click the “Exit” button to save the file and exit logging.

5.7 DATA INTEGRITY AND QUALITY VERIFICATION

During data acquisition, the integrity and quality of the data are verified by the operator by inspection of the EM61 data collection screen, showing the preliminary response, along with the appropriate map to ensure that:

- Data acquisition starts and stops in coordination with the beginning and end of each transect.
- Each transect is assigned a unique numerical identifier (ID), in sequential order.
- All data are collected with the appropriate GPS mode shown by the GPS status indicator.
- There are minimal to no gaps between each transect, and if an obstacle was encountered, it was properly documented.

Throughout these steps, the field team leader will be responsible for recording and maintaining QC documentation and field notes for each step as they occur. File naming conventions will be maintained, and periodic downloads of data will be made as necessary to maintain full function of the logging system.

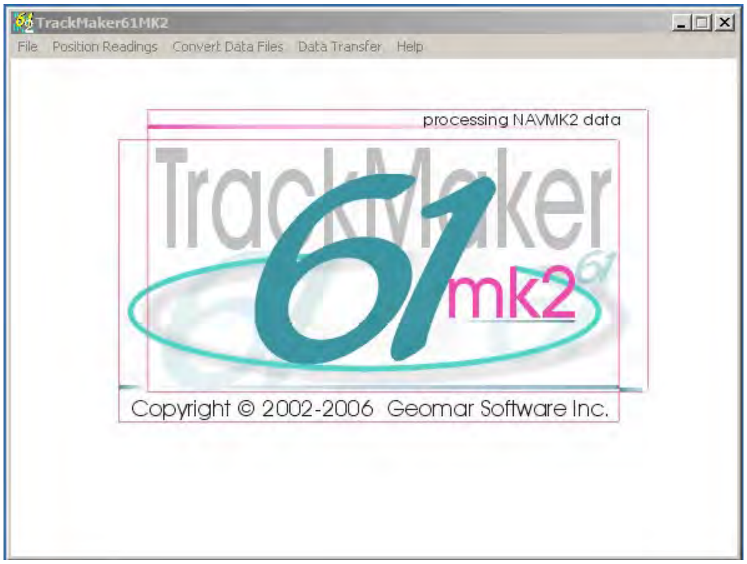
5.8 DATA STORAGE AND PRELIMINARY PROCESSING

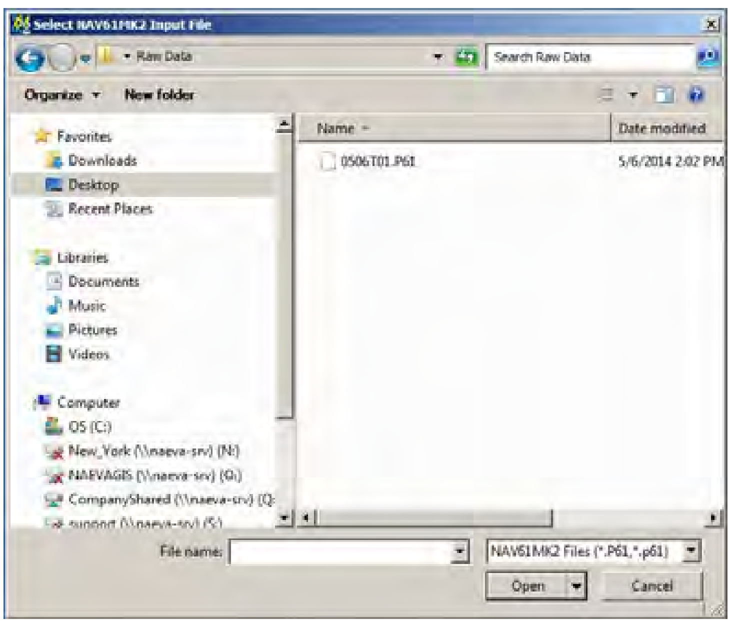
Person-portable EM61-MK2 data are temporarily stored in the data logger via Geonics' EM61MK2 software and then downloaded into a laptop computer for further on-site processing using DAT61MK2 and Seequent Oasis Montaj software. Initial data processing is performed by the field team and includes reviewing data for integrity and repeatability. Once deemed of acceptable quality the data are then uploaded to a file sharing site for data processing at the end of each day.

5.9 DATA STORAGE AND EDITING

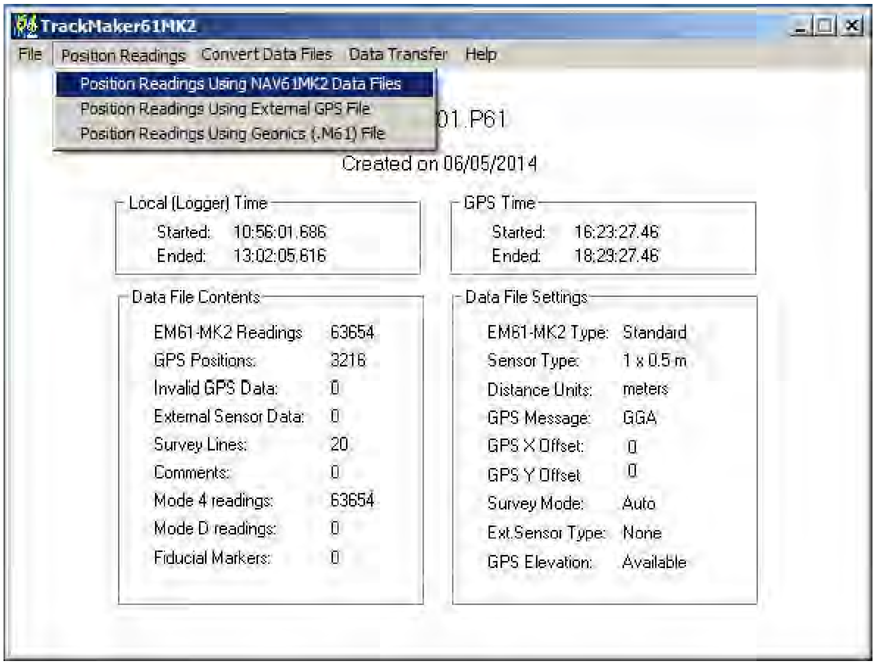
Below are the steps for using TrackMaker61MK2 to convert the raw p61 file into an Oasis Montaj .xyz data file. These steps, along with the downloading of the field data from the data collector to a PC may be performed in the field office. Data processing procedures for person-portable data are described in the MEC QAPP Addendum, Attachment B GEO SOP 5 (DGM Data Processing Using a Person-Portable System). The following steps are used to convert EM61-MK2 person-portable data with RTK GPS positioning to .xyz files:

1. Go to “File” – Open file – Browse and select the *.p61 file.

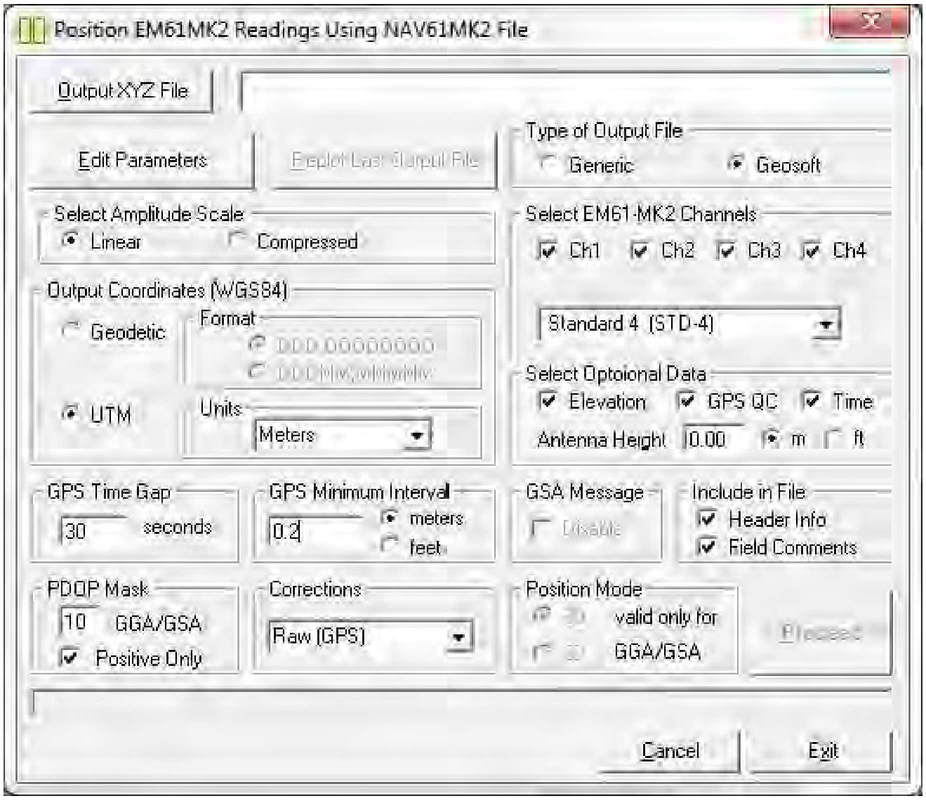




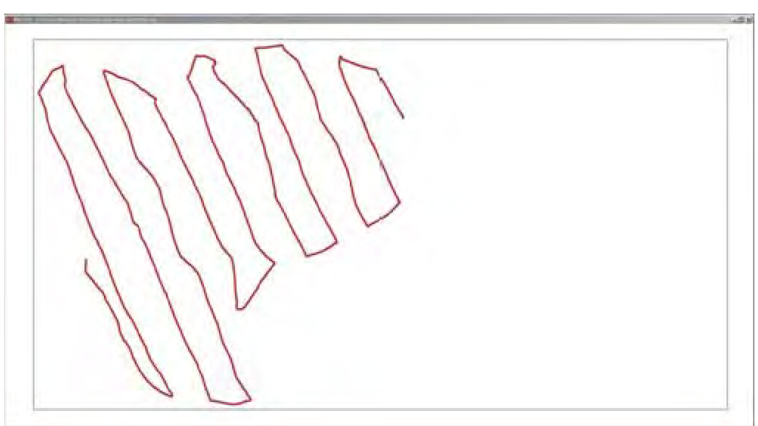
2. To create the Oasis Montaj .xyz data file, start by going to “Position Sensors” and select “Position Selection using ML61MK2 data”



3. Click on “Output XYZ File” and Browse for the location to save the Oasis Montaj XYZ file.



4. Set parameters to the same settings in the above screen and Click “Proceed” A map like the one shown below will appear. Close this window and the “Position Sensors” window.



6. DATA MANAGEMENT

6.1 DATA INPUT

The data inputs required for the EM61 data acquisition are the EM61/GPS height measurements, the data acquisition software variable parameters, the proposed transects for data acquisition, and the survey control point locations.

6.2 DATA OUTPUT

The output will be all daily field notes, QC logs, GPS check-in points exported to a csv file and the raw geophysical field data in binary format.

7.QUALITY CONTROL

The Measurement Quality Objectives (MQOs) can only be qualitatively verified in the field and must be quantitatively verified by the data processor. Typical MQOs related to production data consist of proper sample separation, grid coverage, and speed. If the processed data set fails the MQO acceptance criteria and the interpreted target list does not resolve each blind seed, a root cause analysis will be performed to determine the source of failure, and then the appropriate corrective action will be proposed.

1. Positioning System Static Positional Test (AM and PM): InDepth will conduct static repeatability tests of their RTK-GPS / SLAM positioning systems. This test will be completed at the beginning, and end, of each day at the IVS. The data for these GPS Static Positional Tests will be digitally recorded, observed in the field and results of these tests are to be documented on the geophysical contractor's daily internal Geophysical QC Log (Appendix B).

2. Static Repeatability Test (AM and PM): InDepth will conduct static repeatability tests (background and spike) for each person-portable system. These tests are to be completed twice daily at the IVS and will include 1 minute for background, 1 minute for spike, and 1 minute for an additional background reading. The baseline mV value for the static tests will be the average of AM and PM static tests conducted during the first week that the person-portable system(s) is operational. The data for these static repeatability tests will be digitally recorded, observed in

the field and results of these tests are to be documented on the geophysical contractor's daily internal Geophysical QC Log (Appendix B).

3. Dynamic Repeatability Test (AM and PM): InDepth will conduct dynamic repeatability tests (background and spike) for each person-portable system. These tests are to be completed twice daily (AM/PM) at the IVS. The baseline mV value for each of the IVS items will be the average of all dynamic IVS tests conducted during the first week that the person-portable system(s) is operational. The data for these dynamic repeatability tests will be digitally recorded, observed in the field and results of these tests are to be documented on the geophysical contractor's daily internal Geophysical QC Log (Appendix B).

4. Cable Shake Test (AM only): On a daily basis the EM61MK2 and GPS instrument cables will be tested to verify that cable vibrations do not have a negative effect on the quality of the data. The cable vibration test will be conducted at the beginning of each workday prior to the commencement of that day's operation. The data for these cable shake tests will be digitally recorded, observed in the field and results of these tests are to be documented on the geophysical contractor's daily internal Geophysical QC Log (Appendix B).

5. Personnel Test (AM only): On a daily basis personnel operating the EM61-MK2 will be tested to verify that when in close proximity to the sensor they do not have a negative effect on the quality of the data. This personnel test will be conducted at the beginning of each workday prior to the commencement of that day's operation. The data for these personnel tests will be digitally recorded, observed in the field and results of these tests are to be documented on the geophysical contractor's daily internal Geophysical QC Log (Appendix B).

All QC checks will be digitally recorded and analyzed to verify that all data is within acceptable operational parameters as outlined in the MEC QAPP Addendum. Daily QC will be monitored with the instructions provided in the MEC QAPP Addendum, Attachment B GEO SOP 5 DGM Data Processing Person Portable System, as well as in the Blind Seeding Program.

The QC Inspection checklist is included as Appendix C. Measurement Performance Criteria for DGM using a person-portable system can be found in Worksheet #12 of the MEC QAPP Addendum. See Worksheet #31, 32, 33 of the MEC QAPP Addendum for a description of who will conduct the QC inspection for this DFW and the frequency of the Follow-up Phase QC inspections.

8.REPORTING

DGM data acquisition reporting consists of the daily distribution of the files and documents indicated in Section 6.2 Data Output: daily field notes, QC logs, GPS check-in points exported to a csv file and the raw geophysical field data in binary format. These data will be transmitted using the file system identified in the data management SOP.

9.HEALTH & SAFETY

The reacquisition of targets in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items.

10. REFERENCES

- USACE, 2024, Environmental Quality – Technical Guidance Military Munitions Response Actions, EM 200-1-15, Washington, D.C.

11. REVISION HISTORY

Version	Change Summary	Change Reason	Prepared By	Approved By	Published
Rev-1.01	Initial Release	No Change	Hecker	Smith, Welk	20240819

Appendix A
SOP Signature Page

The following individuals have read and understand this SOP:

Signature:	Date:

Appendix B
QC Log

EM61 DGM Daily QC Log

Project: ____________________ **Date:** ____________

Conditions: Temp: ____________ Conditions: ____________

Team: ____________________

Survey Mode: ☐ 4-TimeGates ☐ Differential

Type of Investigation: ☐ Production ☐ QC Resurvey ☐ QA Resurvey (select appropriate)

Method of Collection: ☐ Grid ☐ Transect ☐ Meandering Path (select appropriate)

Equipment: **Deployment:** ☐ One Coil ☐ Two Coil ☐ Three Coil

Console 1= ____________ Console 2= ____________ Console 3= ____________

Coil 1= ____________ Coil 2= ____________ Coil 3= ____________

Positioning System: RTK Rec 1 = ____________ RTK Ant 1= ____________

Navigation System: RTK Rec 2 = ____________ RTK Ant 2= ____________

DGM Computer = ____________ Navigation Computer = ____________

Setup: Coil Height (cm) ____________ Antenna Height (cm) ____________

Coil Height = bottom of bottom coil to ground | Antenna Height = bottom of antenna to ground

Standard Response:

Coil 1				Coil 2				Coil 3			
CH1	CH2	CH3	CH4/T	CH1	CH2	CH3	CH4/T	CH1	CH2	CH3	CH4/T

Calibration Point Coordinates: Latitude/Northing: ____________ Longitude/Easting: ____________

AM Statics File Name: YYYYMMDD{A,B,C . . .}

Time	Line #	Go/No Go	Operation	Description	Result
	NA		Power On		
	NA		Survey Setup		
	NA		Main Battery Voltage	Observed voltage	
			Personnel Test	Check personnel for change, watches, cell phones, etc.	
			Cable Shake Test	After null, shake cables while watching #s	

Time	Line #	Go/No Go	Coil 1				Coil 2				Coil 3				
			CH1	CH2	CH3	CH4/T	CH1	CH2	CH3	CH4/T	CH1	CH2	CH3	CH4/T	
															Static Test
															Reference Test
															Static Test 2

AM IVS File Name: YYYYMMDD{A,B,C . . .}

	LN #	IVS		Change line #'s on each pass

Middle	Up West	Down West	UP East	Down East	Noise

PM Statics File Name: YYYYMMDD{A,B,C . . .}

Time	Line #	Go/No Go	Operation	Description	Result
	NA		Power On		
	NA		Survey Setup		
	NA		Main Battery Voltage	Observed voltage	

Time	Line #	Go/No Go	Coil 1				Coil 2				Coil 3				
			CH1	CH2	CH3	CH4/T	CH1	CH2	CH3	CH4/T	CH1	CH2	CH3	CH4/T	
															Static Test
															Reference Test
															Static Test 2

PM IVS File Name: YYYYMMDD{A,B,C . . .}

	LN #	IVS		Change line #'s on each pass

Middle	Up West	Down West	UP East	Down East	Noise

Appendix C
QC Checklist

Three Phase Quality Control Checklist

GEO SOP 3 – DGM Using Person-Portable Systems

Team Information		
Team:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	Reference	Inspection Point	Yes	No	NIA	Comments
1	Signature Page	Verify that all personnel have signed the SOP Signature Page				*(P)*
2	4	Verify Geonics EM61-MK2 is being used and that all necessary equipment listed is present and serial numbers recorded as being specific to a team				*(P)*
3	4	Verify RTK-GPS is being used and that all necessary equipment listed is present and serial numbers recorded per team				*(P)*
4	4	Verify GPS is set to 1Hz output in NMEA GGA format				*(I),(F)*
5	4	Verify PP DGM data is uploaded onto a file sharing site at the end of each day.				*(I),(F)*
6	5.2 & 5.3	Instrument setup according to manufacturer specification and cables have been secured				*(I),(F)*
7	5.2 & 5.3	Instrument coil height has been measured				*(I),(F)*
8	5.4	GPS antenna has been mounted over center of coil and cables secured (GPS collection)				*(I),(F)*
9	5.5	Instrument warmed-up for at least 15 minutes				*(I),(F)*
10	5.5	EM61 data collection rate set to at least 10 Hz (when using RTK GPS)				*(I),(F)*
11	5.5	Wheel increment set to 0.1 (when using fiducial collection)				*(I),(F)*
12	5.6	Instrument nulled in area known to be clear of anomalous response				*(I),(F)*
13	7 (1)	GPS Static Positional Test performed showing location within expected parameters (GPS mode)				*(I),(F)*
14	7 (2)	Morning Static Repeatability Test performed showing appropriate response				*(I),(F)*
15	7 (3)	Morning Dynamic Repeatability Test performed showing target locations and response within expected parameters				*(I),(F)*

Three Phase Quality Control Checklist

GEO SOP 3 – DGM Using Person-Portable Systems

16	7 (4)	Cable Shake Test performed showing no effect on the data quality				*(I),(F)*
17	7 (5)	Personnel Test performed showing no effect on the data quality				*(I),(F)*
18	7 (2)	Afternoon Static Repeatability Test performed showing appropriate response				*(I),(F)*
19	7 (3)	Afternoon Dynamic Repeatability Test performed showing target locations and response within expected parameters				*(I),(F)*
20	5.8	All DGM data for the day have been transferred to a field computer				*(I),(F)*
21	5.9	Data have been converted to .xyz format including georeferenced positional data (GPS)				*(I),(F)*
22	5.8	All raw DGM data for the day have been transferred to the project FTP site for final data processing				*(I),(F)*

Punch list Items	
No.	

Conducted by: ______________________________ DATE: ____________________________

Approved by: ______________________________ DATE: ____________________________

GEO SOP 4
DGM USING A TOWED ARRAY SYSTEM

GEO SOP 4

Standard Operating Procedure
DGM Using a Towed Array System

Original Issue Date: August 2024
Last Review/Implementation Date: August 2024

InDepth Corporation

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Table of Contents

Appendices

Appendix A - SOP Signature Page

Appendix B – QC Log

Appendix C – QC Checklist

Acronyms

cm	Centimeter(s)
DFW	Definable Feature of Work
DGM	Digital Geophysical Mapping
Ft	Feet
GIS	Geographic Information System
GPS	Global Positioning System
ID	identifier
in	Inches
IVS	Instrument Verification Strip
m	Meter(s)
MQO	Measurement Quality Objective
MEC	Munitions and Explosives of Concern
MEC QAPP	Munitions and Explosives of Concern Quality Assurance Project Plan
QC	Quality Control
RTK	Real-Time Kinematic

SLAM	Simultaneous Localization and Mapping
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SSWP	Site Specific Work Plan
UXO	Unexploded Ordnance
VMS	Visual Marking System

1. POLICY

InDepth and project personnel will follow procedures established in this Standard Operating Procedure (SOP) for all Digital Geophysical Mapping (DGM) operations that are to be conducted using a towed array systems in support of Munitions and Explosives of Concern (MEC) remediation operations at Fort Ord. This SOP must be distributed to and signed by all personnel performing activities related to this SOP and must be adhered to as field activities are performed.

2. PURPOSE & SCOPE

2.1 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to detail the procedures and operational methodologies associated with the acquisition of DGM data in areas that are potentially contaminated with MEC using a towed array. Equipment to be used includes the Geonics EM61-MK2 system(s) for the detection of metallic objects and Real-Time Kinematic (RTK) Global Positioning Systems (GPS) for navigational positioning and control. Procedures outlined in this SOP will be conducted in accordance with the MEC Quality Assurance Project Plan (MEC QAPP) Addendum, and Site Specific Work Plan. This SOP does not detail the use of positioning equipment that is described herein. This SOP assumes that experienced personnel that will be using this SOP are familiar with the equipment and are competent in their use.

2.2 SCOPE

The information presented in this SOP is applicable to all MEC related project sites. Positional accuracy specifications may vary depending on equipment and contract requirements.

3. MAINTENANCE

InDepth personnel are responsible for the maintenance of this SOP.

4. PERSONNEL, EQUIPMENT & MATERIALS

4.1 PERSONNEL

Personnel performing DGM using a towed array will be performed by a two-person team consisting of a Field Geophysicist and Geophysical Technician, and the two-man rule is to always be followed. Additional personnel required for this operation include the Senior Geophysicist, Quality Control (QC) Geophysicist and InDepth Data Processor. The key personnel implementing this SOP are documented in the MEC QAPP Addendum Worksheets 4, 7, and 8.

4.2 EQUIPMENT

Equipment required for data acquisition using the Towed-array DGM System includes the following:

- Three Geonics EM61-MK2 mounted to a towed platform with integrated RTK-GPS.
- EM61 electronic consoles connected to a field acquisition computer.
- Field acquisition computer, with Geomar ML61MK2xpn data acquisition software installed.
- Geomar Multi61mk2 desktop processing software.

- Transport vehicle (skid steer, tractor, utility terrain vehicle, or specialized deployment vehicle) used to tow the array during data acquisition.
- Multiple standard reference items (3/8" carriage bolts) for operational testing.
- RTK-GPS positioning system
- Visual Marking System (VMS).

4.3 MATERIALS

Materials required for data acquisition include non-metallic pin flags, and VMS biodegradable marking paint as necessary to aid in the acquisition process.

5. PROCEDURES

The following are the procedures and guidelines for data acquisition with the three-coil EM61-MK2A towed array system with integrated RTK GPS system. These procedures are provided to assist in establishing a consistent data acquisition process. The procedures will be adhered to during data acquisition activities to ensure that the data acquired are of sufficient quantity and quality to meet project objectives.

5.1 SITE PREPARATION

Site preparation involves marking the site boundaries, production grids, and survey transects as required to achieve the specified data coverage. The site will be subdivided into grids depending upon the site conditions such that the sensor can be precisely navigated along the desired transect. Survey transect locations will be generated using the "survey layout" function in Unexploded Ordnance (UXO)-Land or within the project Geographic Information System (GIS).

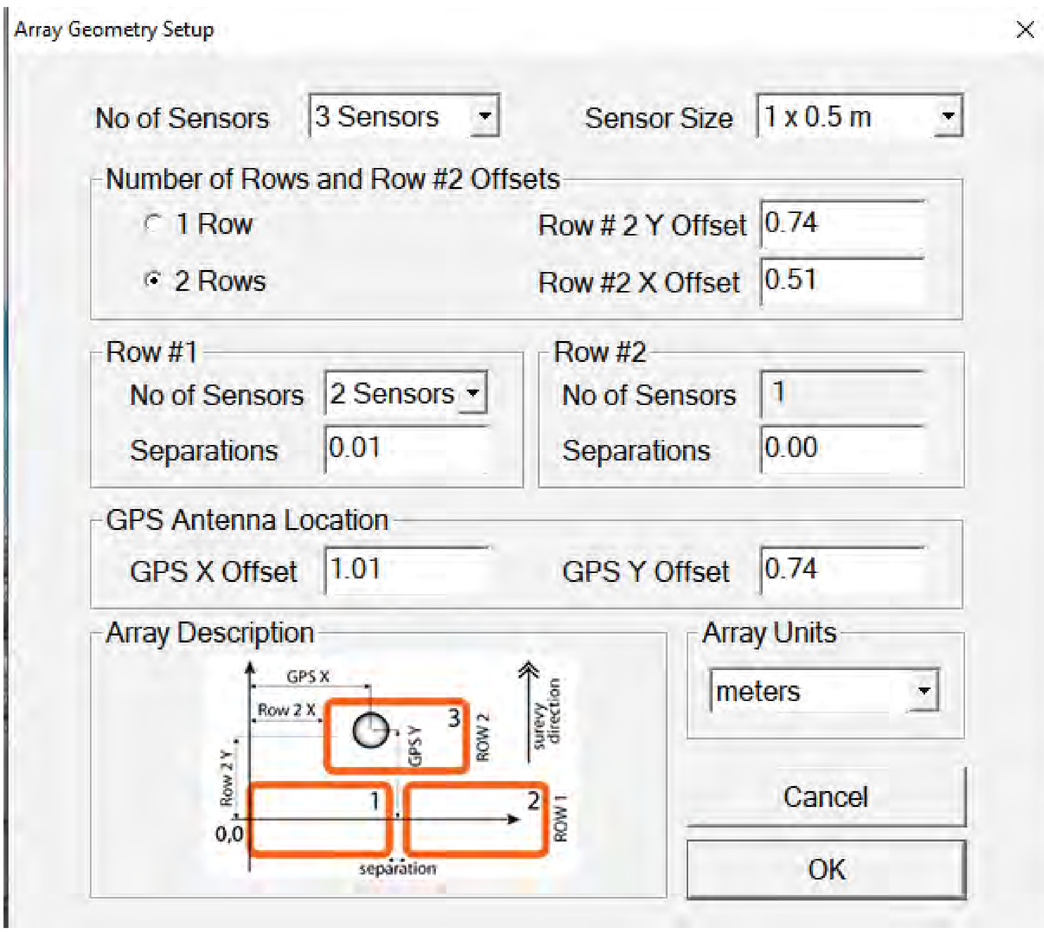
5.2 SYSTEM SETUP

Data acquisition software settings in the GEOMAR ML61MK2xpn software will be set to the following parameters prior to data acquisition activities using the towed array:

5.2.1 ARRAY GEOMETRY

The array geometry will be established using **Array Geometry Setup** once at the beginning of the project and verified daily by reviewing the Current Program Settings screen at the beginning of each day.

The array geometry is initially set and can be updated as necessary throughout the process using the following settings. Once the geometry has been entered and confirmed, the system setup should be confirmed prior to the beginning of each day's data acquisition.



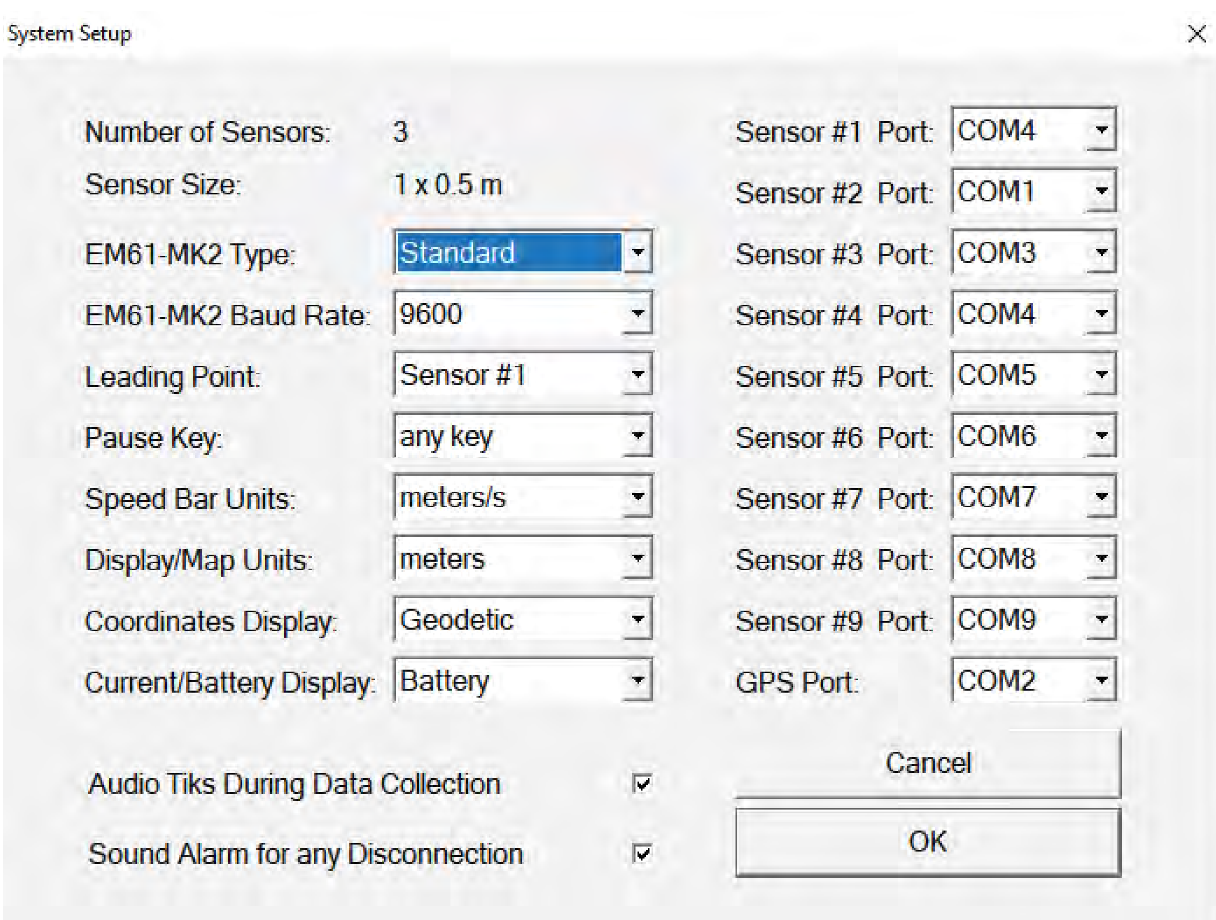
Array Geometry Setup parameters to be used:

- Number of Sensors = 3
- Sensor Size = 1 x 0.5 m
- Number of Rows = 2 (row 2 X-offset, Y-offset)

- Row #2 Offset = X-offset = 0.5 m, Y-offset = 0.74 m)
- Sensors in Row = Row #1 = 2, Row #2 = 1
- Separation in Row #1 = 0 m
- Separation in Row #2 = N/A
- GPS Offset = X-offset (1 m) Y-offset (0.74 m)
- Array Units = meters

5.2.2 System Setup

Use "**System Setup"** to set the type of EM61 units used, the communication protocols, the data ports, the basic survey parameters, and the basic system function as shown below.

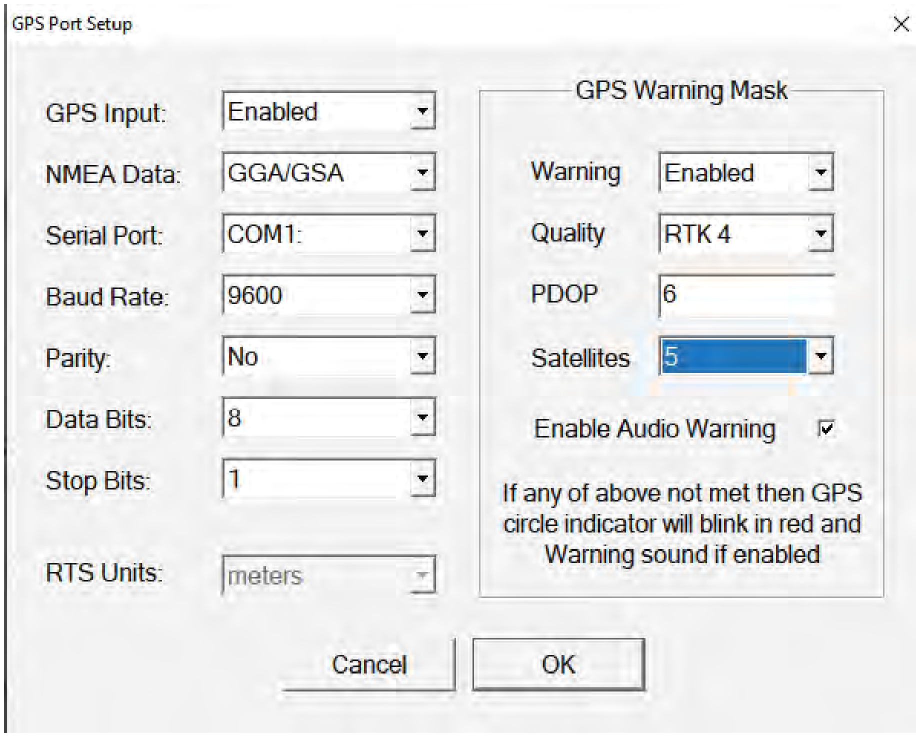


System Setup parameters to be used:

- EM61-MK2 Type = Standard
- Baud Rate = 9600
- Leading EM61 = Sensor #3
- Trigger EM61 = Sensor #1
- Pause Key = any key
- Speed Units = miles per hour
- Display Units = meters
- Current/Battery Display = Battery
- Sensor #1 Port = COMXX
- Sensor #2 Port = COMXX
- Sensor #3 Port = COMXX
- GPS Port = COMXX
- Audio (y/n) = Yes

5.2.3 GPS PORT SETUP

After the System Setup has been completed, use "**GPS Port Setup"** to set up GPS communication using the following parameters:



GPS Port Setup parameters to be used:

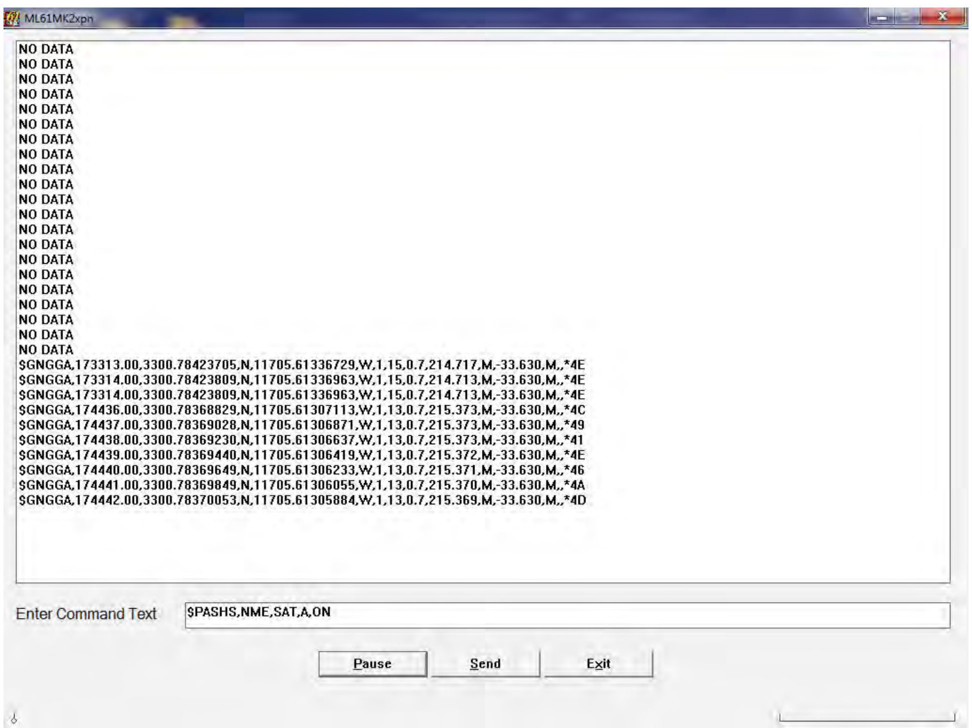
- GPS Input = Enabled
- NMEA Data = GGK (GGA/GSA)
- COM Port = COMX
- Baud Rate = 9600
- Parity = No
- Data Bits = 8
- Stop Bits = 1

GPS Warning Mask

- Warning = Enabled
- Quality = RTK
- PDOP = 6
- Satellites = 5

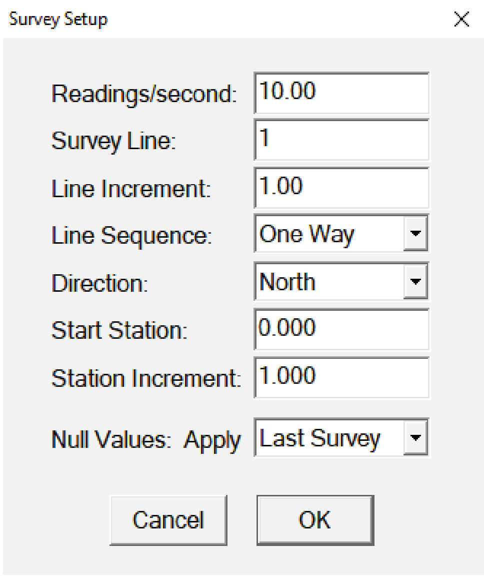
5.2.4 GPS Monitoring

After setting communication protocols using "**GPS Port Setup**", proper functioning of the positioning system should be confirmed using "**GPS Monitoring**"**.** The following is an example of the GPS Monitoring dialog screen. This screen is used to monitor the NMEA data stream being received from the positioning system. The example shows the output of the NMEA data stream from a properly formatted serial connection. If the serial port was improperly formatted, this data screen will show "**NO DATA**".



5.2.5 Survey Setup

Prior to beginning the data acquisition, the proper parameters must be entered in the "**Survey Setup**" dialog screen.



Survey Setup parameters to be used:

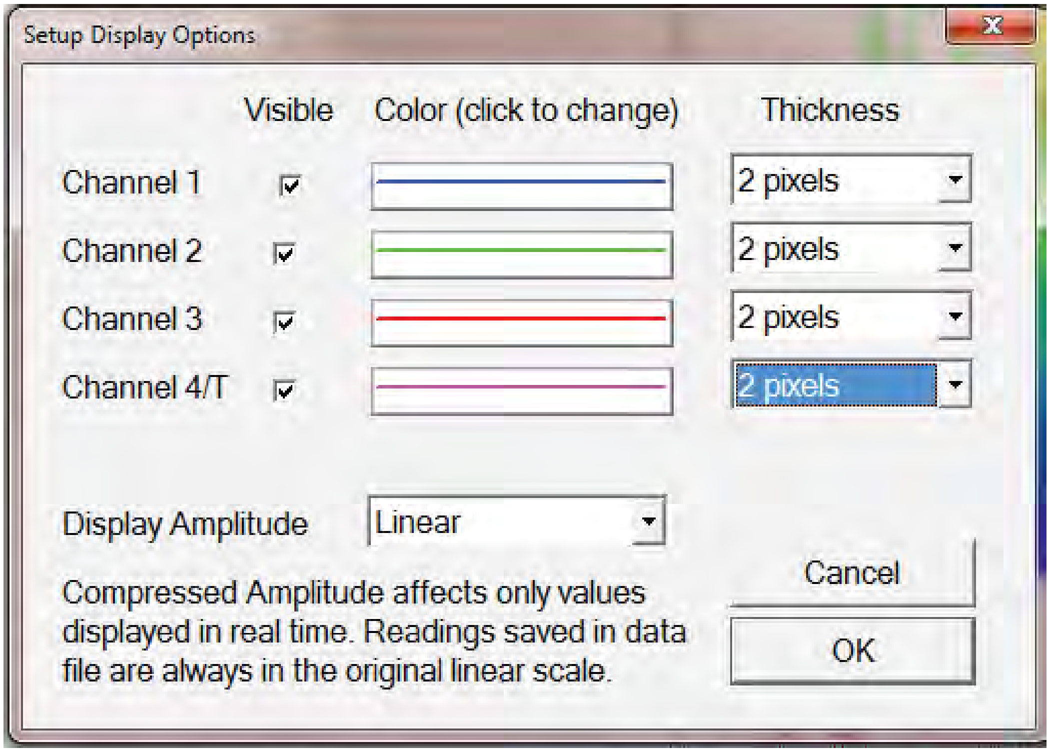
- EM61 Mode = Auto
- Readings/s = 12.00
- Survey Line = 0
- Line Increment = 1.00
- Line Sequence = One Way
- Direction = North
- Start Station = 0.000
- Station Increment = 1.000
- Null Values: Apply = Last Survey

5.3 Daily Data Acquisition File and Survey Setup

After completing the system setup, the "**Navigation and Data Logging"** screen must be set up for daily data acquisition operations. The layout of the "**Navigation and Data Logging"** screen is controlled by the following menu functions: "**Setup Display Options"**, "**Reading Scale"**, "**Map Display Options"**, "**Map Scale"**, and "**New Speed Bar Scale"**.

5.3.1 Setup Display Options

"Setup Display Options" within EM61 Field Computer control how the EM61 response is displayed on the screen. The "**Setup Display Options"** dialog box is shown below.

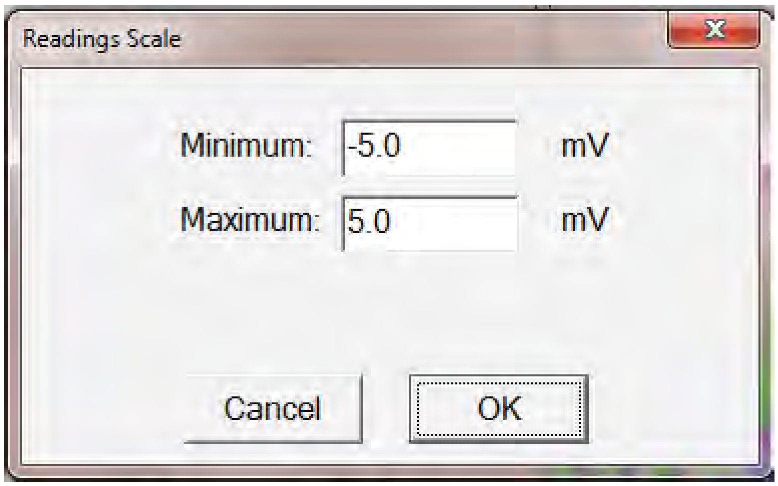


Setup Display Options parameters to be used:

• Ch1 =	checked	blue	2 pixels
• Ch2 =	checked	green	3 pixels
• Ch3 =	checked	red	3 pixels
• Ch4/T	checked	magenta	1 pixel
• Profile Amplitude	Linear		

5.3.2 READINGS SCALE

The range of the response values is controlled by the "**Readings Scale"** dialog box, as shown below.

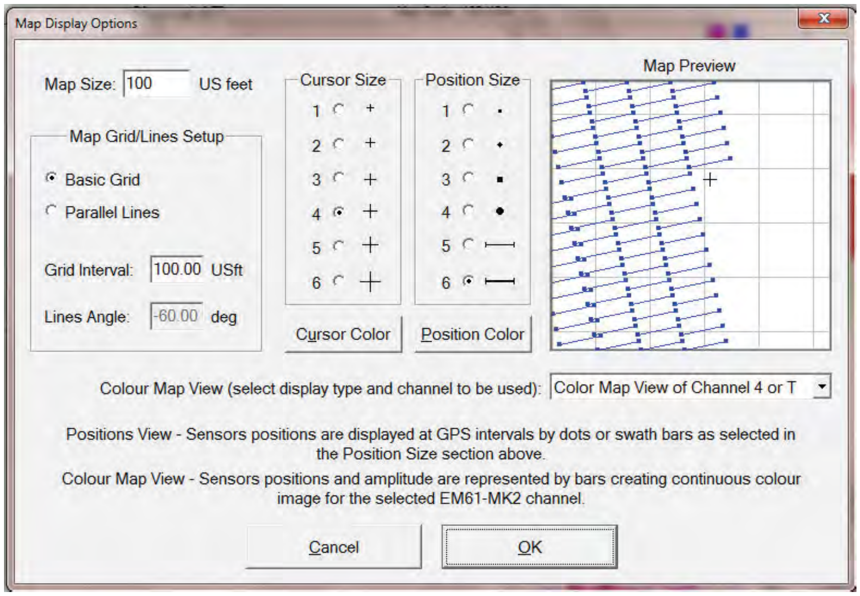


Reading Scale parameters to be used:

- Minimum mV = -5.0
- Maximum mV = 5.0

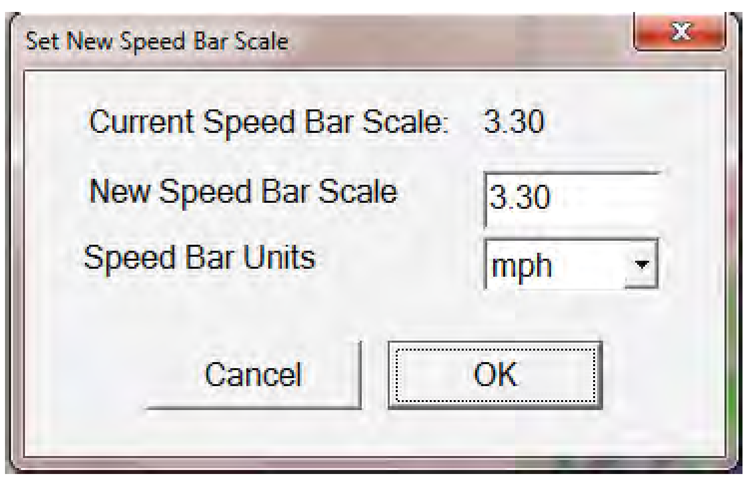
5.3.3 MAP DISPLAY OPTIONS

The type size and color of the navigation cursor is controlled by the Map Display Options dialog box, as shown below. This dialog box also allows you to change the map size and grid intervals.



5.3.4 Set New Speed Bar Scale

The speed reporting and warning system is controlled by the Set New Speed Bar Scale dialog box, as shown below.



Set New Speed Bar Scale parameters to be used:

- = 3.30 mph

5.4 DYNAMIC DATA ACQUISITION

After the equipment has been assembled, data acquisition parameters have been set, and data file started, acquisition can begin following the daily Instrument Verification Strip (IVS) (MEC QAPP Addendum, Attachment B SOP 1) and QC activities (MEC QAPP Addendum, Attachment B SOP 8). Dynamic survey for DGM involves acquiring in-motion data along transects across the survey area with spacing appropriate to the site and project needs, as defined in the MEC QAPP Addendum.

5.4.1 START-UP OF THE EM61TOWED ARRAY

The following steps will be followed to prepare the EM61-MK2 towed array prior to data acquisition:

1. Perform daily inspection of physical system components to include, tow vehicle, power supply, system electronics, hitch connection, cabling, towed array wheels and mechanical components, sensors, positioning systems, and VMS.

2. Turn on EM61 system control boxes and allow the system to warm up for at least 15 minutes.

3. Turn on the field computer and open the Multi61MK2xpn program.

4. Verify data acquisition software settings in the ML61MK2xpn software. After verifying that parameters are set, click on the logging screen. A screen similar to the following will be displayed.

Find a quiet spot (area of low mV response that is similar to background levels) and null the instrument. After successfully completing instrument nulling use the Menu button in the lower left of the acquisition screen and click on **“File”**. Create the filename that incorporates the date, team designator and file designator for data acquisition using the following naming convention:

- Filename = YYYYMMDDFSS.N61
    - YYYYMMDD = Date as Year, Month and Day,
    - F = File Designator sequentially as A through Z,
    - SS = Sensor Number as, 1 through 99 (numeric designator of the sensor identifies both the specific sensor and members of the data acquisition team,
    - Example: 20141108A1.N61 is the first file A, collected by Team 1, on November 8, 2014.

There are four context sensitive buttons on the lower right corner of the Navigation and Data Logging screen.

These buttons control the basic data logging functions of the program and include the following items:

- **"Go"** = Start data acquisition (after null and creating a file)
- **"QLine"** = Change Lines for data acquisition
- **"Exit"** = Returns to Main Screen
- **"Menu"** = Opens other sub-menus related to data acquisition
    - o **"Null"** = Only before Creating Data File
    - o **"Cr.File"** = Create File (automatically sets to Standby Mode)

5.4.2 TESTING OF THE EM61 TOWED ARRAY ON THE IVS

Perform testing of the Towed Array on the IVS in accordance with the IVS SOP (MEC QAPP Addendum, Attachment B GEO SOP 1). To start acquiring test data, Line up on the grid or transect and select **"Go"**. The software will start logging the readings and a large "Pause" button will appear on the screen. At the end of the line, tap the "Pause" button or hit enter on the keypad.

5.4.3 Navigate and Acquire Data

After testing of the Towed Array on the IVS acquiring data, production DGM data acquisition is performed in a similar manner by lining up on the grid or transect and selecting "**Go**". The software will start logging the readings and a large Pause button will appear on the screen. At the end of the line, tap the Pause button or hit enter on the keypad and change "Q Line(s)" as necessary.

Navigation of the towed array system is accomplished through a combination of the integrated of RTK-GPS and shown on the filed computer combined with VMS. When performing a 100% coverage survey, once a baseline is set the VMS is used to spray visual ink marks on the ground providing a visual ground-based means of navigation to reduce/prevent data gaps and provide increased production. The RTK-GPS receiver antenna is mounted over the center EM61-MK2 coil to provide real time positional tracking of data during acquisition and recorded along with the EM61-MK2 data.

Data acquisition is controlled by the user with the ML61MK2 software, which allows the user to assign a numerical identifier (ID) to each transect line and start/stop data acquisition at the beginning/end of each transect. When an obstacle is encountered along a transect, the obstacle can be avoided by either altering the path of the transect or stopping data acquisition when the obstacle is encountered and resuming a new ID transect on the other side of the obstacle. Data gaps that are the result of obstacles should be recorded by the project geophysicist or field technician and submitted to the data processor. Data gaps that are the result of line spacing greater than the defined acceptable spacing will be determined by the data processor and provided to the project geophysicist or field technician for re-collection.

As stated in Worksheet #12 of the MEC QAPP Addendum (Definable Feature of Work (DFW): DGM Using Towed Array System), the velocity of the towed array system(s) is not to exceed 4 MPH (70 inches per second). Below is a discussion about across-lane and down-lane positional accuracy for the towed-array DGM system. Although their computed accuracies are described below, the across-lane and down-lane positional accuracies may also be negatively impacted by sensor tilt as described in the following sections. To mitigate this, a search radius of 3 ft is used during target reacquisition.

5.4.4 Across-Lane & Down Lane Positional Accuracy

Using a towed array DGM platform configured with RTK-GPS positional equipment and three overlapping EM61-MK2 coils in a triangular configuration, and using lanes that have an overlap of approximately 1.6 feet (ft) (0.5 m), then based on a 4.9-ft (1.5-m) line spacing this system has an across-lane positional precision of approximately +/- 1.1 ft (0.3 m). Across-lane accuracies for anomalies may be negatively impacted by sensor tilt. To mitigate this, a search radius of 3 ft is recommended during target reacquisition.

5.4.5 Down-Lane Positional Accuracy

Using a towed array DGM platform configured with RTK-GPS positional equipment and three overlapping EM61-MK2 coils in a triangular configuration, the RTK-GPS is set to output GPS data at a rate of 1 Hz and the EM61-MK2 is set to output data at a rate of 10 Hz. During data processing positional data is interpolated for the EM61-MK2 data points that exist between each of the 1Hz GPS readings. Using a maximum speed of 4 miles per hour (70 inches per second), as stated in Worksheet #12 of the MEC QAPP Addendum (DFW: DGM Using a Towed-Array System, this equates to one reading every 7 inches. Thus, the down lane positional accuracy for the towed array DGM system using RTK-GPS is +/- 7 inches. Down-lane accuracies for anomalies may be negatively impacted by sensor tilt. To mitigate this, a search radius of 3 ft is recommended during target reacquisition.

5.5 DATA INTEGRITY AND QUALITY VERIFICATION

During data acquisition, the integrity and quality of the data are verified by the operator by inspection of the EM61 data acquisition screen, showing the preliminary response, along with the appropriate map to ensure that:

- Data acquisition starts and stops in coordination with the beginning and end of each transect.
- Each transect is assigned a unique numerical ID, in sequential order.
- All data are collected with the appropriate GPS mode shown by the GPS status indicator.
- There are minimal to no gaps between each transect, and if an obstacle was encountered, it was properly documented.

Throughout these steps, the field team leader will be responsible for recording and maintaining QC documentation and field notes for each step as they occur. File naming conventions will be maintained, and periodic downloads of data will be made as necessary to maintain the full function of the logging system.

5.6 DATA STORAGE AND PRELIMINARY PROCESSING

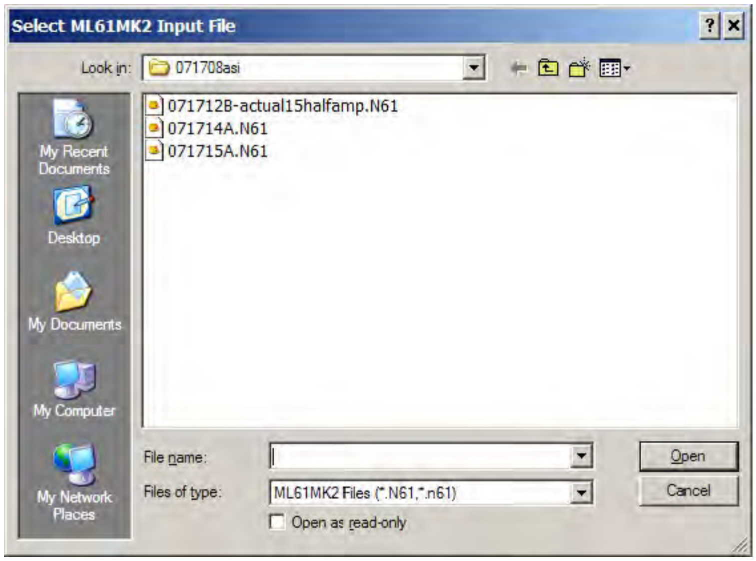
Towed array EM61-MK2 data are temporarily stored in the field computer and then downloaded into a laptop computer for further on-site processing using Geosoft Oasis Montaj software. Initial data processing is performed by the field team and includes reviewing data for integrity and repeatability. Once deemed of acceptable quality the data are then uploaded to a file sharing site for data processing at the end of each day.

5.7 DATA STORAGE AND EDITING

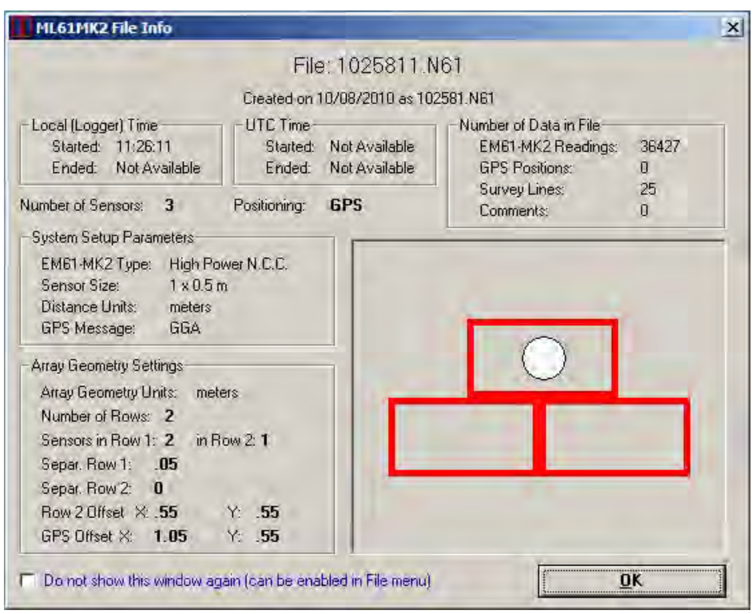
The acquired Towed Array data are stored directly into a ruggedized field computer. Below are the steps for using Multi61MK2 to convert the raw n61 file into a Geosoft .xyz data file and a M61 culture file for processing. These steps may be performed in the field trailer.

1. Go to "**File"** – Open file.

2. Browse and select the appropriate *.n61 file.



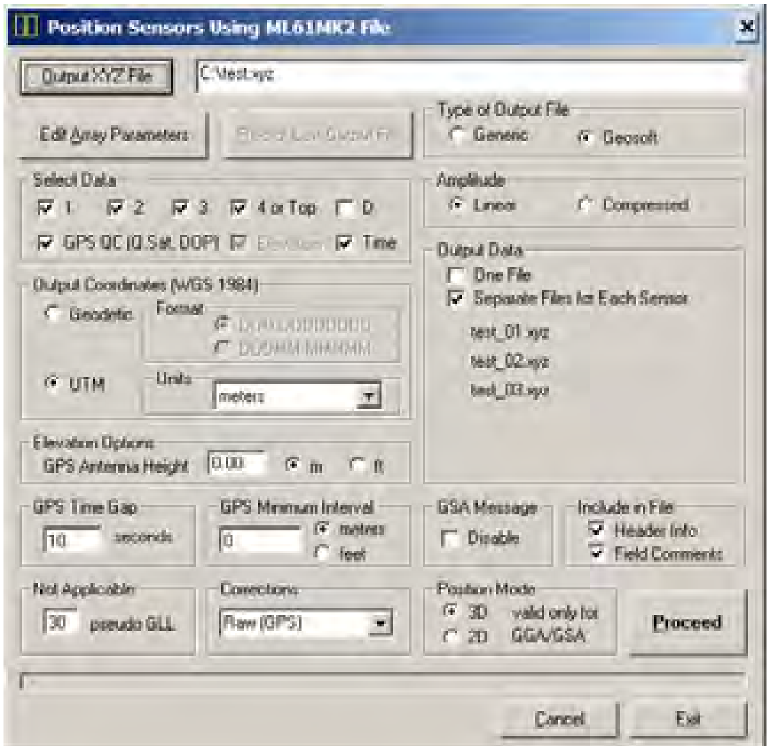
3. Ensure all settings on the below screen are correct and click **"OK".**



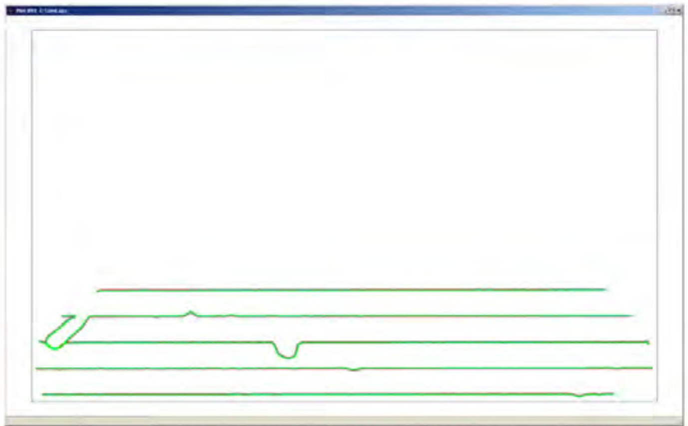
4. To create the Geosoft .xyz data file, perform the following:

- From the main screen select **"Position Sensors".**

- Select “**Position Selection using ML61MK2 data**”

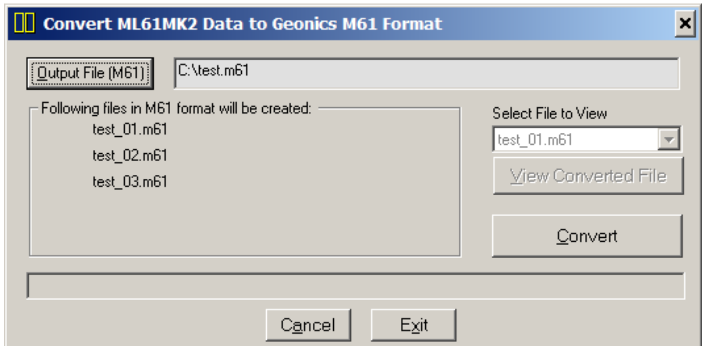


- Click on **“Output File”** and Browse for the location to save the Geosoft XYZ file.
- Set parameters to the same settings in the above screen and browse for location to save Geosoft XYZ file. Click “**Proceed**”.
- A map like the one below will appear. Close this window and the “**Position Sensor Window**”.



5. Create the M61 culture file using the following procedures:

- From the main screen, select “**Convert Data**” and select “**ML61MK2 data to Geonics M61 format”**.



- Click on "**Output File"** and browse for the location to save the M61 file.
- Click **"Convert".**
- Once the file has converted click **"Exit".**
- Then go to **"File"** and select "**Exit"**.
- Open the M61 file in Notepad and delete all lines except the culture lines and re-save the file (make sure to have " " around the file name so the file extension remains M61 and not .txt.

Initial data processing is performed by the field team and includes reviewing data for integrity and repeatability. Once deemed of acceptable quality the data is then uploaded to a file sharing site for data processing at the end of each day. Data processing procedures for towed-array data are described in GEO SOP 6 (DGM Data Processing Using a Towed Array System).

6. DATA MANAGEMENT

6.1 DATA INPUT

The data inputs required for the EM61 data acquisition are the EM61/GPS height measurements, the data acquisition software variable parameters, the proposed transects for data acquisition, and the survey control point locations.

6.2 DATA OUTPUT

The output will be all daily field notes, QC logs, GPS check-in points exported to a csv file and the raw geophysical field data in binary format.

7. QUALITY CONTROL

The MQOs can only be qualitatively verified in the field and must be quantitatively verified by the data processor. Typical MQOs related to production data consist of proper sample separation, grid coverage, and speed. If the processed data set fails the MQO acceptance criteria and the interpreted target list does not resolve each blind seed, a root cause analysis will be performed to determine the source of failure, and then the appropriate corrective action will be proposed.

1. Positioning System Static Positional Test (AM and PM): InDepth will conduct static repeatability tests of their RTK-GPS systems. This test will be completed at the beginning of each day at the IVS. The data for these GPS Static Positional Tests will be digitally recorded, observed in the field and results of these tests are to be documented on the geophysical contractor’s daily internal Geophysical QC test form (Appendix B).

2. Static Repeatability Test (AM and PM): InDepth will conduct static repeatability tests (background and spike) for each towed array system. These tests are to be completed twice daily at the IVS and will include 1 minute for background, 1 minute for spike, and 1 minute for an additional background reading. The baseline mV value for the static tests will be the average of AM and PM static tests conducted during the first week that the towed array system is operational. The data for these static repeatability tests will be digitally recorded, observed in the field and results of these tests are to be documented on the geophysical contractor’s daily internal Geophysical QC test form (Appendix B).

3. Dynamic Repeatability Test (AM and PM): InDepth will conduct dynamic repeatability tests (background and spike) for each towed array system. These tests are to be completed twice daily (AM/PM) at the IVS. The baseline mV value for each of the IVS items will be the average of all dynamic IVS tests conducted during the first week that the towed array DGM system is operational. The data for these dynamic repeatability tests will be digitally recorded, observed in the field

and results of these tests are to be documented on the geophysical contractor's daily internal Geophysical QC test form (Appendix B).

4. Cable Shake Test (AM only): On a daily basis the EM61MK2 and GPS instrument cables will be tested to verify that cable vibrations do not have a negative effect on the quality of the data. The cable vibration test will be conducted at the beginning of each workday prior to the commencement of that day's operation. The data for these cable shake tests will be digitally recorded, observed in the field and results of these tests are to be documented on the geophysical contractor's daily internal Geophysical QC test form (Appendix B).

5. Tow Vehicle elevated RPM response (AM only). On a daily basis the effect of an elevated RPM will be tested to verify that an elevated tow vehicle RPM does not have a negative effect on the quality of the data. This RPM response test will be conducted at the beginning of each workday prior to the commencement of that day's DGM survey operation. The data for these tow vehicle elevated RPM response tests will be digitally recorded, observed in the field and results of these tests are to be documented on the geophysical contractor's daily internal Geophysical QC test form (Appendix B).

All QC checks will be digitally recorded and analyzed to verify that all data is within acceptable operational parameters as outlined in the MEC QAPP Addendum. Daily QC will be monitored with the instructions provided in the MEC QAPP Addendum, Attachment B GEO SOP 6 DGM Data Processing Towed Array System, as well as in the Blind Seeding Program.

The QC Inspection checklist is included as Appendix C. Measurement Performance Criteria for DGM data acquisition using a towed array can be found in Worksheet #12 of the MEC QAPP Addendum. See Worksheet #31, 32, 33 of the MEC QAPP Addendum for a description of who will conduct the QC inspection for this DFW and the frequency of the Follow-up Phase QC inspections.

8. REPORTING

DGM data acquisition reporting consists of the daily distribution of the files and documents indicated in Section 6.2 Data Output: daily field notes, QC logs, GPS check-in points exported to a csv file and the raw geophysical field data in binary format. These data will be transmitted using the file system identified in the data management SOP.

9. HEALTH & SAFETY

The acquisition of towed array DGM data in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items.

10. REFERENCES

- USACE, 2024, Environmental Quality – Technical Guidance Military Munitions Response Actions, EM 200-1-15, Washington, D.C.

11. REVISION HISTORY

Version	Change Summary	Change Reason	Prepared By	Approved By	Published
Rev-1.01	Initial Release	No Change	Hecker	Smith, Welk	20240819

Appendix A
SOP Signature Page

The following individuals have read and understand this SOP:

Signature:	Date:

Appendix B
QC Log

EM61 DGM Daily QC Log

Project: ______ **Date:** ______

Conditions: Temp: ______ Conditions: ______

Team: ______

Survey Mode: ☐ 4-TimeGates ☐ Differential

Type of Investigation: ☐ Production ☐ QC Resurvey ☐ QA Resurvey (select appropriate)

Method of Collection: ☐ Grid ☐ Transect ☐ Meandering Path (select appropriate)

Equipment: **Deployment:** ☐ One Coil ☐ Two Coil ☐ Three Coil

Console 1= ______ Console 2= ______ Console 3= ______

Coil 1= ______ Coil 2= ______ Coil 3= ______

Positioning System: RTK Rec 1 = ______ RTK Ant 1= ______

Navigation System: RTK Rec 2 = ______ RTK Ant 2= ______

DGM Computer = ______ Navigation Computer = ______

Setup: Coil Height (cm) ______ Antenna Height (cm) ______

Coil Height = bottom of bottom coil to ground — Antenna Height = bottom of antenna to ground

Standard Response:

Coil 1				Coil 2				Coil 3			
CH1	CH2	CH3	CH4/T	CH1	CH2	CH3	CH4/T	CH1	CH2	CH3	CH4/T

Calibration Point Coordinates: Latitude/Northing: ______ Longitude/Easting: ______

AM Statics File Name: YYYYMMDD{A,B,C . . .}

Time	Line #	Go/No Go	Operation	Description	Result
	NA		Power On		
	NA		Survey Setup		
	NA		Main Battery Voltage	Observed voltage	
			Personnel Test	Check personnel for change, watches, cell phones, etc.	
			Cable Shake Test	After null, shake cables while watching #s	

Time	Line #	Go/No Go	Coil 1				Coil 2				Coil 3				
			CH1	CH2	CH3	CH4/T	CH1	CH2	CH3	CH4/T	CH1	CH2	CH3	CH4/T	
															Static Test
															Reference Test
															Static Test 2

AM IVS File Name: YYYYMMDD{A,B,C . . .}

	LN #	IVS		Change line #'s on each pass

Middle	Up West	Down West	UP East	Down East	Noise

PM Statics File Name: YYYYMMDD{A,B,C . . .}

Time	Line #	Go/No Go	Operation	Description	Result
	NA		Power On		
	NA		Survey Setup		
	NA		Main Battery Voltage	Observed voltage	

Time	Line #	Go/No Go	Coil 1				Coil 2				Coil 3				
			CH1	CH2	CH3	CH4/T	CH1	CH2	CH3	CH4/T	CH1	CH2	CH3	CH4/T	
															Static Test
															Reference Test
															Static Test 2

PM IVS File Name: YYYYMMDD{A,B,C . . .}

	LN #	IVS		Change line #'s on each pass

Middle	Up West	Down West	UP East	Down East	Noise

Appendix C
QC Checklist

Three Phase Quality Control Checklist

GEO SOP 4 – DGM Using a Towed Array Systems

Team Information		
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	Signature Page	Verify that all personnel have signed the SOP Signature Page				*(P)*
.2	4	Verify that 3 Geonics EM61-MK.2s are being used and that all necessary equipment listed is present and serial numbers recorded per team				*(P)*
3	4	Verify RTK-GPS is being used and that all necessary equipment listed is present and serial numbers recorded per team				*(P)*
4	5	Verify GPS is set to 1Hz output in NMEA GGA format				*(I),(F)*
5	5	Instrument setup according to manufacturer specification and/or as described in this SOP (and cables have been secured)				*(I),(F)*
6	5	Instrument coil height has been measured				*(I),(F)*
7	5	GPS antenna has been mounted over center of middle coil and cables secured				*(I),(F)*
8	5	Tow vehicle is being driven no faster than maximum speed demonstrated in IVS (approximately 3 mph (1.34 m/s)				*(I),(F)*
9	5..2	Instrument warmed-up for at least 15 minutes				*(I),(F)*
1O	5..2	EM61 data collection rate set to at least 15 Hz				*(I),(F)*
11	5..2	Correct towed array coil geometry has been set in the data collection software				*(I),(F)*
1.2	5..2	Instrument nulled in area known to be clear of anomalous response				*(I),(F)*
13	6 (1)	GPS Static Positional Test performed showing location within expected parameters				*(I),(F)*

Three Phase Quality Control Checklist

GEO SOP 4 – DGM Using a Towed Array Systems

14	6 (.2)	Morning Static Repeatability Test performed showing expected response				*(I),(F)*
15	6 (3)	Morning Dynamic Repeatability Test performed showing target locations and response within expected parameters				*(I),(F)*
16	6 (4)	Cable Shake Test performed showing no effect on the data quality				*(I),(F)*
17	6 (5)	Tow Vehicle Elevated RPM Test performed showing no effect on the data quality				*(I),(F)*
18	6 (.2)	Afternoon Static Repeatability Test performed showing expected response				*(I),(F)*
19	6 (3)	Afternoon Dynamic Repeatability Test performed showing target locations and response within expected parameters				*(I),(F)*
.20	5.7	All DGM data for the day have been transferred to a field computer				*(I),(F)*
.21	5.7	Export settings are correct for the towed array coil geometry				*(I),(F)*
.2.2	5.7	Data have been converted to xyz format including georeferenced positional data				*(I),(F)*
.23	5.7	All raw DGM data for the day have been transferred to the project FTP site for final data processing				*(I),(F)*

Punch list Items	
No.	

Conducted by: ______________________________ DATE: ______________________________

Approved by: ______________________________ DATE: ______________________________

GEO SOP 5
DGM DATA PROCESSING FOR A PERSON-PORTABLE SYSTEM

GEO SOP 5

Standard Operating Procedure DGM Data Processing for A Person-Portable System

Original Issue Date: August 2024
Last Review/Implementation Date: August 2024

InDepth Corporation

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Table of Contents

Appendices

Appendix A - SOP Signature Page

Appendix B – QC Checklist

Acronyms

ADB	Access Database
cm	Centimeter(s)
DGM	Digital Geophysical Mapping
Ft	Feet
GDB	Geosoft Database
GIS	Geographic Information System
GPS	Global Positioning System
GUI	Graphical User Interface
in	Inches
ISO	Industry Standard Object
IVS	Instrument Verification Strip
m	Meter(s)
MQO	Measurement Quality Objective
MEC	Munitions and Explosives of Concern
MEC QAPP	Munitions and Explosives of Concern Quality Assurance Project Plan

QC	Quality Control
RTK	Real-Time Kinematic
SFT	Static Function Test or Sensor Function Test
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SSWP	Site Specific Work Plan
UXO	Unexploded Ordnance

1. POLICY

InDepth and project personnel will follow procedures established in this Standard Operating Procedure (SOP) for all data processing of Digital Geophysical Mapping (DGM) data collected using person-portable methods in support of Munitions and Explosives of Concern (MEC) remediation projects at the former Fort Ord. This SOP must be distributed to and signed by all personnel performing activities related to this SOP and must be adhered to as field activities are performed.

2. PURPOSE & SCOPE

2.1 PURPOSE

The purpose of this SOP is to detail the procedures and operational methodologies associated with the processing of DGM data collected using person-portable methods in areas that are potentially contaminated with MEC. All data processing will be performed using Geosoft's Oasis Montaj software package equipped with the UXO- Land module.

2.2 SCOPE

The scope of this SOP applies to all geophysical projects that require data processing of person-portable EM61 DGM data.

3. MAINTENANCE

InDepth personnel are responsible for the maintenance of this SOP.

4. PERSONNEL, EQUIPMENT & MATERIALS

4.1 PERSONNEL

The following individuals will be involved in the processing of person-portable system data for advanced analysis:

- Senior Geophysicist
- QC Geophysicist
- InDepth Data Processor

The key personnel implementing this SOP are documented in the MEC Quality Assurance Project Plan (MEC QAPP) Addendum Worksheets 4, 7 & 8.

4.2 EQUIPMENT

Hardware and software required for the processing and analysis of dynamic DGM data include the following:

- Processing software appropriate for specific DGM equipment
- Seequent Oasis Montaj, Standard Edition, with UXO Land and DoD UX-Analyze Custom Tools extensions, Versions 9.2. or later
- Geonics DAT61MK2 EM61 Data processing software.
- Data processing computer suitable for running processing software.

4.3 MATERIALS

Materials required for data processing include raw field data, computer capable of running Oasis Montaj, Geonics DAT61MK2, python, MS Access, Notepad++, and the following common data elements:

Minimum Data Requirements

- Project Name
- Client
- Project Personnel List
- Location (Lat/Long/Elevation)
- Survey Datum
- MEC QAPP Addendum

Folder Structure

Base Root: C:/Projects/Client_Name/Project#_Name/DGM/... (Note: all projects must have this same folder structure under the C drive to be able to use this data processing flow.)

STANDARD DIRECTORY STRUCTURE:

Folder structure (folder names in bold):

DGM/

- **/Oasis_ProjectX/**

  Note: Must contain Oasis project file, named ProjectX.gpf

  - **/Deliverables/**
  - **/Exports/**
  - **/GDB/ (max lines = 1000, channels = 100,** must contain these gdb's:)
    - ProjectX_IVSseeded_Master,
    - ProjectX_Master,
    - ProjectX_IVSnoise_Master,
    - ProjectX_spike_Master,
    - ProjectX_static_Master
    - ProjectX_noiseline_Master
  - **/Grids/**
  - **/Imports/**
  - **/Maps/, must contain these maps: (you need to create these after you have data in a gdb with the coordinate system setup)**
    - ProjectX_day.map,
    - ProjectX_Grids.map
    - ProjectX_Master.map
    - ProjectX_tmp.map
    - ProjectX_QC_day.map,
    - ProjectX_targets.map

- **/Polygons/, must contain:**
  - ProjectX_boundary.ply,
  - IVS_boundary.ply (must match name of the IVS used in access database)
  - Grid_groups – which must contain grid.ply and grid_buff.ply (ex. A5.ply, A5_buff.ply
  - Transect_groups- which must contain same as above but for transects.
- **/RawData/**
  - Raw data files are stored in folders using YYYYMMDD individual data files are stored in the format YYYYMMDDx# where x= alphabetical code for the current file e.g. a, b, c, d… and # is the number assigned to the geophysical team collecting data e.g. 1, 2, 3, ….to 0 representing the 10th data acquisition team. Team numbers cannot go above single digits.
- **/Shapes/**
- **/Templates/**

- **/Scripts/**
  - **Scripts to edit:**
    - ProjectX_1.1_1Coil_Import_Combined_cl.gs – for projects with single coil data, make sure import template matches the xyz file – trackmaker and dat61 have different output channels.
    - ProjectX_1.2_MultiCoil_CoordinateProjection_cl.gs – adjust to project coordinate system.
  - **/Templates/**
- **/pdfs/**
  - This is where daily QC reports get written out too.
- **/plots/**
- This is where temporary figures for the daily QC reports are stored.

5. PROCEDURES

Once the initial editing steps have been performed, as described in the MEC QAPP Addendum, Attachment B GEO SOP 3 (DGM Using a Person-Portable System), the data are turned over to InDepth's processors for analysis, target selection, and preparation of deliverables. The processor will go through three primary steps before the final data packages are delivered.

5.1 Dynamic Data Processing Outline

Using instrument specific exporting, conversion, and processing software, dynamic data are processed using these steps in the following order:

5.1.1 1 PROJECT SETUP

1.1 Download Templates to Create New Project

1.2 Initial Setup

1.3 Default Parameter Setup

1.4 Geosoft Setup

1.5 Project and Parameter Setup

1.6 Site Specific Setup

1.7 Database Maintenance

5.1.2 2 DYNAMIC DATA PROCESSING

2.1 Convert Dynamic Sensor Data (R61 to XYZ)

2.2 Renumber Lines in XYZ files.

2.3 Input GPS check-in points and Daily DGM entry to Access Database

2.4 Run Daily Process

2.5 Pick Industry Standard Objects (ISOs)

2.6 Run Stats

2.7 Create Daily Report

2.8 QC

2 DELIVERABLES

2.a Static Calibration Tests

2.b Response and Positioning Table

2.c ISO Response History

2.d Sample Separation Map

2.e Velocity Grid Map

2.f Footprint Coverage Map

5.1.3 3 DYNAMIC TARGET PICKING

3.1 Fill Out 3_FilestoGridpick.bat

3.2 Run 0_Menu.bat

3.3 Run Input 3 (Grid: Target Picking) in Script

3.4 Run Input 4 (Grid: Target Analysis) in Script

3.5 Run Input 5 (Target and Map Export) in Script

5.2 PROJECT SETUP

Project setup must be performed once at the beginning of each project in order to create the required directory structure, processing scripts, batch processing files, data formats, project specific measurement quality objectives (MQOs), and all project specific variables.

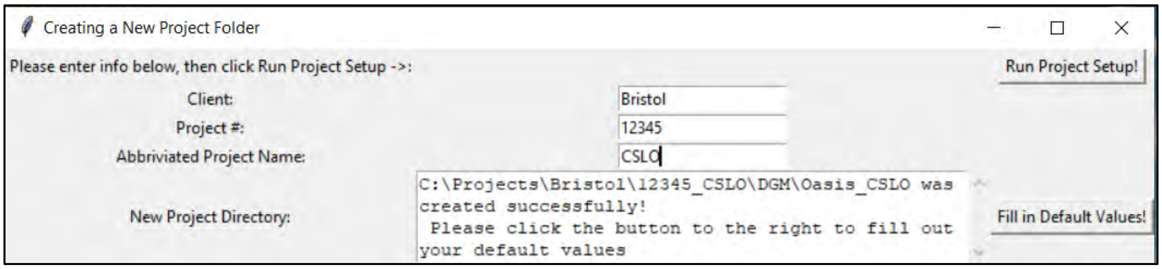
5.2.1 DOWNLOAD TEMPLATES TO CREATE NEW PROJECT

a. Download the most current version of **DGM_template.zip** and **create_new_project.exe** files from the **company drive (S:)**. Do not unzip the **DGM_template.zip**, the program will do automatically.

b. To create a new project, copy both files into the **C:\Projects** folder and double-click **create_new_project.exe** to run it.

5.2.2 INITIAL SETUP

a. Fill out the GUI with **Client Name**, **Project #**, and **Abbreviated Project Name**. For example, a job where the client is Bristol, the site is at Camp San Luis Obispo, and the project number is 12345 would look like this below:

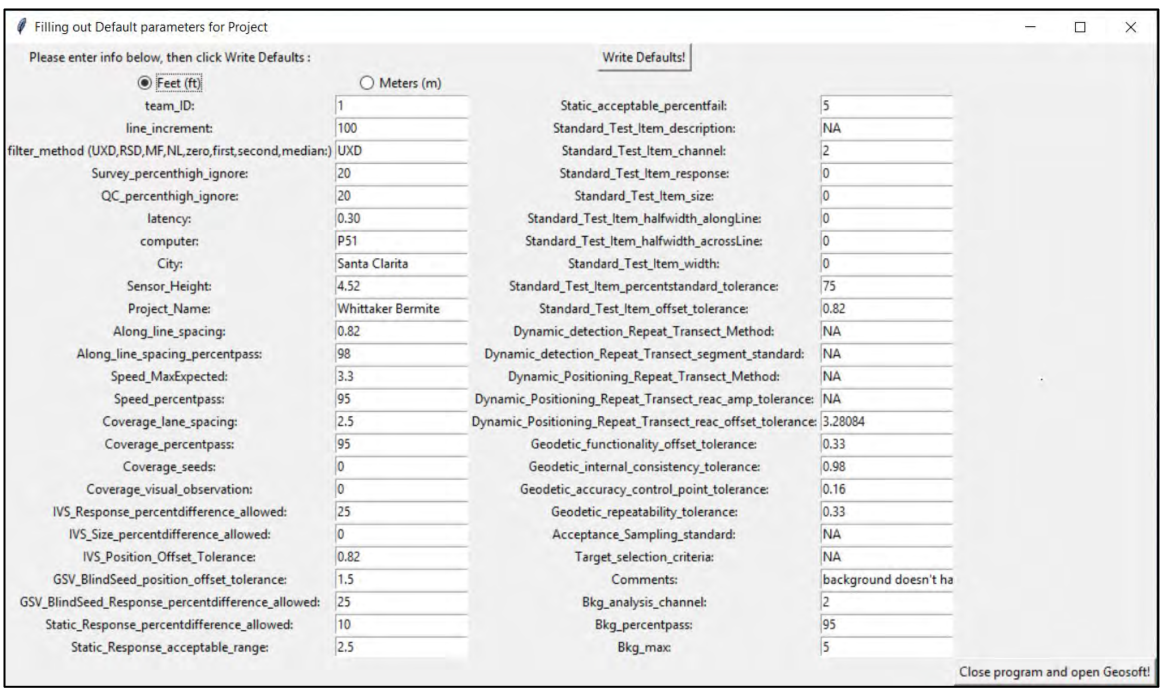


b. Click Run Project Setup. This creates the final folder structure and renames files accordingly.

c. Click Fill in Default Values to continue to the next GUI to fill out.

5.2.3 DEFAULT PARAMETER SETUP

a. Click **Feet (ft)** or **Meters (m)** option to auto-fill in the standard parameters for most projects. Change other parameters to match the project requirements listed in the MEC QAPP Addendum. Click **Write Defaults**, to write out these parameters to the **defaults.txt** file.



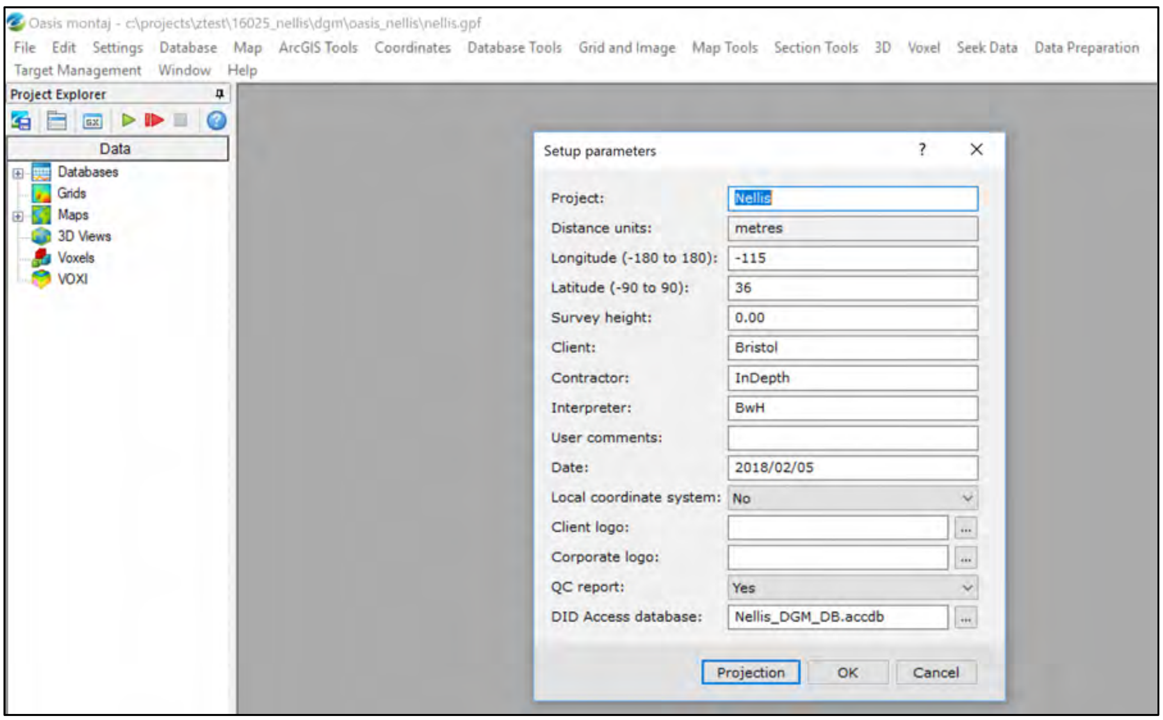
b. Once complete, click **Close program and open Geosoft!** to open the new Geosoft project file.

5.2.4 Geosoft Setup

a. Fill in **Setup Parameters** under **Data Preparation**. Name the project and the ADB to be project specific (projectname_DGM_DB). This project name must match the Geosoft project filename (e.g., ADB = CSLO_DGM_DB, GPF = CSLO).

b. Check the project's MQOs and confirm that the correct parameters are entered.

c. Save Geosoft and exit.



5.2.5 Project and Parameter Setup

a. Run **project_setup.py** using Python in DGM folder. This copies over template project processing scripts and GDBs to the correct locations and renames them. It also merges/copies/renames the ADB from a template. Answer **Yes** to update the computer-based scripts and to update the ADB.

b. Run **parameters_gui.py** to fill out **parameters.txt** file, which contains filter options, thresholds, main channel, and the like. Then run **update_parameters.py**.

c. If a mistake is made or an update to the parameters is wanted at any time, fill in the new parameters in the **parameters.txt** file and then run **update_parameters.py**.

5.2.6 Site Specific Setup

a. Import GPS control points into ADB.

b. Record the script when setting the correct coordinate system projection which will be used for the project. This must be performed after having initial data, ideally it would be in the field, where the installation of the IVS will be, after the first background is collected.

c. After recording the script, it will need to be edited. Specifically, lines 39-43 in **projectname_1.2.MultiCoil_CoordinateProjection_cl.gs** will be edited to ensure the correct coordinate projection system is implemented during the automated data processing.

d. Create a map from a shape file (.shp), obtained from ArcGIS, that encompasses the entire project area. This .shp will be duplicated and renamed. However, before duplicating it, save the .shp as a polygon and save it to the **Polygons** folder. Create the six standard maps, which can been seen in the folder structure below.

e. Create sites in the ADB for the IVS and any other project boundary of interest. Typically, the IVS is named **IVS1** which needs to have a polygon file (.ply) with the same name prefix in the polygon folder (e.g., IVS1_boundary) Note, **boundary** must be appended to the end of the site name with an underscore. The same applies for the project sites (e.g., MRS 03 needs to have a correlating .ply in the polygon folder, like **MRS03_boundary.ply**)

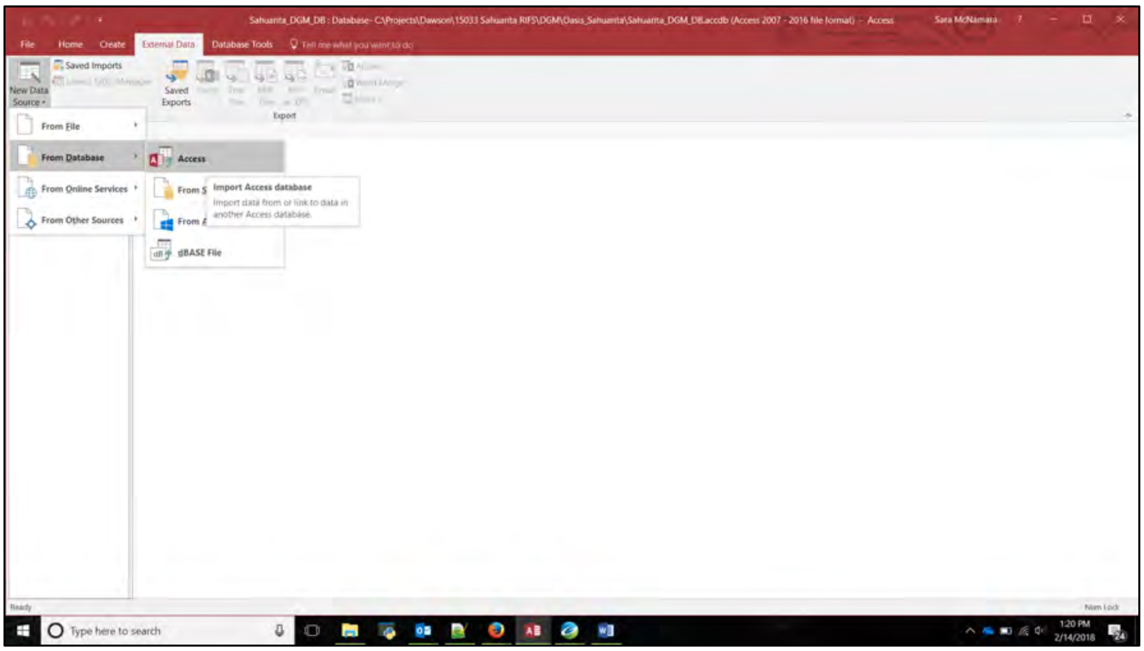
5.2.7 Database Maintenance

a. It is best practice to compact and repair the new database at the beginning of the project, but it is not necessary. To do so, open Geosoft and go to **Database Tools > Compact and Repair Database**.

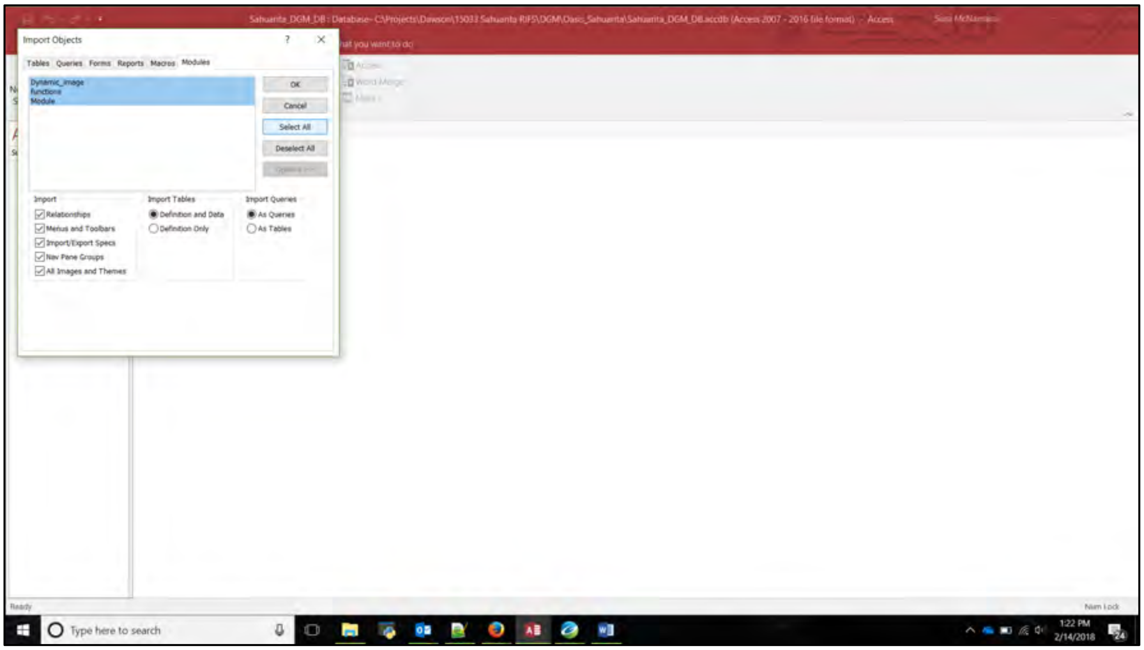
b. Sometimes the database grows unacceptably large, especially if there have been changes to queries, forms, or reports. There is also a known memory leak in Microsoft Access. Thus, periodically, a fresh new database should be created and all the data from the original database should be imported. Note, this is similar to creating an empty database as described above, but in this case, all data is being kept.

c. Example steps to maintain database:

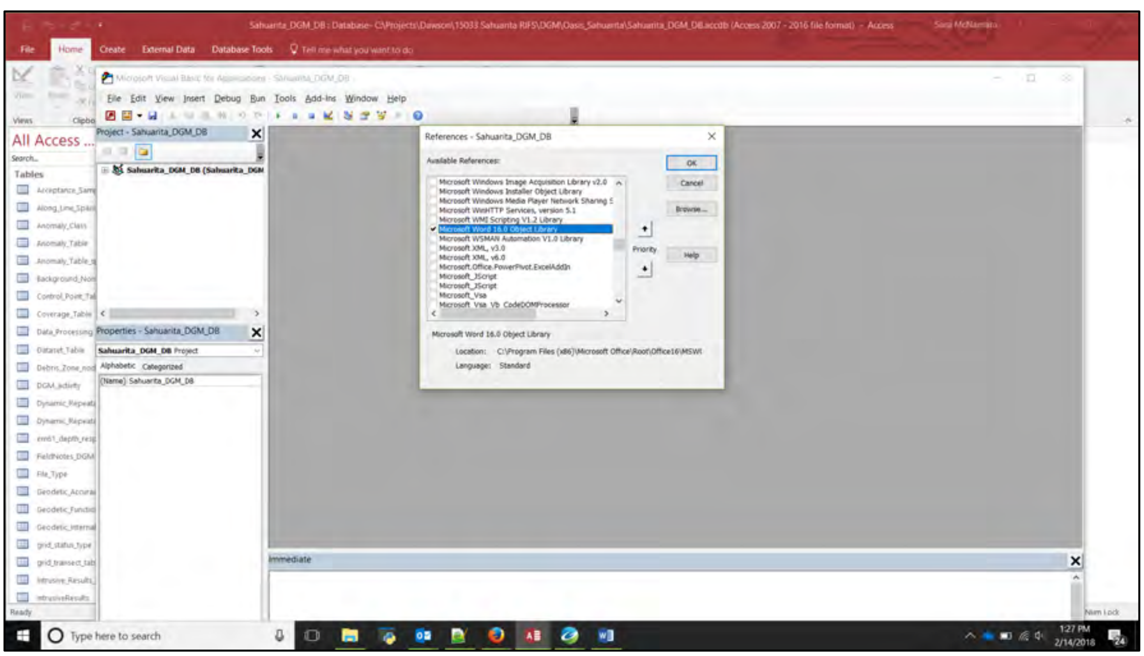
- Save the previous database with the date (e.g., Nellis_DGM_DB.accdb becomes Nellis_DGM_DB_20180213.accdb)
- Create a new blank database and name it for the project (e.g., if Nellis_DGM_DB.accdb is created, it will open with a blank table. This can be closed.)
- Click on **External Data** and choose **New Data Source > From database > access**.



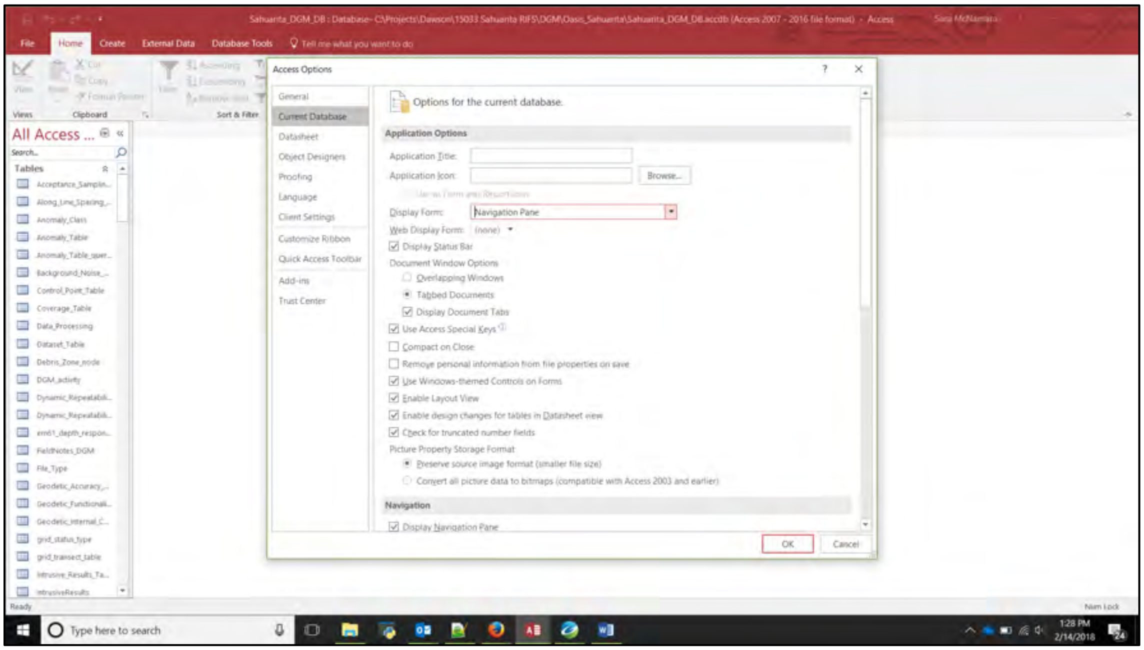
- Browse to the previous database (e.g., Nellis_DGM_DB_20180213. Keep default – import tables, queries etc. In the **Import Objects** dialog, **click options**. Choose everything under **Import**. Then click on each tab – Tables, Queries, Forms, etc. and **Select All**.



- Then click **OK**. This can sometimes be a slow process.
- Press **Alt + F11** (alternatively, click **Database Tools > Visual Basic**). Choose **Tools > References**. Select **Microsoft Excel 16.0 Object Library** and **Microsoft Word 16.0 Object Library** and click **OK**. Close the VB window.



- **File > Options > Current Database > Display Form**: choose **Navigation Pane**.



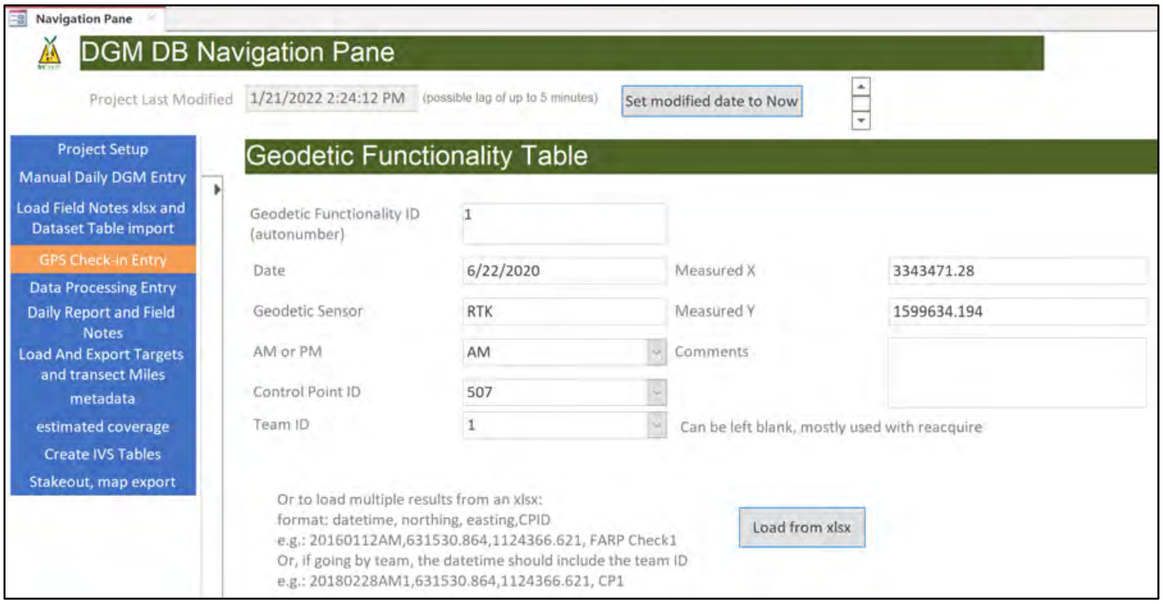
- Then **Database Tools > Compact and Repair Database**.

5.3 Dynamic Data Processing

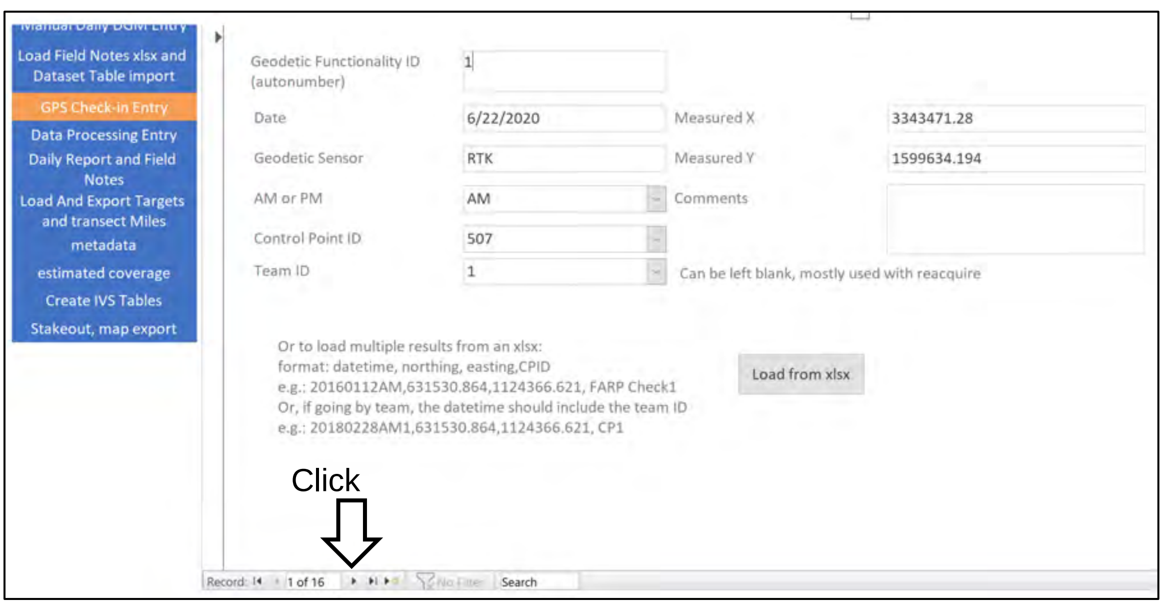
After completing the project setup daily QC and production data may be processed using the following procedures.

5.3.1 Input GPS Check-in Points and Daily DGM Entry to Access Database

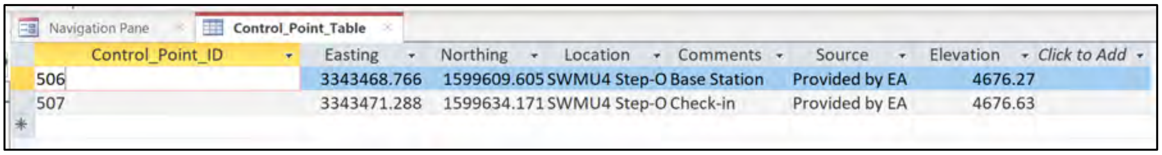
a. Open the specific project's Microsoft Access database. A tab labeled **Navigation Plane** should automatically be open. In the blue column to the left, click on **GPS Check-in Entry**.



b. With respect to the specific project's information (different projects will have different values for the following), fill out the **Date, Geodetic Sensor, AM or PM, Control Point ID, Team ID, Measured X, and Measured Y** boxes, similar to the picture above. To fill out the rest of the information, scroll down and at the bottom there should be arrows next to a box that shows the number of records, as shown in the photo below. Click on the right arrow to go to the next record to fill out until done.

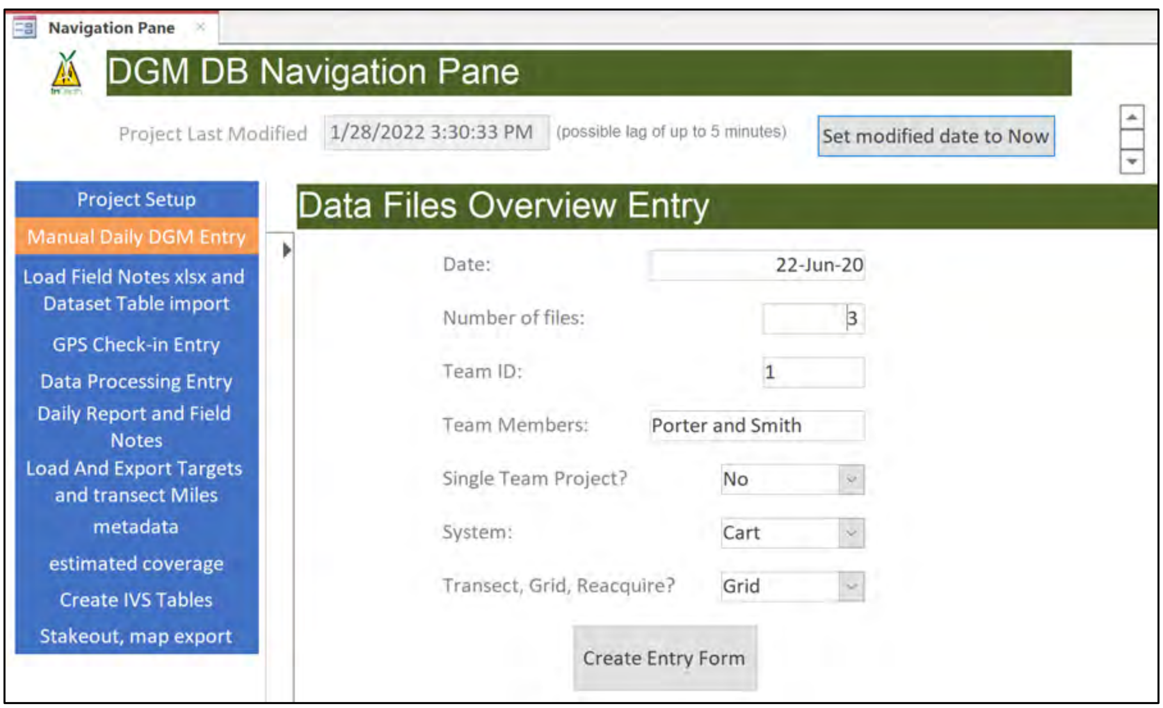


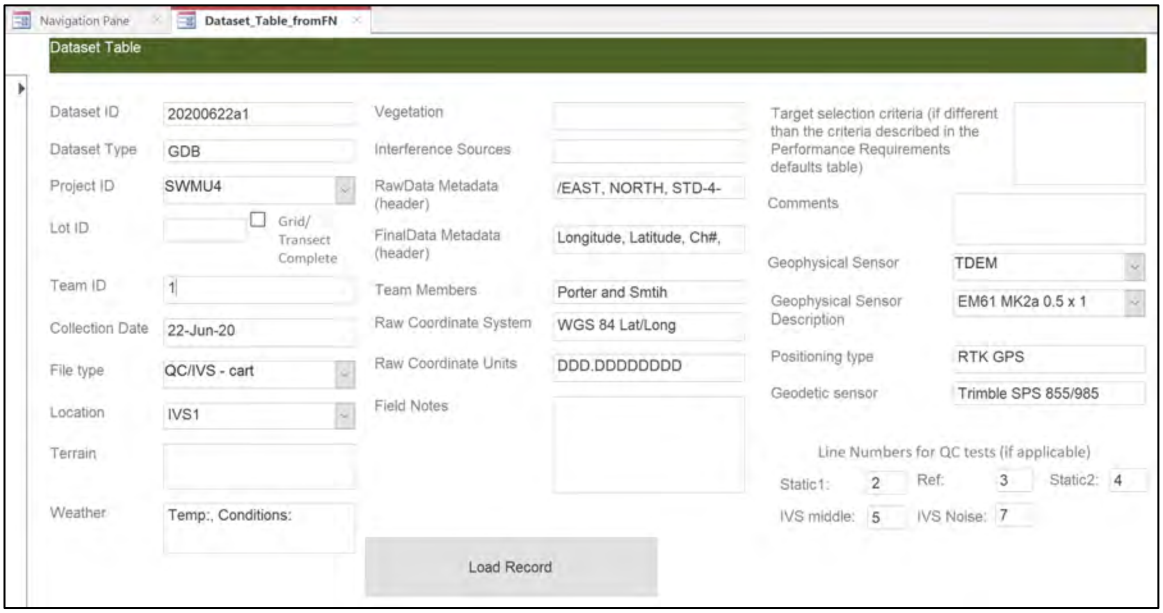
c. Once successfully loaded, double-check that the GPS check-in points are correct. To do this, look in the list of objects on the far left and open **Control_Point_Table**. Refer to the picture below as an example.



Control_Point_ID	Easting	Northing	Location	Comments	Source	Elevation	Click to Add
506	3343468.766	1599609.605	SWMU4 Step-O Base Station		Provided by EA	4676.27	
507	3343471.288	1599634.171	SWMU4 Step-O Check-in		Provided by EA	4676.63	

d. Next, click on the **Navigation Pane** tab, and click **Manual Daily DGM Entry** to the left in the blue column. Before inputting any values, make sure to check the field report first, which notes the specific lines and data file types (i.e., production or IVS). Now, input the proper **Date, Number of Files, Team ID, and Team Members** (this parameter should automatically fill in once **Team ID** is input). Make sure **Single Team Project?** Is set to **No**, and ensure that **System** and **Transect, Grid, Reacquire?** have the correct option selected for the specific project. Once done, click **Create Entry Form**.

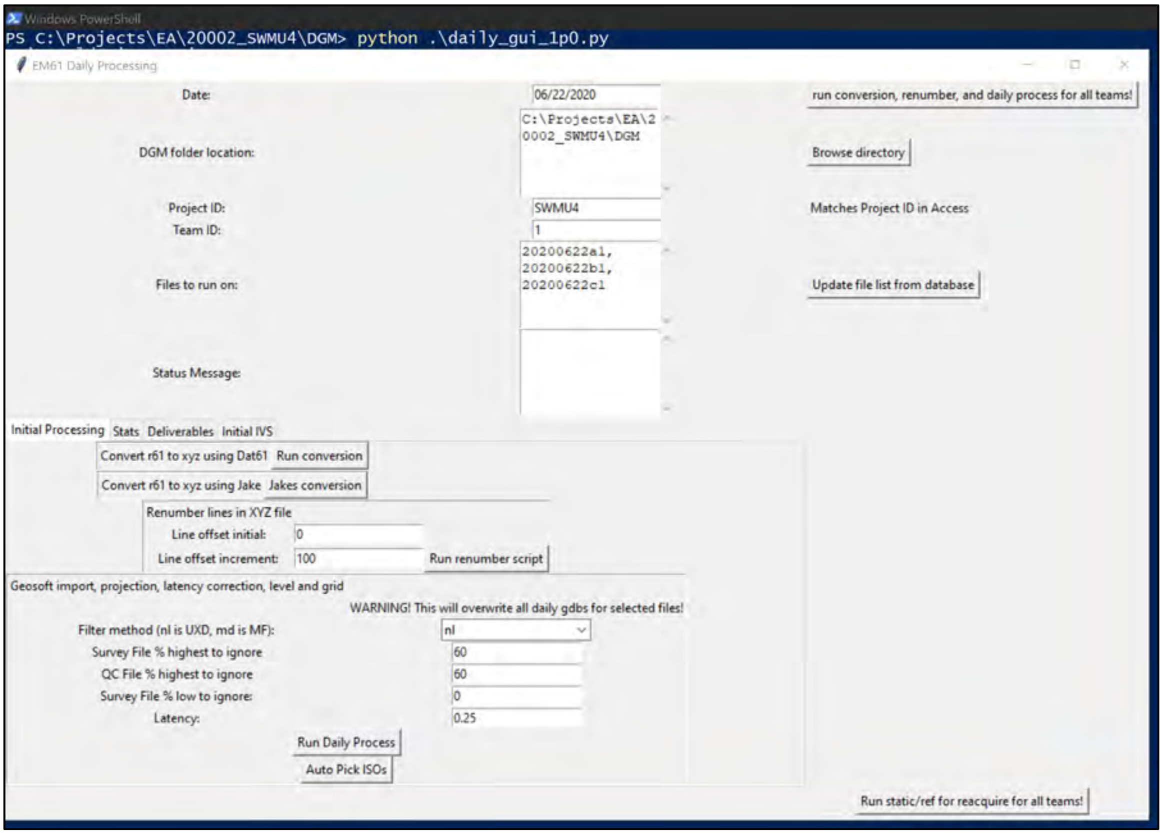




5.3.2 UN DAILY PROCESS

a. Open File Explorer and locate the project folder that contains the Python script, **daily_gui_1p0**. In the blank space below, press **shift + right click**. Select **Open PowerShell window here**.

b. Once open, ensure the proper directory is selected and type **python .\daily_gui_1p0.py**, then press **Enter**. The EM61 Daily Processing GUI will open, as shown below.



c. Make sure the correct date is inputted, then click **Update file list from database**. The same number of files specified earlier in the Access Database should appear in the **Files to run on** box. If not, double-check that the **Daily DGM Entry** was inputted correctly in Access Database.

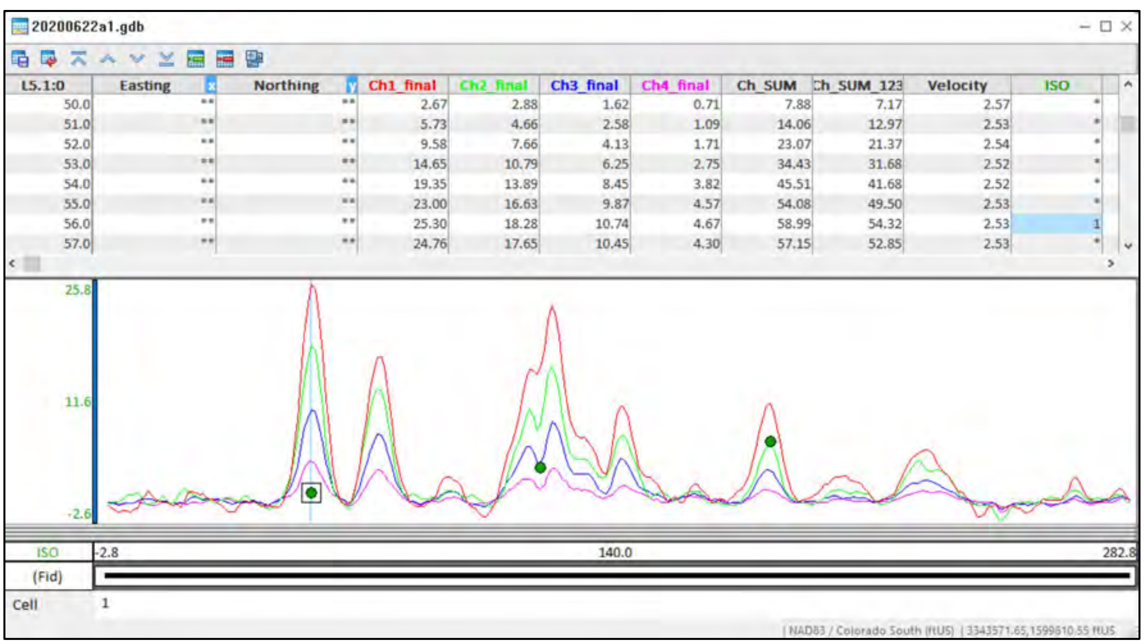
d. Once the correct files are loaded, click **Run Daily Process** under the **Initial Processing** tab. The script will automatically run. The script imports the converted R61 to XYZ files into Geosoft and creates databases for those files; it then converts the data into the correct coordinate system, applies instrument drift correction and instrument latency correction to the data, and grids and maps the data. The daily process script is finished. If the parameters within the script need to be updated for any reason (e.g., change the filter cutoff values), this can be done by going into the **DGM** folder in File Explorer, opening the **parameters** text file in Notepad or Notepad++ and adjusting the parameters accordingly. Once changes are made to the parameters, either run the **update_parameters_gui** first and then run the **daily_gui_1p0**, or just rerun **daily_gui_1p0**, as it will automatically run the **update_parameters_gui** in the script.

e. Note, it is always good to double-check the **DGM_fieldnotes** table and the **Dataset Table**, as well as if the **Daily DGM Entry** has the correct inputs for each file and the correct number of files. This is where known issues occur. For example, if the script is run with the incorrect number of files, one must go into Access Database and delete all inputs from that date in each tab to the far left. Once all of those inputs are deleted, go back to the **Navigation Pane,** and recreate the entry form with the correct number of files. Next, rerun the daily process and move on to the next step. Further note, if all of those inputs were not deleted from when the daily processing script was first run, other errors may occur in the daily processing script when being run a second time.

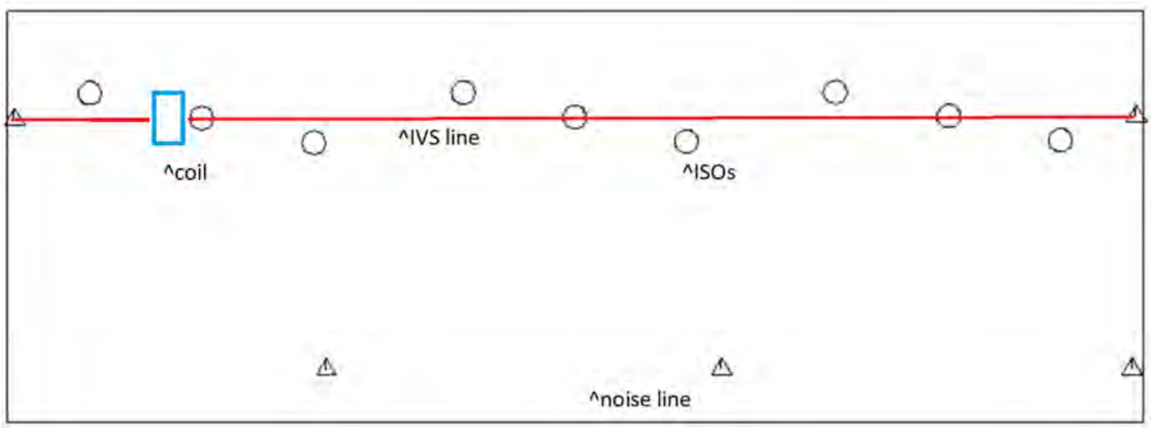
5.3.3 PICK ISOS

a. Before running the next script, the ISOs need to be picked in Geosoft for the AM and PM IVS database (.gdb) files.

b. The .gdb files should already be open in Geosoft due to the script. If not, go to the **Project Explorer** to the left, under the **Data** tab, expand **Databases**, and open the proper .gdb files for the AM and PM IVS. Once open, ensure that there is an **ISO** column present in the database. If not, scroll to an empty column, right-click the header, select **List…**, select **ISO**, then click **OK**. Note, make sure that **ISO** is also set to a **mask** channel (**mask** should already be typed next to **Class** in the **Edit Channel** pop-up). A new column will appear, filled with asterixis, and headered **ISO** – it should look like the picture below. Right-click the **ISO** header and select **Show Symbol Profile**. This will help in the picking of the ISOs.



c. Next, ensure the proper line number is selected. Typically, and in this particular case, for the AM .gdb, the ISOs will be picked on L5. NOTE: double-check the daily field logs for the correct line number, as this line number could vary. NOTE: not all projects will use the same number of ISOs as in this example. These ISOs are picked in Geosoft by going to the line profile below the database window, clicking the respective peaks for a vertical ISO (or trough, in the case of an in-line horizontal ISO), and inputting the corresponding numbers in the ISO column, as shown above. If the whole profile is not shown or is compacted, right-click the empty space to the left and click **Rescale All**.



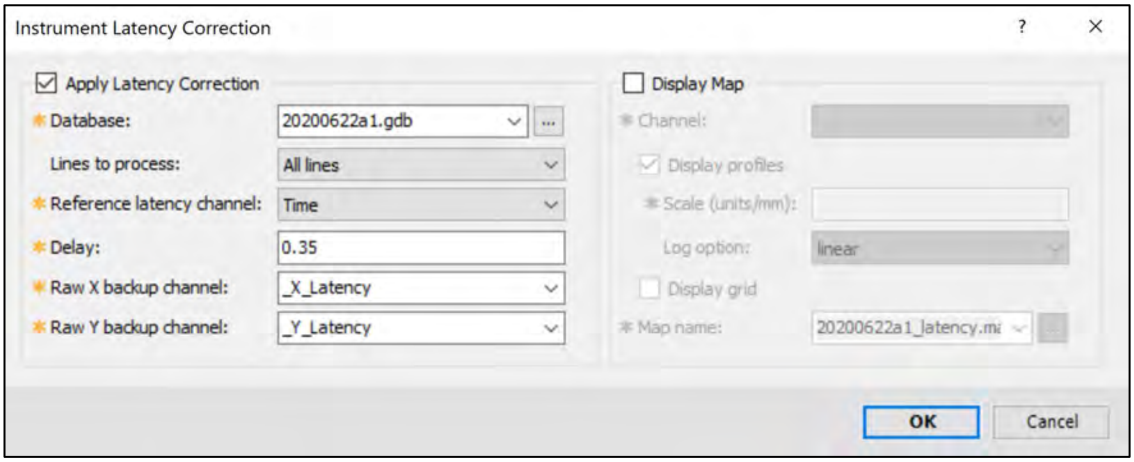
d. It is important to note that the overall IVS layout for a specific project and which ISOs are in which direction should always be reviewed first. This will ensure the proper ISOs are picked for the proper line.

e. Repeat for the PM .gdb. Again, typically and in this particular case, the ISOs will be picked on L7. NOTE: double-check that this is the correct line number in the daily field logs. The same ISO numbers are picked for the PM IVS. Once done, double-check that all ISO numbers are correct in the AM and PM .gdb. Save work and close Geosoft.

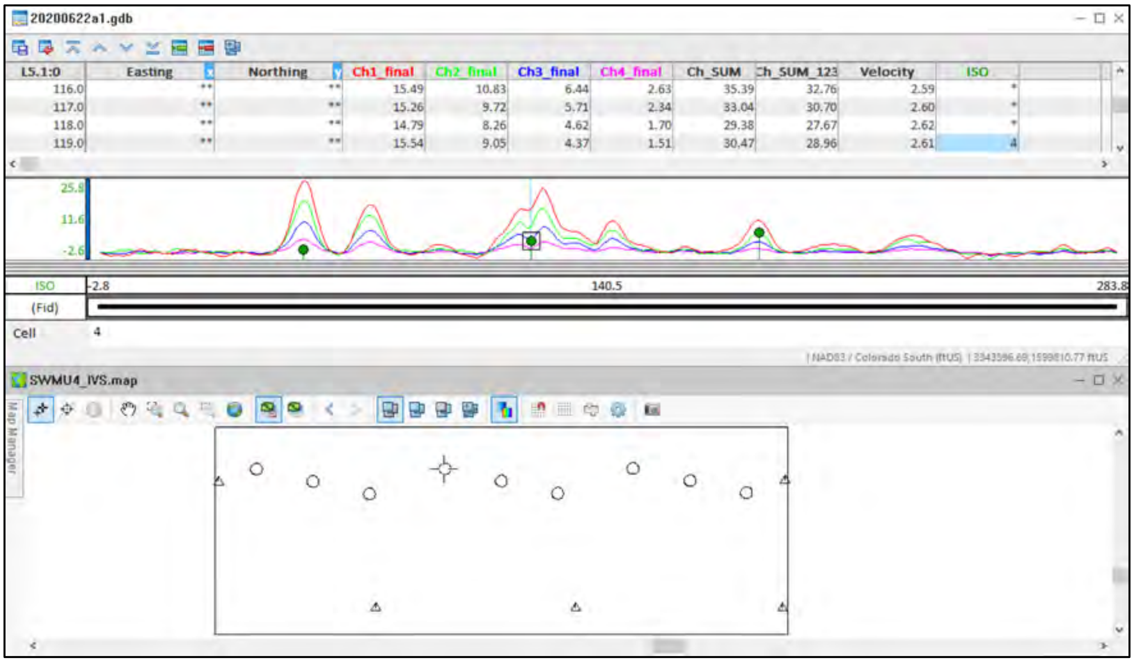
f. Note, if the wrong line was picked during the ISO selection or the ISO number was input incorrectly in the ISO column, the next step (run daily stats) will fail. To avoid this mistake, go back to each line for the AM and PM .gdb and double-check that the correct line has the correct ISO number selected.

g. Furthermore, it is important to check if the latency parameter is appropriate for that specific day's dataset since it can vary immensely due to other factors. Pick an ISO on the upgoing line and another on the down going line for the same file. The latency can then be checked by adjusting it accordingly in the **Instrument Latency Corrections** window.

h. In the case that latency needs to be adjusted, go to the **Data Preparation > Path Corrections > Instrument Latency Corrections…** – here, a pop-up should appear like the one shown below.



i. Adjust the **Delay** parameter to see how close or far apart the picks are relative to the ground truth location, and then click **OK**. Typical **Delay** parameters are **0.30-0.40**. Adjust this accordingly until the best fit is found for both ISOs (which is when the picked ISOs locations are as close as possible to the ground truth locations). Once latency is adjusted, replot the picks on the map. NOTE: when picking ISO locations manually, the ground truth locations are unknown. The manual ISO picking is based solely on the line profile's peaks/troughs. After picking, the latency can then be checked and adjusted by opening up the project's IVS map and seeing how close all of the ISO picks are to the ground truth locations, as shown below.

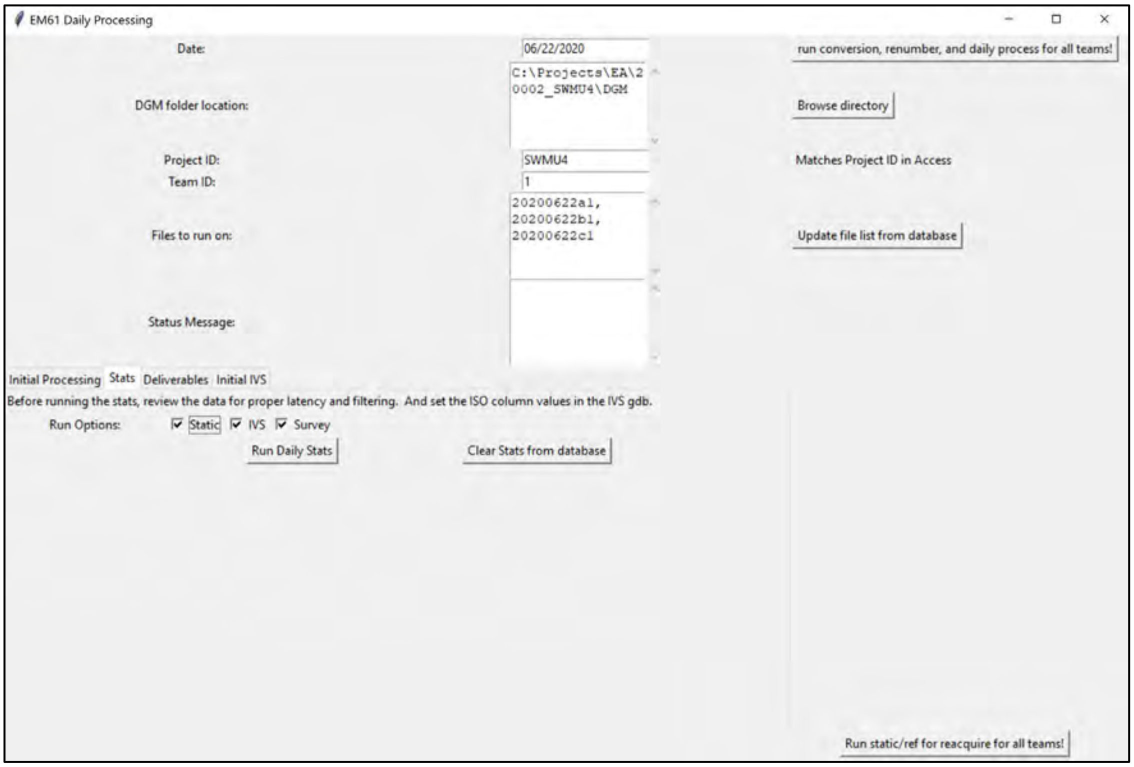


j. NOTE: The daily process will need to be repeated if the latency was not initially suitable.

5.3.4 Run Stats

a. Return to PowerShell and run the daily GUI, again. Make sure all the information is the same as before, but this time, click the **Stats** tab. Ensure that **Static**, **IVS**, and **Survey** are all checked in the **Run Options**. Click **Clear Stats from database**. Next, click **Run Daily Stats**. The script will automatically run. The script generates a velocity map, a data separation map, a footprint coverage map, response and positioning table, and ISO response history, as well as performing a static calibration test for each coil. NOTE: the progress of the script and the generation of said maps can be visually checked by accessing the output (deliverables) folder. The maps will appear in that folder successively as they are generated. The **Run Stats** script is finished.

b. Note, this step can take up to 40 minutes to complete, if not longer. Most of the time, an error is not realized until after the script is finished running. That is why it is important to double-check everything. If an error does occur, for example, only with data from the **Survey**. When one decides to rerun the stats, after fixing the error, they can uncheck **Static** and **IVS** under the **Stats** tab in the daily GUI pop-up, then click **Clear Stats from database** before clicking **Run Daily Stats**. In terms of locating the errors, Windows PowerShell states on which line the error(s) occurred in the script. The script can then be opened in Notepad++ to observe what is causing the script to fail. From there, the error(s) can be fixed accordingly. A common error that occurs is picking/mistyping the wrong ISO in Geosoft. Therefore, when this error occurs, go into Geosoft to fix this mistake. Save and close. Then run the daily stats again.



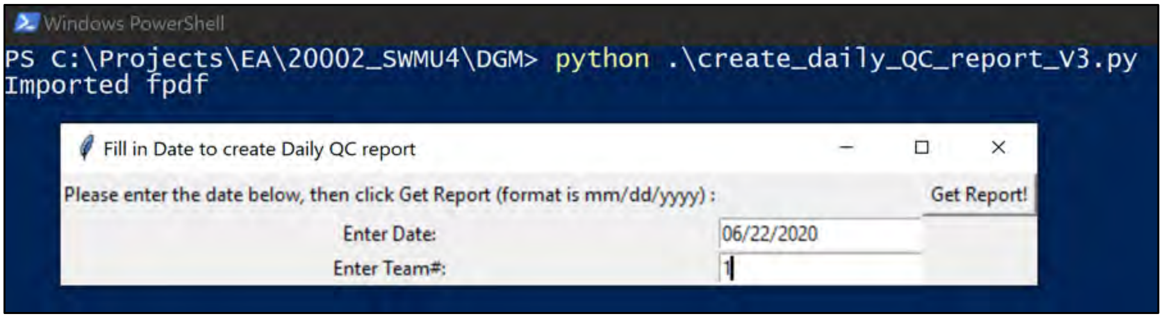
5.3.5 CREATE DAILY REPORT

a. Return to the same File Explorer as before that contains the python scripts. The script **create_daily_QC_report_V3** should be there. In the blank space below, press **shift + right click**. Select **Open PowerShell window here**.

b. Once open, ensure the proper directory is selected and type **python .\create_daily_QC_report_v3.py**, then press **Enter**. The Daily QC report GUI will open, as shown below.

c. Input the correct date and team number, then click **Get Report!**. The script will automatically create a daily QC report, which will appear in the **pdfs** folder in the same directory as the scripts. The Daily Report script is finished.

d. Double-check that all .jpg map files were properly exported to their respective folder.



5.3.6 QC

a. The next step is to QC the data to ensure that the parameters meet all project specific MQO's for the IVS data, and production data.

b. Check IVS data for proper **Speed**, **Positioning**, **Response**, and **Along-line Spacing**.

c. Check production data for proper **Coverage**, **Speed**, and **Along-line Spacing**.

d. Note, if the data do not pass the acceptance criteria, the non-conforming data must be evaluated. The non-conforming data will be addressed according to the required actions for each MQO.

e. Further note, before moving onto the last section for target picking, make sure all previous steps are repeated for each day of the project.

5.3.7 CREATE DELIVERABLES

a. The last step is to create deliverables by running the **daily_gui_1p0**, again. This time, make sure that the **Deliverables** tab is selected. Before clicking **Create Daily deliverables**, ensure that the data review and stats are completed and the Daily QC report is generated, otherwise this step will not work, and the initial processing and stats might have to be run again from the beginning. If all is okay, click **Create Daily deliverables**. This tool will append the daily survey data to the **master.gdb** and move the velocity, data separation, and footprint coverage maps to the Maps\QC folder. Additionally, everything is zipped and packaged nicely into files for delivery. These can be found in the **GDB** folder in the respective project folder in File Explore.

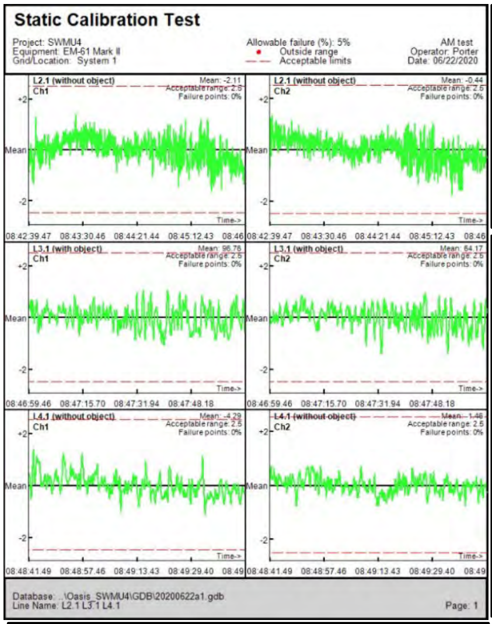
2 DELIVERABLES

For each IVS dataset, the following will be generated:

- 2.a Static Calibration Tests
- 2.b Response and Positioning Table
- 2.c ISO Response History

For each survey dataset, each of the following will be generated:

- 2.d Sample Separation Map
- 2.e Velocity Grid Map
- 2.f Footprint Coverage Map



a) Static Calibration Test

b) Response and Positioning Table

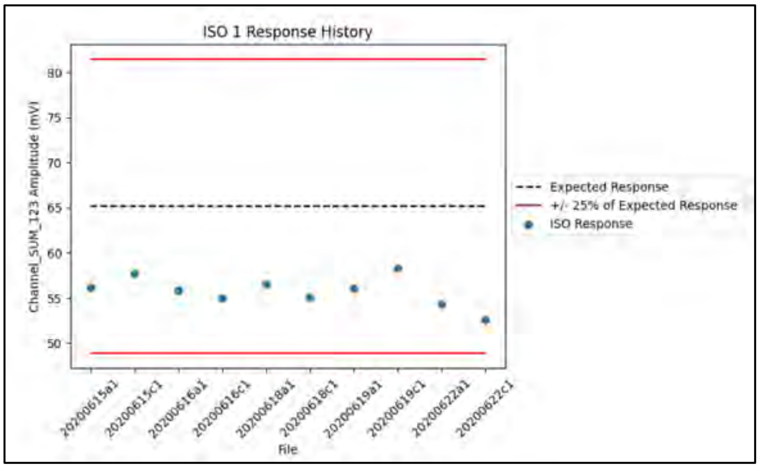
File Name	Date	ISO ID	Sensor ID	Response (mV)	X	Y	Offset	Expected Response (mV)	Response % Dif.
20210524a1	05/24/21	1	1	10.38	646553.33	4334504.36	0.03	10.46	-0.76
20210524a1	05/24/21	4	1	27.85	646544.24	4334504.43	0.09	31.11	-10.48
20210524a1	05/24/21	5	1	39.92	646540.27	4334504.45	0.06	41.78	-4.45
20210524a1	05/24/21	6	1	25.55	646536.15	4334504.47	0.16	26.5	-3.58
20210524c1	05/24/21	1	1	10.13	646553.24	4334504.36	0.11	10.46	-3.15
20210524c1	05/24/21	4	1	27.24	646544.22	4334504.44	0.11	31.11	-12.44
20210524c1	05/24/21	5	1	37.88	646540.31	4334504.41	0.04	41.78	-9.33
20210524c1	05/24/21	6	1	25.02	646536.23	4334504.45	0.08	26.5	-5.58

Project Coordinate System: UTM zone 10N

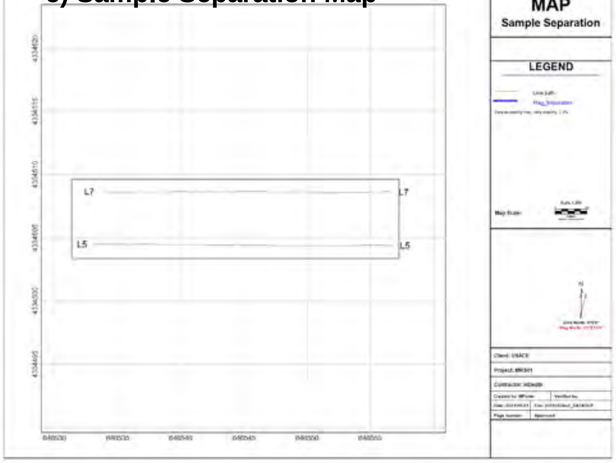
Project Datum: WGS84

Project Units: Metre

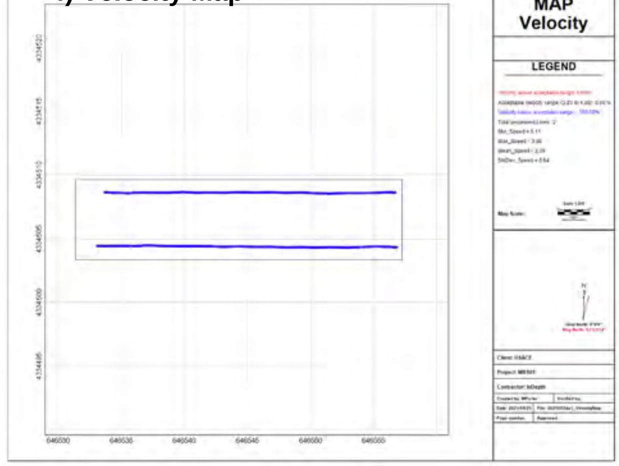
c) ISO Response History



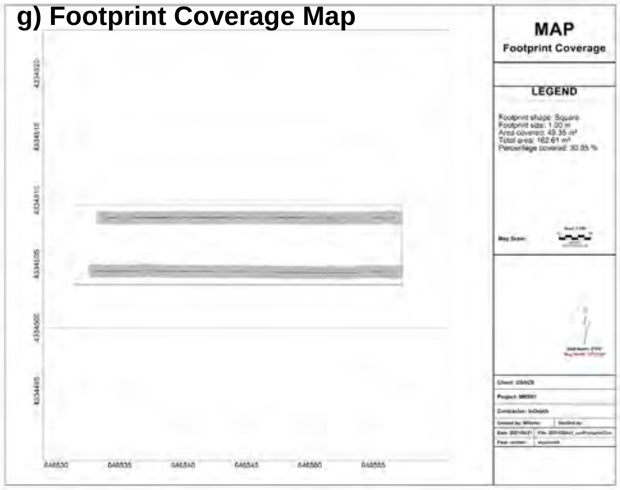
e) Sample Separation Map



f) Velocity Map



g) Footprint Coverage Map



5.4 DYNAMIC TARGET PICKING

Upon completion of the Dynamic Data Processing and review of the daily QC results target picking can be performed on completed grids within the survey area using the following procedures. These target picking scripts should automate the repetitive tasks, such as breaking the **master.gdb** into component grids, making gridded images, making the initial automated target selection, assigning target numbers, and exporting the files for delivery to the client. These scripts should be placed in the **.\Project\DGM folder**. These scripts expect certain files and folders to be in their respective places. If the files and folders are not properly developed system errors will be encountered. If errors occur, examine the error in the script to locate where the missing file/folder is and relocate the file/folder accordingly. Prior to running these scripts the following naming conventions should be verified:

Script Naming Nomenclature

- **3_FilestoGridpick.bat** - This file contains the list of grids to be worked on. Edit this first and then run **0_menu.bat**.
- **3a_FilestoTransectpick.bat** - This file contains the list of transects to be worked on. Edit this first and then run **0_menu.bat**.
- **0_menu.bat** - This is run in the command prompt. When running this script, it presents options on what process to run next.
- **GridPick_xx.gs** - These are several Geosoft scripts for picking, reviewing, and exporting targets from complete grids. They are split into multiple files, because they may have components that error out when rerun on a particular file. Errors will occur if you try to create a channel name that already exists in the database. If all of these were merged into a single .gs file and then were run, an acceptable error would occur and cause the entire process to stop. Because they are split up, when one errors out, the process will move on to the next file.
- **TransectPick_xx.gs -** These are scripts that do the same as **GridPick_xx.gs**, except these are for transect based data.
- **DailyProcess_xx.gs** - These are more scripts to process each team's daily raw EM61 data and to review that the data meet the quality standards.

5.4.1 FILL OUT 3_FILESTOGRIDPICK.BAT

a. Edit the file, **3_FilestoGridpick.bat**, in a text editor, such as Notepad or Notepad++. Note, the new update parameters script will also update this file. It will contain something like:

  - **rem call %STEPNAME%_SLAVE 'PROJECTID' 'GRID'**
  - **call %STEPNAME%_SLAVE 'PROJECTID' 'GRID'**

Note, REM is another way of saying this line is not meant to be run - the line is for comments to be read by humans. Another thing to note, all of the defined **PROJECTID** and **GRID** names being used below (e.g., SWMU4 and C44) are just examples being used in this SOP – the same goes for the math being used in **Channel Math** in Geosoft. Be careful to make sure that all of these values match those of the actual project being worked on, not the ones being shown here.

b. Where it says **PROJECTID**, change it to the name of the project (e.g., PROJECTID = SWMU4).

c. Where it says **GRID**, change it to the name of the grid where target picking will occur (e.g., GRID = C44) – these are the grid polygons. Note, multiple grids can be run at once; to do so, just remove **rem**. In the picture below, only grid C44 would be processed, not any of the other grids during this run for target picking.

```
rem call %STEPNAME%_SLAVE SWMU4 RR1
rem call %STEPNAME%_SLAVE SWMU4 RR2
rem call %STEPNAME%_SLAVE SWMU4 RR3
rem call %STEPNAME%_SLAVE SWMU4 RR4
rem call %STEPNAME%_SLAVE SWMU4 RR5
rem call %STEPNAME%_SLAVE SWMU4 RR6
rem call %STEPNAME%_SLAVE SWMU4 RR7
rem call %STEPNAME%_SLAVE SWMU4 RR8
rem call %STEPNAME%_SLAVE SWMU4 RR9
rem call %STEPNAME%_SLAVE SWMU4 RR10
rem call %STEPNAME%_SLAVE SWMU4 RR11
rem call %STEPNAME%_SLAVE SWMU4 RR12
rem call %STEPNAME%_SLAVE SWMU4 RR13
rem call %STEPNAME%_SLAVE SWMU4 RR14
rem call %STEPNAME%_SLAVE SWMU4 RR15
rem call %STEPNAME%_SLAVE SWMU4 RR16
rem call %STEPNAME%_SLAVE SWMU4 RR17
rem call %STEPNAME%_SLAVE SWMU4 RR18
rem call %STEPNAME%_SLAVE SWMU4 RR19
rem call %STEPNAME%_SLAVE SWMU4 RR20
rem call %STEPNAME%_SLAVE SWMU4 RR21
rem call %STEPNAME%_SLAVE SWMU4 RR22
rem call %STEPNAME%_SLAVE SWMU4 RR23
rem call %STEPNAME%_SLAVE SWMU4 RR24
rem call %STEPNAME%_SLAVE SWMU4 RR25
rem call %STEPNAME%_SLAVE SWMU4 C41
rem call %STEPNAME%_SLAVE SWMU4 C42
rem call %STEPNAME%_SLAVE SWMU4 C43
call %STEPNAME%_SLAVE SWMU4 C44
rem call %STEPNAME%_SLAVE SWMU4 C45
rem call %STEPNAME%_SLAVE SWMU4 C46
rem call %STEPNAME%_SLAVE SWMU4 C47
rem call %STEPNAME%_SLAVE SWMU4 B42
rem call %STEPNAME%_SLAVE SWMU4 B46
rem call %STEPNAME%_SLAVE SWMU4 B47
```

5.4.2 RUN 0_MENU.BAT

a. First, in Geosoft, make sure the **ProjectName_Master.gdb** has the channels **transect_mask** and/or **grid_mask** included and populated with the value **1**, using Channel Math. Save and close.

b. Next, open the scripts folder in File Explorer, right-click and pick **Windows PowerShell,** and then type in **./0_menu.bat** or **0_menu.bat** in the PowerShell window. A text menu will appear with a list of following inputs (also shown in the picture below):

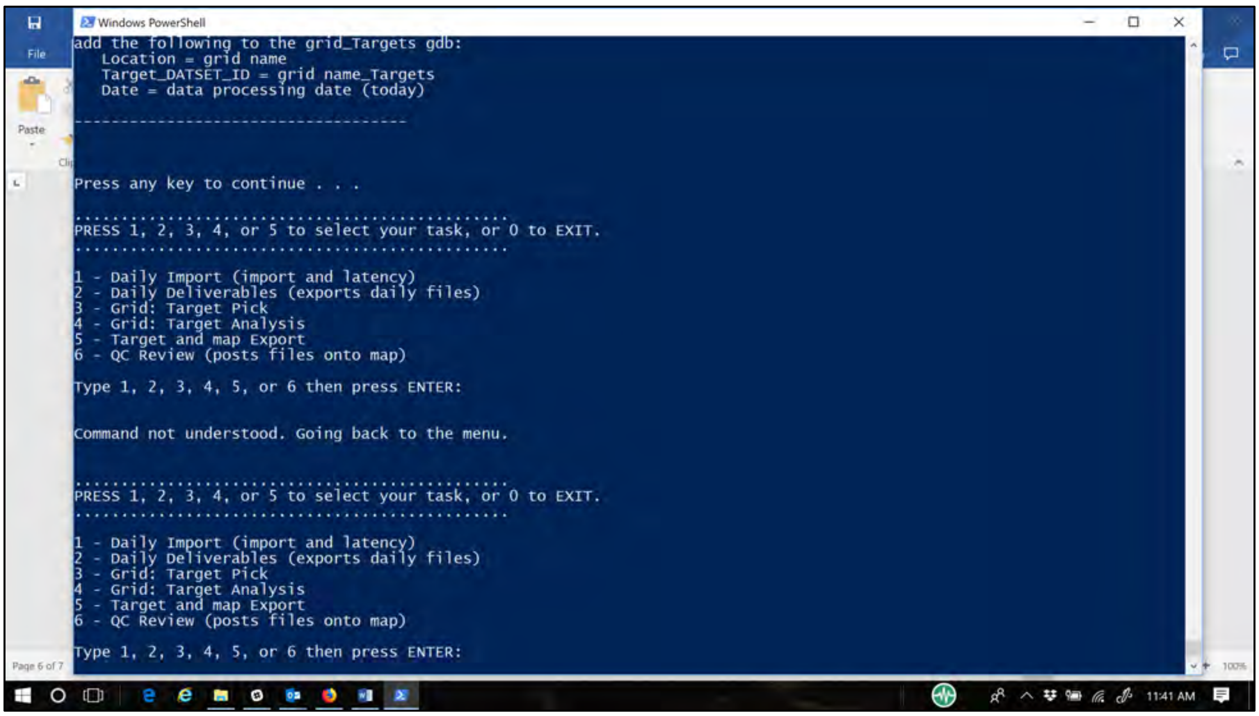
1. **Daily Import (imports XYZ files and applies latency)**
2. **Daily Deliverables (exports daily fiies)**
3. **Grid: Target Pick**

4. **Grid: Target Analysis**

5. **Target and Map Export**

6. **QC Review (posts files onto map)**

Note, inputs 1 and 2 should already have been completed using the **daily_gui_1p0.py**. Therefore, begin the next step with selecting input **3 (Grid: Target Pick)**.



5.4.3 RUN INPUT 3 (GRID: TARGET PICK) IN SCRIPT

a. In PowerShell, select input **3 (Grid: Target Pick)** by typing **3** and pressing **Enter**, as shown in the instructions in the PowerShell window. This step takes the **project_master.gdb** and makes another .gdb that contains solely the grid area (and on some occasions, a little outside of the grid area). Then it grids the data for **ch1**, **ch2**, **ch3**, **ch4**, **ch_sum**, and **ch_sum_123** using the strict grid boundaries and also using a slight buffer (determined by the **grid.ply** and **grid_buff.ply** files). It then picks anomalies based on a set threshold that can be found in the scripts folder. Then the anomalies are plotted on the **project_target.map**. Note, this step will run all the **GridPick_3xx.gs** scripts for a grid before repeating the process for the next grid listed in the **3_FilestoGridPick**.

b. Next, keep the PowerShell window open and open the respective Geosoft project. In the **project_target.map**, or more specifically, the **project_grid.map**, review the targets and add any targets that are missing. To add targets, use the tool in the menu bar **Parameters Determination > Target Selection > Digitize Targets from a Map** (e.g., Target database = grid#_targets.gdb, mask channel – mask, grid value ch = Grid#_buff_ch_sum_123, grid to sample = grid#_buff_ch_sum_123.grd, survey database- leave blank). It is helpful to also plot the Debris Zone (DZ), unsurveyable areas, site boundaries, and grid outlines on the map.

c. Note, target classes can be added during this time, or Step 4 has been run. The target class is an integer value and is put into a channel that is called **Manual_Target_Class**. A description of the target classes is in the **class_categories.xlsx** file in the scripts folder. Target classes, like 8-out of bounds, tells the script to add or not add the target to the dig list no matter what.

d. After any targets have been added, fill out the following Oasis GDB channels:

Date = today's date

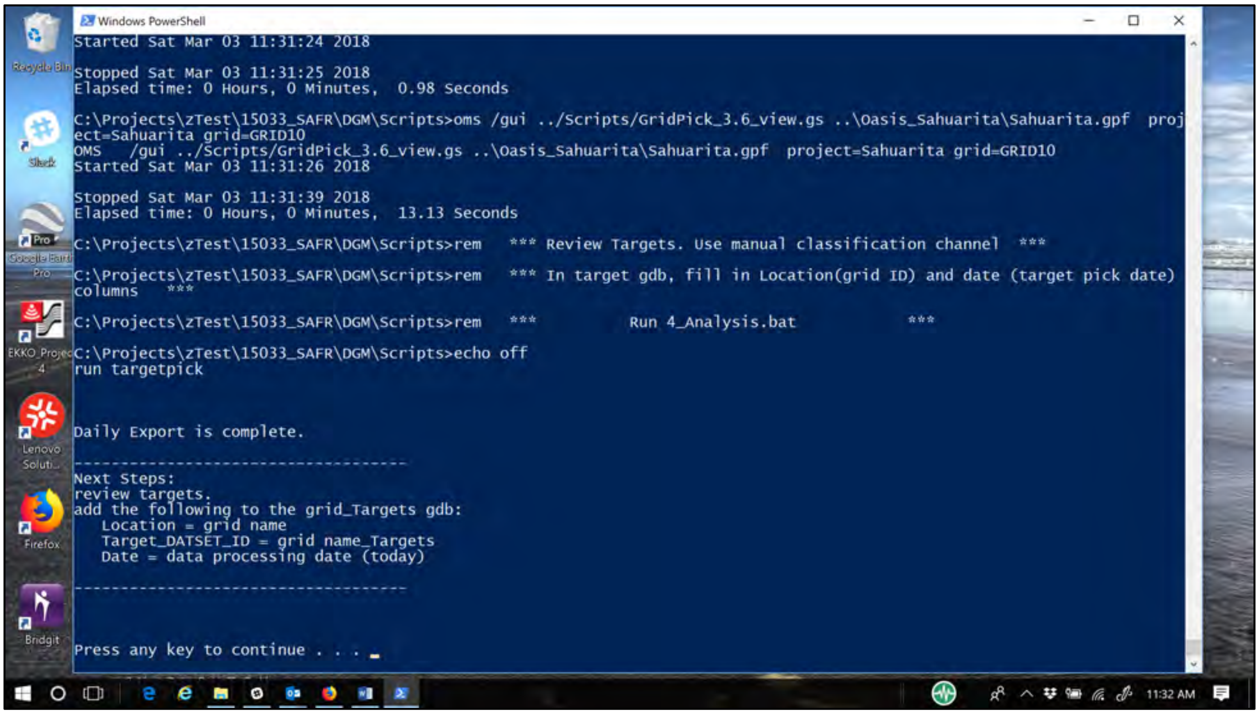
Target_Picker = First initial last name (e.g. BHecker)

Location = Grid / Transect number (must be the same format as used in the polygon file)

Target_Dataset_ID = Name of the current GDB containing the targets, (e.g., GRID1_Targets)

e. Prior to running input 4, you need to review your work one last time. Also, repeat the above process if necessary.

f. Save your work, close all the windows in Geosoft, close Geosoft, and backup DGM folder.



5.4.4 RUN INPUT 4 (GRID: TARGET ANALYSIS) IN SCRIPT

a. Before running the script for all grids, go into Geosoft and make sure that all of the **target.gdbs** are set to mask with a value of **1**. To do this, go into Channel Math and type **mask = 1** for all grids being processed. Save and close.

b. Then in PowerShell, select input **4** to run.

c. Once the script analyzes the targets, go back into Geosoft. Sort the data based on 2 channels (using **DIG** and target picking channel (e.g., **CH_SUM_123**) as the channels). Then reset target_id based on mask, and then repeat for composite target ID. Next unselect non-target lines – only have the targets selected.

d. Plot the targets on the map and make sure all the targets you want are selected.

e. Note, if new targets are needed, you can pick these by going to parameter determination, target selection, then digitize from map. Select target database (might be grid specific), **group = Targets**, **Append not overwrite**, **mask = Mask**, **grd val ch = ch** you are picking on (threshold specific).

f. Save your work, close your all the windows in geosoft, and close geosoft.

g. Note, rerun Step 4 if you added, removed, or reclassified anomalies.

h. Open Geosoft, then go to Channel Math to modify the following: **Dig = 1 if Ch2_Final > 60.9**, **class = 1**, **Tau = 1**, and **decay = 1**.

i. Also, add the following in Channel Math to create a list of targets to dig (edited per project based on anomaly/target thresholds:

- **Dig = ((Ch2_Final>4.9)&&(class==1)&&(Anom_Tau==1)&&(Anom_Decay==1))?(1):(DUMMY);**
- **Anom_Threshold = (Ch2_Final >4.9)?(1):(DUMMY);**
- **Class = (Anom_Threshold !=1)?(0):(Class);**
- **Mask= Dig.**

j. Close Channel Mask, and then sort by **one channel dig, descending**. Then **Reset_TargetIDs** in **target list management**, unselect **mask check box**, and unselect **premerge_line**.

k. Save and close your work in Geosoft.

5.4.5 Run Input 5 (Target and Map Export) in Script

a. Once this script is running, it exports various files into the **.\Oasis_project\Deliverables\Grids\ folder**. The list file types are: .jpg, .tiff, .gdb, .csv. Note, you can actively check the correct files are being exported in real time by viewing the Deliverables folder as Step 5 is being ran.

b. After the exports are complete, load the **grid_access_targets.csv** file into the project accdb using the **targets upload** function in the project database.

c. The exported files listed above are bundled up into a zip file, and can be delivered as appropriate.

6. DATA MANAGEMENT

6.1 Data Input

The data inputs required for performing DGM data processing and analysis are:

- A site boundary file
- A grid layout file

  - o If it becomes necessary to subset a grid, the subset grids will be identified with a new unique identifier and processed as a distinct production unit. The grids will be split in such a way as to maintain the original coverage with no gaps.
- A file containing the coordinates of the IVS endpoints and seed locations.
- Amplitude response minimum detection threshold (derived from the MEC QAPP Addendum)
- Raw dynamic data files for the opening IVS, field data, and the closing IVS
- Digital field notes for data acquisition activities.

6.2 DATA OUTPUT

The data outputs of the DGM data processing and analysis for each day of survey data collection are:

- Daily QC Report containing:
  - o Data Summary with QC statuses
  - o Static Function Tests for opening (AM) and closing (PM) IVS data.
  - o Table of Interpreted ISO locations and responses from AM/PM IVS data
  - o Profile views of the IVS data
  - o Graph of ISO response history throughout the project
  - o Figure plotting the GPS check-in accuracy for each day.
  - o Sample separation map for all data.
  - o Footprint coverage map for all data
  - o Velocity Map for all data
  - o A Completed Dynamic DGM Data Processing QC Checklist (Attachment 1).

The data outputs of the DGM data processing for each delivered production survey unit (contiguous subset of the survey site) are:

- Un-surveyable areas and/or areas of signal density saturation
- Daily QC Reports for all data in survey unit documenting the performance objectives relative the MQOs in the MEC QAPP Addendum Worksheet #22 and Site Specific Work Plan (SSWP).
- Dynamic Data Processing Results
  - o Target map on color shaded grid
  - o target anomaly list (target ID, x, y)

Upon completion of the daily processing and the associated, processed data and updated processing information will be distributed to the Site Specific Data Manager along with a notification email to the appropriate parties.

7. QUALITY CONTROL

The GEO SOP 5 – DGM Data Processing for Person-Portable Systems, Three Phase QC Checklist, is presented as Appendix B to this SOP, will be filled out and delivered as part of the reporting requirement for this SOP. The MQOs for dynamic data measurements and target selection are presented in Worksheet #22 of the MEC QAPP Addendum and the SSWP. Performance relative to the MQOs will be assessed during the processing of the dynamic data. Dynamic data will not be used to select targets until these MQOs are met, or if not met, until the suspect data are recollected, or the project team agrees on modifications to these MQOs.

Measurement Performance Criteria for DGM data acquisition using a person portable system can be found in Worksheet #12 of the MEC QAPP Addendum. See Worksheet #31, 32, 33 of the MEC QAPP Addendum for a description of who will conduct the QC inspection for this Definable Feature of Work and the frequency of the Follow-up Phase QC inspections.

8. REPORTING

Data processing and analysis consist of the daily distribution of the files and documents indicated in Section 6.2. Reporting activities associated with this SOP include a target selection memorandum as described below.

QC Report detailing the system performance against the MQOs identified on the MEC QAPP Addendum Worksheet #22 and SSWP (including MQOs for daily IVS, Function Test performance, and Field Data Quality).

Target Selection Memorandum detailing:

- Specific approach to the target selection process
- Target list - final list of identified anomalies within the area subset with verification of submittal to the target management system
- Cumulative final map presenting the individual target distribution across the project investigation footprint
- Cumulative final map presenting the target density analysis across the project investigation footprint
- Final grids of amplitude response within the area subset
- Final grids of any other detection metric used for analysis within the area subset.

- Final data archive .gdb or .xyz format for data within the area subset
- Inclusion of the QC Report as an appendix for data within the area subset

9. REFERENCES

- USACE, 2024, Environmental Quality – Technical Guidance Military Munitions Response Actions, EM 200-1-15, Washington, D.C.

10. REVISION HISTORY

Version	Change Summary	Change Reason	Prepared By	Approved By	Published
Rev-1.00	Initial Release	No Change	Hecker	Smith, Welk	20240819

Appendix A
SOP Signature Page

The following individuals have read and understand this SOP:

Signature:	Date:

Appendix B
QC Checklist

Three Phase Quality Control Checklist

GEO SOP 5 – DGM Data Processing for Person-Portable Systems

Team Information		
Data Processor:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	Reference	Inspection Point	Yes	No	NIA	Comments
1	Signature Page	Verify that all personnel have signed the SOP Signature Page				*(P)*
2	4.2	Verify Geosoft Oasis Montaj is being used for all final data processing				*(P)*
3	4.3	Field forms are complete and contain all of the specified information				*(I),(F)*
4	5.2	Separate folders and project files have been created for the day's function tests				*(I),(F)*
5	5.3	Function test xyz files have been imported into a Geosoft database using the appropriate template				*(I),(F)*
6	5.3	Preliminary auto leveling corrections to the function test data have been performed according to specifications				*(I),(F)*
7	5.3	Static background and static spike statistics have been calculated and exported				*(I),(F)*
8	5.3	Preliminary lag correction has been performed for IVS tests				*(I),(F)*
9	5.3	IVS data for targeting channel has been gridded and Geosoft maps have been created				*(I),(F)*
1O	5.3	IVS target locations and peak responses have been compared to the expected values				*(I),(F)*
11	5.3	IVS target lists and processed xyz data have been exported				*(I),(F)*
12	5.3	Separate folders and project files have been created for the day's field data				*(I),(F)*
13	5.3	Field data xyz files have been imported into a Geosoft database using the appropriate template				*(I),(F)*
14	5.3	Data density statistics have been calculated and displayed on a map				*(I),(F)*
15	5.3	GPS Quality map has been created				*(I),(F)*
16	5.3	Preliminary auto leveling corrections to the field data have been performed according to specifications				*(I),(F)*

Three Phase Quality Control Checklist

GEO SOP 5 – DGM Data Processing for Person-Portable Systems

17	5.3	Preliminary lag correction has been performed for IVS tests				*(I),(F)*
18	5.3	Field data for targeting channel has been gridded and Geosoft maps have been created				*(I),(F)*
19	5.4	Culture files have been plotted on the preliminary contour maps				*(I),(F)*
2O	5.4	Targets have been selected over all anomalous features meeting the targeting criteria (Category A or B)				*(I),(F)*
21	5.4	Targets have been sorted according to amplitude from highest to lowest and given unique target IDs				*(I),(F)*
22	5.4	Final contour maps have been created by grid in pdf and GeoTIFF formats				*(I),(F)*
23	5.4	Final processed data files and final target lists have been exported				*(I),(F)*
24	5.4	Deliverables package has been created including all specified files and has been transferred to project FTP site				*(I),(F)*
25	5.4	All processing information has been documented in the Ahtna Database				*(I),(F)*
26	6.2	Updated processing information has been sent to the Site Specific Data Manager				*(I),(F)*
27	6.2	Processed data email has been sent to the appropriate parties				*(I),(F)*

Punch list Items	
No.	

Conducted by: ______________________________ DATE: ____________________________

Approved by: ______________________________ DATE: ____________________________

GEO SOP 6
DGM DATA PROCESSING FOR A TOWED ARRAY SYSTEM

GEO SOP 6

Standard Operating Procedure
DGM Data Processing for
Towed-Array Systems

Original Issue Date: August 2024
Last Review/Implementation Date: August 2024

InDepth Corporation

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Table of Contents

Appendices

Acronyms

ADB	Access Database
cm	Centimeter(s)
DGM	Digital Geophysical Mapping
Ft	Feet
GDB	Geosoft Database
GIS	Geographic Information System
GPS	Global Positioning System
GUI	Graphical User Interface
in	Inches
ISO	Industry Standard Object
IVS	Instrument Verification Strip
m	Meter(s)
MQO	Measurement Quality Objective

MEC	Munitions and Explosives of Concern
MEC QAPP	Munitions and Explosives of Concern Quality Assurance Project Plan
QC	Quality Control
RTK	Real-Time Kinematic
SFT	Static Function Test or Sensor Function Test
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SSWP	Site Specific Work Plan
UXO	Unexploded Ordnance

1. POLICY

InDepth and project personnel will follow procedures established in this Standard Operating Procedure (SOP) for all data processing of Digital Geophysical Mapping (DGM) data collected using towed-array methods in support of Munitions and Explosives of Concern (MEC) remediation projects at the former Fort Ord. This SOP must be distributed to and signed by all personnel performing activities related to this SOP and must be adhered to as field activities are performed.

2. PURPOSE & SCOPE

2.1 PURPOSE

The purpose of this SOP is to detail the procedures and operational methodologies associated with the processing of DGM data collected using towed-array methods in areas that are potentially contaminated with MEC. All data processing will be performed using Geosoft's Oasis Montaj software package equipped with the "UXO-Land" module.

2.2 SCOPE

The scope of this SOP applies to all geophysical projects that require data processing of towed array DGM data.

3. MAINTENANCE

InDepth personnel are responsible for the maintenance of this SOP.

4. PERSONNEL, EQUIPMENT & MATERIALS

4.1 PERSONNEL

The following individuals will be involved in the processing of towed array system data for advanced analysis:

- Senior Geophysicist
- QC Geophysicist
- InDepth Data Processor

The key personnel implementing this SOP are documented in the MEC Quality Assurance Project Plan (MEC QAPP) Addendum Worksheets 4, 7 & 8.

4.2 EQUIPMENT

Hardware and software required for the processing and analysis of dynamic DGM data include the following:

- Processing software appropriate for specific DGM equipment
- Seequent Oasis Montaj, Standard Edition, with UXO Land and DoD UX-Analyze Custom Tools extensions, Versions 9.2. or later
- Geonics Multi61MK2 and ML61MK2 EM61 Data processing software.
- Data processing computer suitable for running processing software.

4.3 MATERIALS

Materials required for data processing include raw field data, computer capable of running Oasis Montaj, Geonics Multi61MK2 and ML61MK2, python, MS Access, Notepad++, and the following common data elements:

Minimum Data Requirements

- Project Name
- Client
- Project Personnel List
- Location (Lat/Long/Elevation)
- Survey Datum
- MEC QAPP Addendum

Folder Structure
Base Root: C:/Projects/Client_Name/Project#_Name/DGM/... (Note: all projects must have this same folder structure under the C drive to be able to use this data processing flow.)

STANDARD DIRECTORY STRUCTURE:
Folder structure (folder names in bold):

DGM/

- **/Oasis_ProjectX/**

  Note: Must contain Oasis project file, named ProjectX.gpf

  - **/Deliverables/**
  - **/Exports/**
  - **/GDB/ (max lines = 1000, channels = 100, must** contain these gdb's:)
    - ProjectX_IVSseeded_Master,
    - ProjectX_Master,
    - ProjectX_IVSnoise_Master,
    - ProjectX_spike_Master,
    - ProjectX_static_Master
    - ProjectX_noiseline_Master

- **/Grids/**
- **/Imports/**
- **/Maps/,** must contain these maps: (you need to create these after you have data in a gdb with the coordinate system setup)
  - o ProjectX_day.map,
  - o ProjectX_Grids.map
  - o ProjectX_Master.map
  - o ProjectX_tmp.map
  - o ProjectX_QC_day.map,
  - o ProjectX_targets.map
- **…**

- **/Polygons/,** must contain:
  - o ProjectX_boundary.ply,
  - o IVS_boundary.ply (must match name of the IVS used in access database)
  - o Grid_groups – which must contain grid.ply and grid_buff.ply (ex. A5.ply, A5_buff.ply
  - o Transect_groups- which must contain same as above but for transects
- **/RawData/**
  - o Raw data files are stored in folders using YYYYMMDD individual data files are stored in the format YYYYMMDDx# where x= alphabetical code for the current file e.g. a, b, c, d… and # is the number assigned to the geophysical team collecting data e.g. 1, 2, 3, ….to 0 representing the 10th data acquisition team. Team numbers can not go above single digits.
  - o /Shapes/
- **/Templates/**
- **/Scripts/**
  - **Scripts to edit:**

   - ProjectX_1.1_1Coil_Import_Combined_cl.gs – for projects with single coil data, make sure import template matches the xyz file – trackmaker and dat61 have different output channels.
   - ProjectX_1.2_MultiCoil_CoordinateProjection_cl.gs – adjust to project coordinate system.

- **/Templates/**
- **/pdfs/**
  - This is where daily QC reports are written to.
- **/plots/**
  - This is where temporary figures for the daily QC reports get stored.

5. PROCEDURES

Once the initial editing steps have been performed, as described in the MEC QAPP Addendum Attachment B, GEO SOP 4 (DGM Using a Towed Array System), the data are turned over to InDepth's processors for analysis, target selection, and preparation of deliverables. The processor will go through three primary steps before the final data packages are delivered.

5.1 DYNAMIC DATA PROCESSING OUTLINE

Using instrument specific exporting, conversion, and processing software, dynamic data are processed using these steps in the following order:

5.1.1 1 PROJECT SETUP

1.1 Download Templates to Create New Project

1.2 Initial Setup

1.3 Default Parameter Setup

1.4 Geosoft Setup

1.5 Project and Parameter Setup

1.6 Site Specific Setup

1.7 Database Maintenance

5.1.2 2 DYNAMIC DATA PROCESSING

2.1 Convert Dynamic Sensor Data (R61 to XYZ)

2.2 Renumber Lines in XYZ files.

2.3 Input GPS check-in points and Daily DGM entry to Access Database

2.4 Run Daily Process

2.5 Pick Instrument Standard Objects (ISOs)

2.6 Run Stats

2.7 Create Daily Report

2.8 QC

2 DELIVERABLES

2.a Static Calibration Tests

2.b Response and Positioning Table

2.c ISO Response History

2.d Sample Separation Map

2.e Velocity Grid Map

2.f Footprint Coverage Map

5.1.3 3 DYNAMIC TARGET PICKING

3.1 Fill Out 3_FilestoGridpick.bat

3.2 Run 0_Menu.bat

3.3 Run Input 3 (Grid: Target Picking) in Script

3.4 Run Input 4 (Grid: Target Analysis) in Script

3.5 Run Input 5 (Target and Map Export) in Script

5.2 PROJECT SETUP

Project setup must be performed once at the beginning of each project in order to create the required directory structure, processing scripts, batch processing files, data formats, project specific measurement quality objectives (MQOs), and all project specific variables.

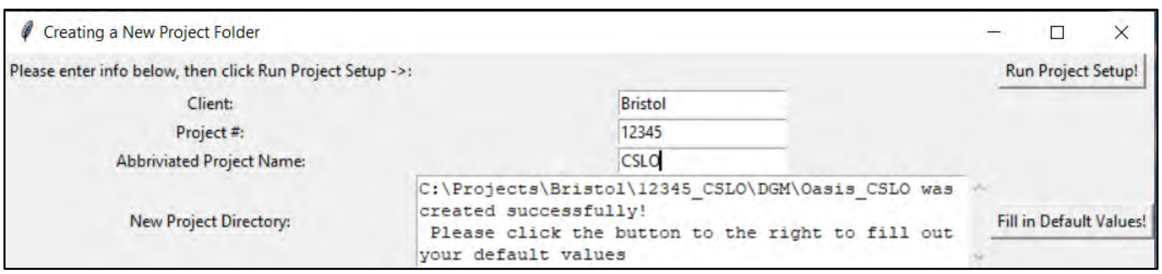
5.2.1 Download Templates to Create New Project

a. Download the most current version of **DGM_template.zip** and **create_new_project.exe** files from the **company drive (S:)**. Do not unzip the **DGM_template.zip**, the program will do automatically.

b. To create a new project, copy both files into the **C:\Projects** folder and double-click **create_new_project.exe** to run it.

5.2.2 Initial Setup

a. Fill out the GUI with **Client Name**, **Project #**, and **Abbreviated Project Name**. For example, a job where the client is Bristol, the site is at Camp San Luis Obispo, and the project number is 12345 would look like this below:

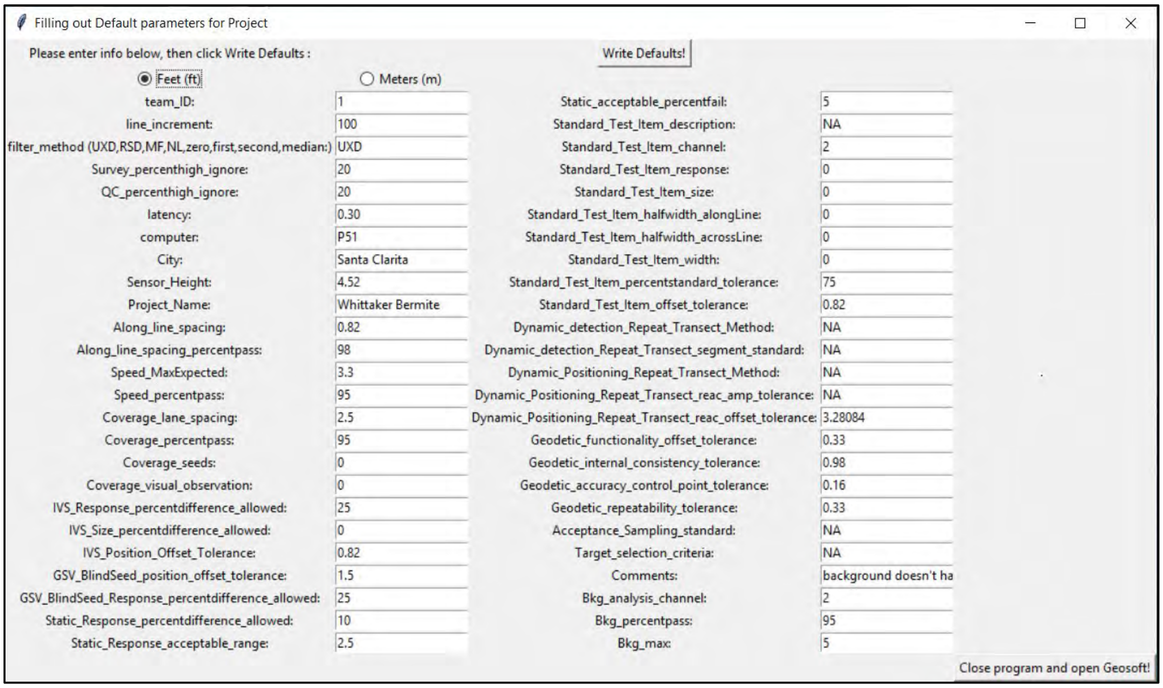


b. Click Run Project Setup. This creates the final folder structure and renames files accordingly.

c. Click Fill in Default Values to continue to the next GUI to fill out.

5.2.3 Default Parameter Setup

a. Click **Feet (ft)** or **Meters (m)** option to autofill in the standard parameters for most projects. Change other parameters to match the project requirements listed in the MEC QAPP Addendum. Click **Write Defaults**, to write out these parameters to the **defaults.txt** file.



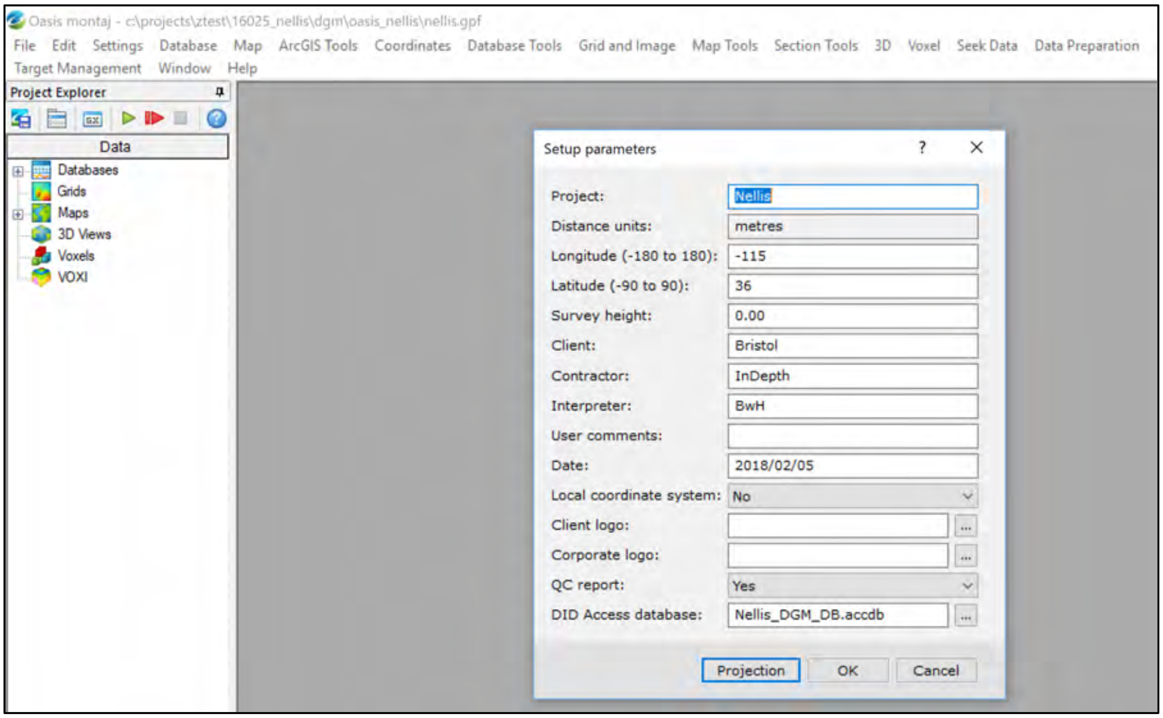
b. Once complete, click Close program and open Geosoft! to open the new Geosoft project file.

5.2.4 GEOSOFT SETUP

a. Fill in **Setup Parameters** under **Data Preparation**. Name the project and the ADB to be project specific (projectname_DGM_DB). This project name must match the Geosoft project filename (e.g., ADB = CSLO_DGM_DB, GPF = CSLO).

b. Check the project’s MQOs and confirm that the correct parameters are entered.

c. Save Geosoft and exit.



5.2.5 Project and Parameter Setup

a. Run **project_setup.py** using Python in DGM folder. This copies over template project processing scripts and GDBs to the correct locations and renames them. It also merges/copies/renames the ADB from a template. Answer **Yes** to update the computer-based scripts and to update the ADB.

b. Run **parameters_gui.py** to fill out **parameters.txt** file, which contains filter options, thresholds, main channel, and the like. Then run **update_parameters.py**.

c. If a mistake is made or an update to the parameters is wanted at any time, fill in the new parameters in the **parameters.txt** file and then run **update_parameters.py**.

5.2.6 Site Specific Setup

a. Import GPS control points into ADB.

b. Record the Oasis script when setting the correct coordinate system projection which will be used for the project. This must be performed after having initial data, ideally it would be in the field, where the installation of the IVS will be, after the first background is collected.

c. After recording the Oasis script, it will need to be edited. Specifically, lines 39-43 in **projectname_1.2.MultiCoil_CoordinateProjection_cl.gs** will be edited to ensure the correct coordinate projection system is implemented during the automated data processing.

d. Create a map from a shape file (.shp), obtained from ArcGIS, that encompasses the entire project area. This .shp will be duplicated and renamed. However, before duplicating it, save the .shp as a polygon and save it to the **Polygons** folder. Create the six standard maps, which can be seen in the folder structure below.

e. Create sites in the ADB for the IVS and any other project boundary of interest. Typically, the IVS is named **IVS1** which needs to have a polygon file (.ply) with the same name prefix in the polygon folder (e.g., IVS1_boundary) Note, **boundary** must be appended to the end of the site name with an underscore. The same applies for the project sites (e.g., MRS 03 needs to have a correlating .ply in the polygon folder, like **MRS03_boundary.ply**)

5.2.7 DATABASE MAINTENANCE

a. It is best practice to compact and repair the new database at the beginning of the project, but it is not necessary. To do so, open Geosoft and go to **Database Tools > Compact and Repair Database**.

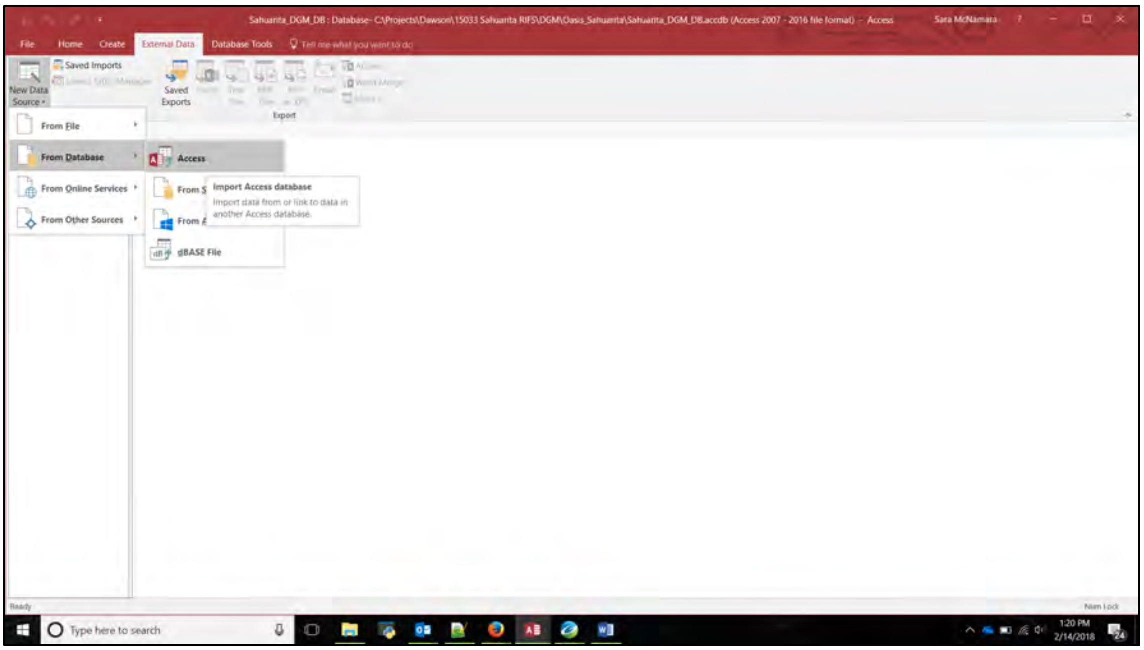
b. Sometimes the database grows unacceptably large, especially if there have been changes to queries, forms, or reports. There is also a known memory leak in Microsoft Access. Thus, periodically, a fresh new database should be created and all the data from the original database should be imported. Note, this is similar to creating an empty database as described above, but in this case, all data is being kept.

c. Example steps to maintain database:

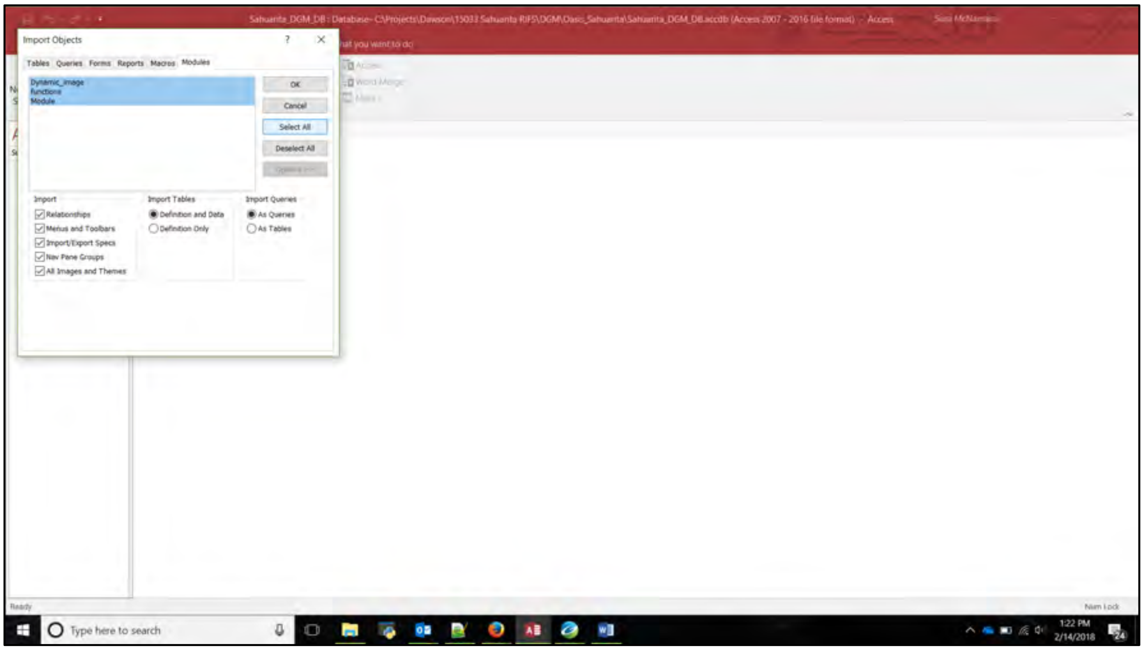
   - Save the previous database with the date (e.g., Nellis_DGM_DB.accdb becomes Nellis_DGM_DB_20180213.accdb)

- Create a new blank database and name it for the project (e.g., if Nellis_DGM_DB.accdb is created, it will open with a blank table. This can be closed.)

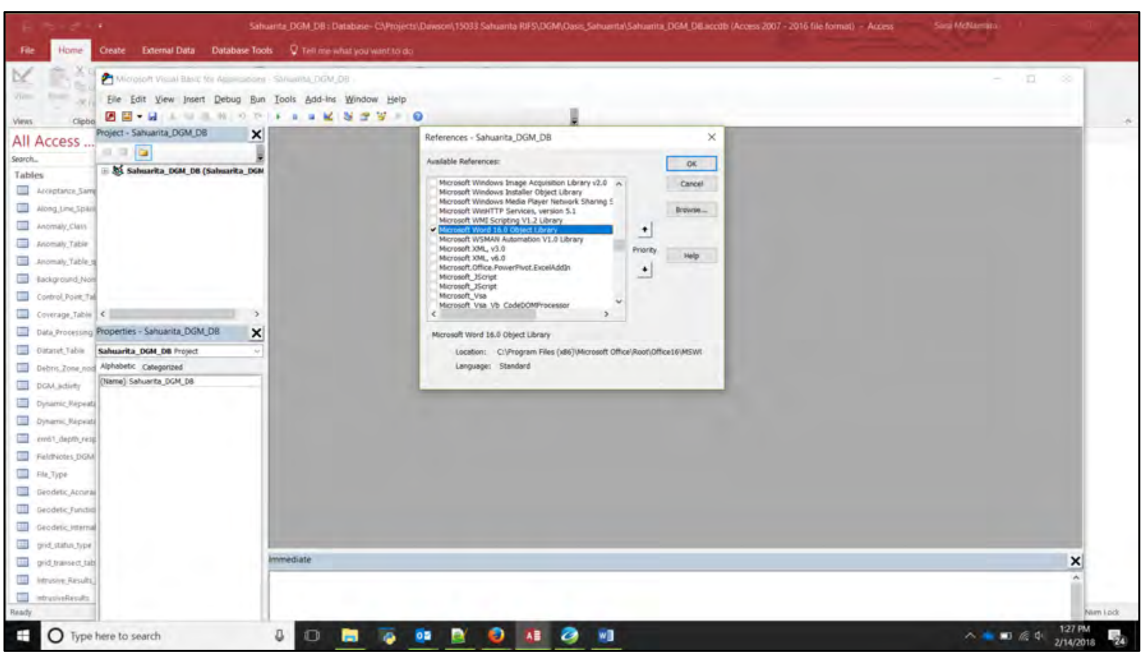
- Click on **External Data** and choose **New Data Source > From database > access**.



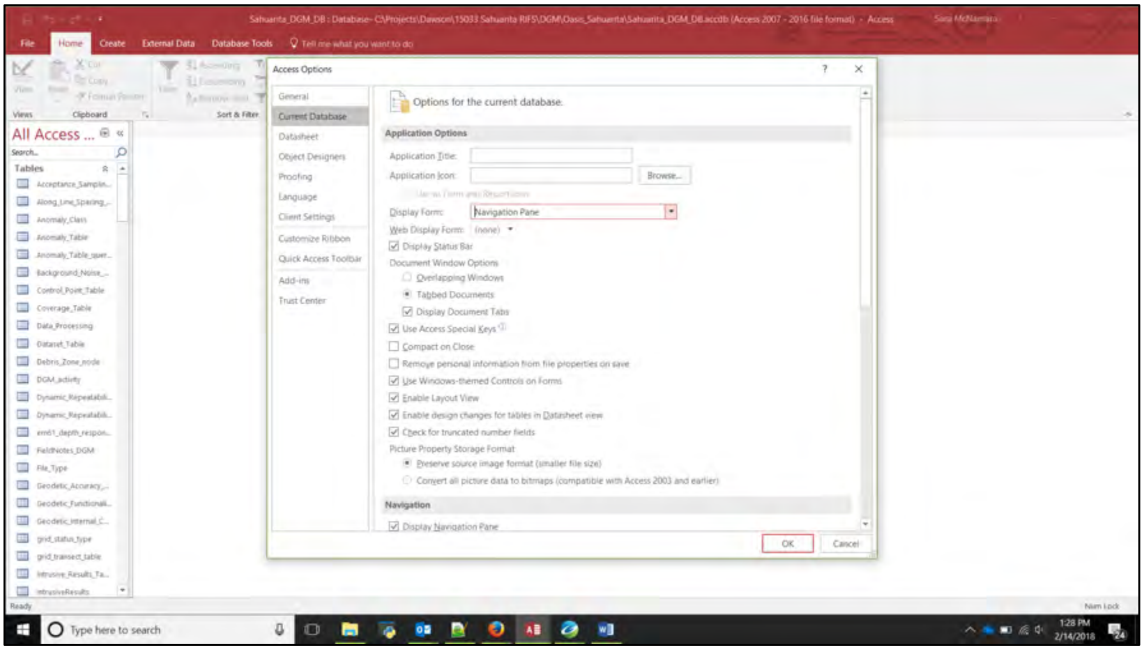
- Browse to the previous database (e.g., Nellis_DGM_DB_20180213. Keep default – import tables, queries… etc. In the **Import Objects** dialog, **click options**. Choose everything under **Import**. Then click on each tab – Tables, Queries, Forms, etc. and **Select All**.



- Then click OK. This can sometimes be a slow process.
- Press Alt + F11 (alternatively, click Database Tools > Visual Basic). Choose Tools > References. Select Microsoft Excel 16.0 Object Library and Microsoft Word 16.0 Object Library and click OK. Close the VB window.



- File > Options > Current Database > Display Form: choose Navigation Pane.



- Then Database Tools > Compact and Repair Database.

5.3 Dynamic Data Processing

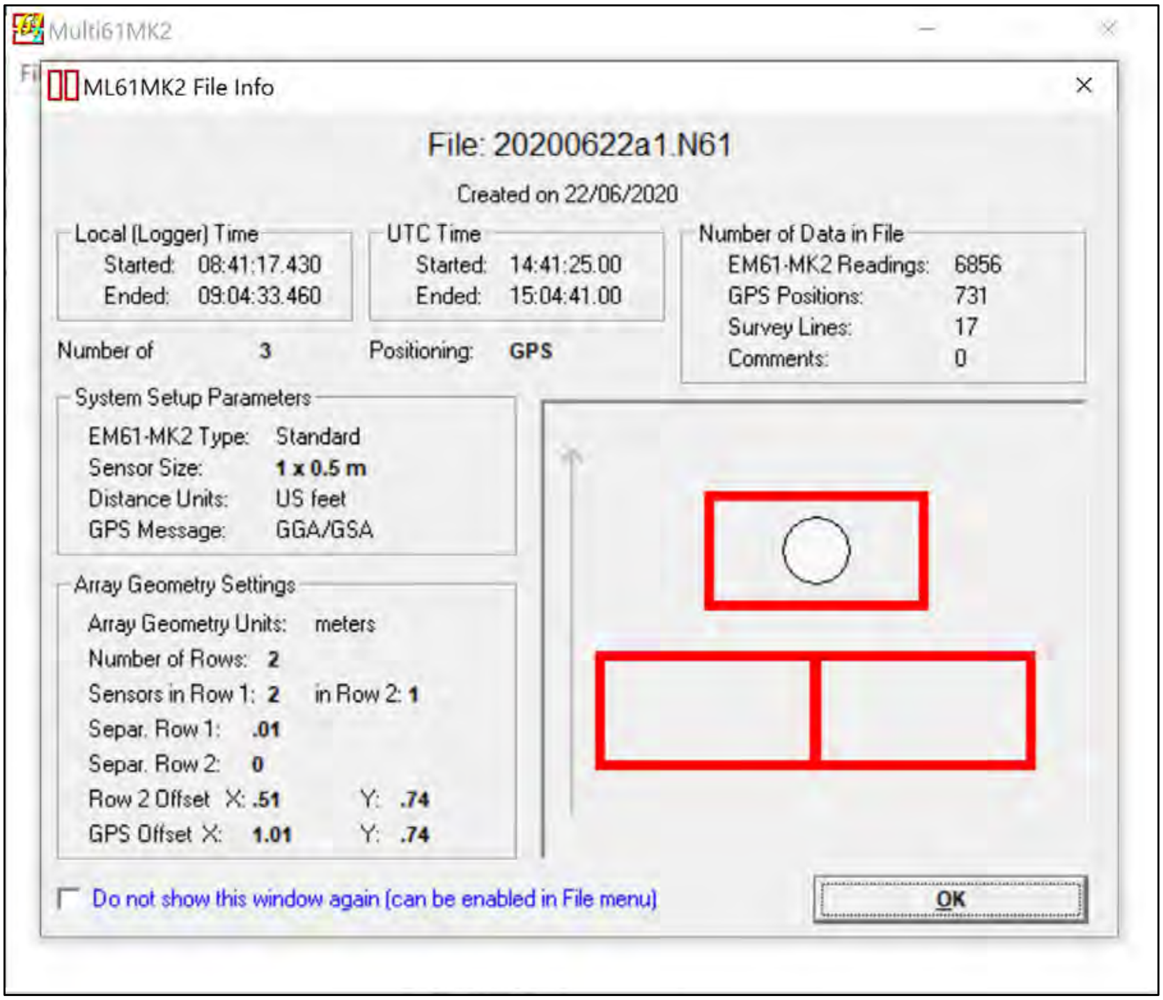
After completing the project setup daily QC and production data may be processed using the following procedures.

5.3.1 Convert Dynamic Sensor Data (N61 to XYZ) in Multi61MK2

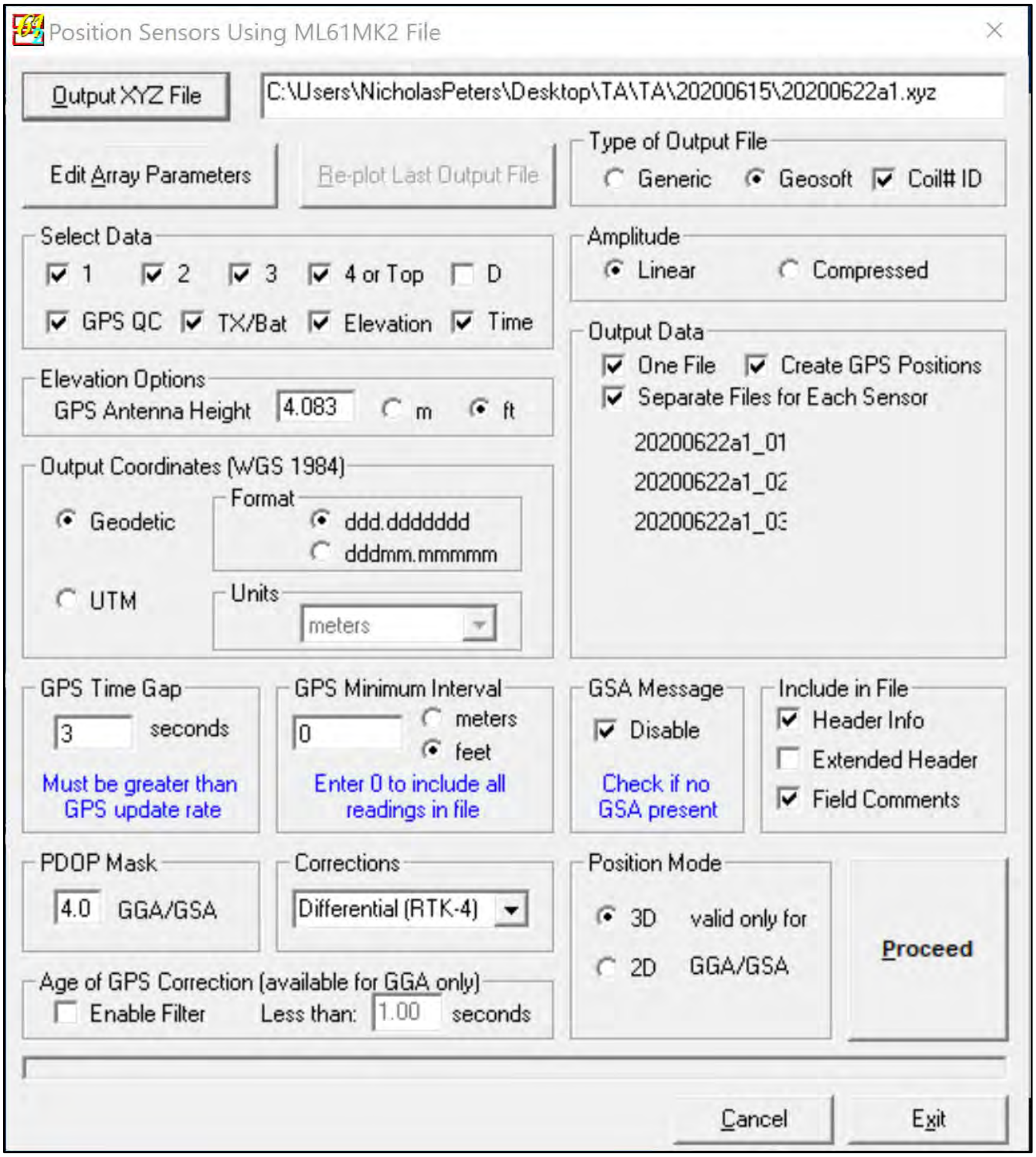
a. Open Multi61MK2, then click **File > Open File > Click N61 file > Open**. After opening the file, a window containing the coil geometry and standard parameters will pop up, as seen in the first picture below. Click **OK**.

b. Click **Position Sensors > Position Sensors Using ML61MK2 Data**. Click **Output XYZ File** and name the file the same as the N61 file. The XYZ extension will automatically be added. The other parameters in the window should be the same as below. Once done, click **Proceed**. The N61 file is now converted to XYZ. Click **Exit**.

c. Click **File > Close**. Repeat steps until all N61 files are converted to XYZ.



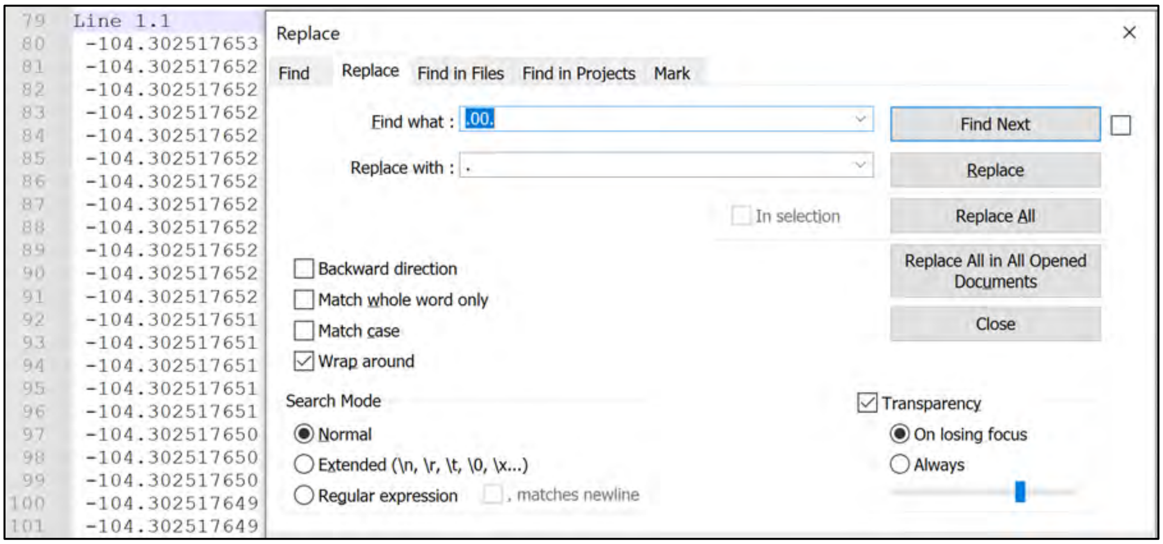
Multi61MK2
ML61MK2 File Info
File: 20200622a1.N61
Created on 22/06/2020
Local (Logger) Time
Started: 08:41:17.430
Ended: 09:04:33.460
UTC Time
Started: 14:41:25.00
Ended: 15:04:41.00
Number of Data in File
EM61-MK2 Readings: 6856
GPS Positions: 731
Survey Lines: 17
Comments: 0
Number of 3
Positioning: GPS
System Setup Parameters
EM61-MK2 Type: Standard
Sensor Size: 1 x 0.5 m
Distance Units: US feet
GPS Message: GGA/GSA
Array Geometry Settings
Array Geometry Units: meters
Number of Rows: 2
Sensors in Row 1: 2 in Row 2: 1
Separ. Row 1: .01
Separ. Row 2: 0
Row 2 Offset X: .51 Y: .74
GPS Offset X: 1.01 Y: .74
Do not show this window again (can be enabled in File menu)
OK



5.3.2 Renumber Lines in XYZ files

a. Open the newly converted XYZ files in Notepad ++ to renumber lines by right-clicking the files and click **Open with Notepad ++**.

b. Once in Notepad ++, press **ctrl + h**, and input **.00.** in the **Find what** bar and **.** in the **Replace with** bar. Next, click **Replace All**. All lines should be renumbered correctly, as shown below.



c. Note, if this step is not done properly, the automated script will not run correctly, so double-check that the lines are renumbered.

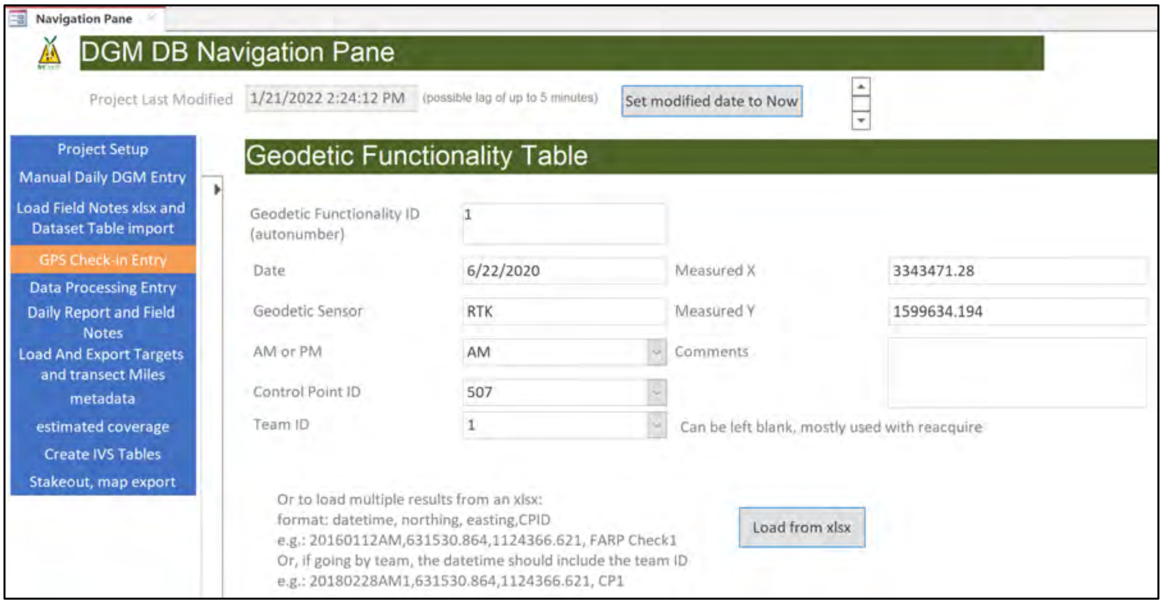
d. Also, make sure to double-check that all of the column headers are present and listed correctly. From left to right they should read: **Longitude, Latitude, Ch1[mV], Ch2[mV], Ch3[mV], Ch4[mV], Quality, Sat., HDOP, Avg.TX[A], TX[A], Bat[V], Elev[ft], Time**, as shown below.

```
/ML61MK2xpn  V2.03  Array of 3 Sensors, Geodetic [DDD.DDDDDD], Datum: WGS1984
/Longitude, Latitude, Ch1[mV], Ch2[mV], Ch3[mV], Ch4[mV],    Quality, Sat., HDOP, Avg.TX[A], TX[A], Bat[V], Elev[ft], Time
Line 0.1
 -104.302493837   38.307809572   -0.73   -0.66   -0.48   -0.24   4  16   0.70   5.68   5.95  11.70   437.404   08:41:17.508
 -104.302493840   38.307809574   -0.83   -0.37   -0.39   -0.34   4  16   0.70   5.68   5.95  11.70   437.404   08:41:17.617
 -104.302493842   38.307809575   -0.73   -0.46   -0.39   -0.34   4  16   0.70   5.68   5.95  11.70   437.404   08:41:17.711
 -104.302493845   38.307809577   -0.92   -0.75   -0.29   -0.24   4  16   0.70   5.68   5.95  11.70   437.404   08:41:17.819
 -104.302493848   38.307809579   -1.21   -0.66   -0.20   -0.34   4  16   0.70   5.68   5.95  11.70   437.404   08:41:17.929
 -104.302493850   38.307809581   -1.02   -0.56   -0.20   -0.34   4  16   0.70   5.68   5.95  11.70   437.404   08:41:18.038
 -104.302493853   38.307809582   -0.83   -0.18   -0.20   -0.24   4  16   0.70   5.68   5.95  11.70   437.404   08:41:18.147
 -104.302493856   38.307809584   -0.64    0.11   -0.39   -0.24   4  16   0.70   5.68   5.95  11.70   437.404   08:41:18.257
 -104.302493859   38.307809586   -0.83    0.02   -0.39   -0.15   4  16   0.70   5.68   5.95  11.70   437.404   08:41:18.366
 -104.302493861   38.307809587   -1.11   -0.18   -0.48   -0.24   4  16   0.70   5.68   5.95  11.70   437.404   08:41:18.459
 -104.302493862   38.307809588   -1.11   -0.37   -0.39   -0.24   4  16   0.70   5.68   5.95  11.70   437.404   08:41:18.568
 -104.302493863   38.307809589   -0.92   -0.66   -0.10   -0.24   4  16   0.70   5.68   5.95  11.70   437.405   08:41:18.677
 -104.302493864   38.307809590   -0.73   -0.56   -0.10   -0.24   4  16   0.70   5.68   5.95  11.70   437.405   08:41:18.787
 -104.302493866   38.307809591   -1.02   -0.37   -0.29   -0.34   4  16   0.70   5.68   5.95  11.70   437.405   08:41:18.896
 -104.302493867   38.307809591   -1.12   -0.27   -0.29   -0.34   4  16   0.70   5.68   5.95  11.70   437.405   08:41:19.005
 -104.302493868   38.307809592   -1.12   -0.27   -0.29   -0.24   4  16   0.70   5.68   5.95  11.70   437.405   08:41:19.099
 -104.302493870   38.307809593   -1.02   -0.56   -0.20   -0.15   4  16   0.70   5.68   5.95  11.70   437.405   08:41:19.208
 -104.302493871   38.307809594   -1.21   -0.56   -0.29   -0.24   4  16   0.70   5.68   5.95  11.70   437.406   08:41:19.318
 -104.302493872   38.307809595   -1.31   -0.46   -0.29   -0.34   4  16   0.70   5.68   5.95  11.70   437.406   08:41:19.426
 -104.302493875   38.307809596   -1.31   -0.46   -0.29   -0.24   4  16   0.70   5.68   5.95  11.70   437.406   08:41:19.536
 -104.302493877   38.307809598   -1.21   -0.46   -0.29   -0.15   4  16   0.70   5.68   5.95  11.70   437.406   08:41:19.645
 -104.302493879   38.307809599   -1.21   -0.66   -0.10   -0.24   4  16   0.70   5.68   5.95  11.70   437.406   08:41:19.739
 -104.302493881   38.307809600   -1.31   -0.66   -0.20   -0.34   4  16   0.70   5.68   5.95  11.70   437.405   08:41:19.848
 -104.302493884   38.307809602   -1.40   -0.46   -0.29   -0.34   4  16   0.70   5.68   5.95  11.70   437.405   08:41:19.957
 -104.302493886   38.307809604   -1.31   -0.37   -0.20   -0.24   4  16   0.70   5.68   5.95  11.70   437.405   08:41:20.066
 -104.302493888   38.307809605   -1.02   -0.37   -0.20   -0.24   4  16   0.70   5.68   5.95  11.70   437.405   08:41:20.175
 -104.302493891   38.307809607   -1.12   -0.46   -0.29   -0.24   4  16   0.70   5.68   5.95  11.70   437.405   08:41:20.284
 -104.302493893   38.307809608   -1.12   -0.66   -0.29   -0.24   4  16   0.70   5.68   5.95  11.70   437.405   08:41:20.378
 -104.302493895   38.307809609   -1.12   -0.46   -0.48   -0.24   4  16   0.70   5.68   5.95  11.70   437.405   08:41:20.488
 -104.302493897   38.307809611   -1.12   -0.18   -0.48   -0.15   4  16   0.70   5.68   5.95  11.70   437.405   08:41:20.597
 -104.302493900   38.307809612   -1.21   -0.18   -0.48   -0.24   4  16   0.70   5.68   5.95  11.70   437.404   08:41:20.706
 -104.302493902   38.307809614   -1.31   -0.18   -0.29   -0.24   4  16   0.70   5.68   5.95  11.70   437.404   08:41:20.815
 -104.302493904   38.307809615   -1.21   -0.37   -0.39   -0.15   4  16   0.70   5.68   5.95  11.70   437.404   08:41:20.924
 -104.302493906   38.307809616   -1.40   -0.46   -0.10   -0.24   4  16   0.70   5.68   5.95  11.70   437.404   08:41:21.018
 -104.302493908   38.307809618   -1.50   -0.46   -0.10   -0.24   4  16   0.70   5.68   5.95  11.70   437.404   08:41:21.127
 -104.302493910   38.307809619   -1.40   -0.18   -0.10   -0.34   4  16   0.70   5.68   5.95  11.70   437.404   08:41:21.236
 -104.302493913   38.307809621   -1.69   -0.27   -0.10   -0.34   4  16   0.70   5.68   5.95  11.70   437.404   08:41:21.346
 -104.302493915   38.307809622   -1.59   -0.18   -0.20   -0.24   4  16   0.70   5.68   5.95  11.70   437.403   08:41:21.455
 -104.302493919   38.307809624   -1.59   -0.27   -0.20   -0.24   4  16   0.70   5.68   5.95  11.70   437.404   08:41:21.564
 -104.302493921   38.307809626   -1.40   -0.37   -0.39   -0.34   4  16   0.70   5.68   5.95  11.70   437.404   08:41:21.657
 -104.302493925   38.307809628   -1.21   -0.37   -0.39   -0.34   4  16   0.70   5.68   5.95  11.70   437.404   08:41:21.766
 -104.302493928   38.307809630   -1.21   -0.37   -0.29   -0.34   4  16   0.70   5.68   5.95  11.70   437.404   08:41:21.876
 -104.302493932   38.307809633   -1.02   -0.46   -0.10   -0.24   4  16   0.70   5.68   5.95  11.70   437.404   08:41:21.985
```

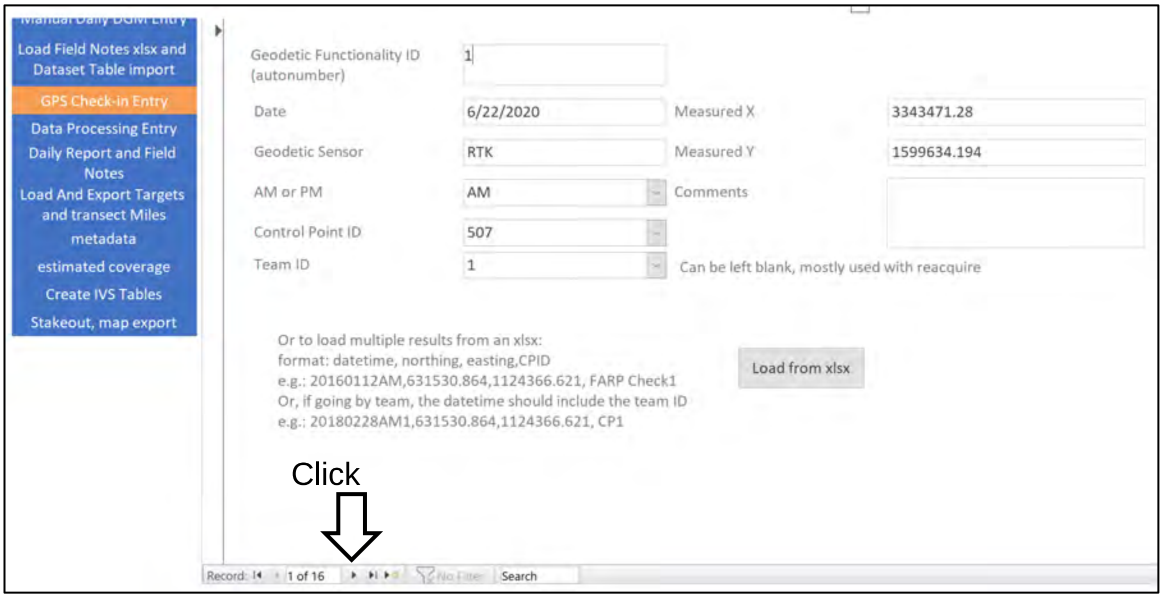
e. Save the file and repeat for all XYZ files.

5.3.3 Input GPS Check-in Points and Daily DGM Entry to Access Database

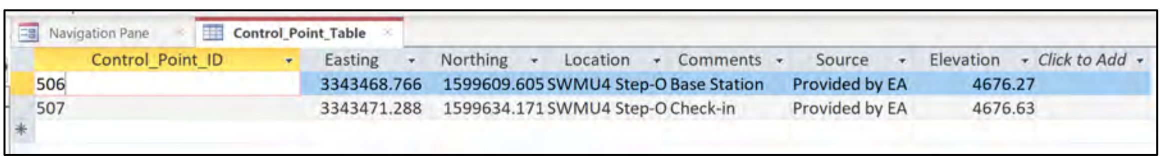
a. Open the specific project's Microsoft Access database. A tab labeled **Navigation Plane** should automatically be open. In the blue column to the left, click on **GPS Check-in Entry**.



b. With respect to the specific project’s information (different projects will have different values for the following), fill out the **Date, Geodetic Sensor, AM or PM, Control Point ID, Team ID, Measured X, and Measured Y** boxes, similar to the picture above. To fill out the rest of the information, scroll down and at the bottom there should be arrows next to a box that shows the number of records, as shown in the photo below. Click on the right arrow to go to the next record to fill out until done.

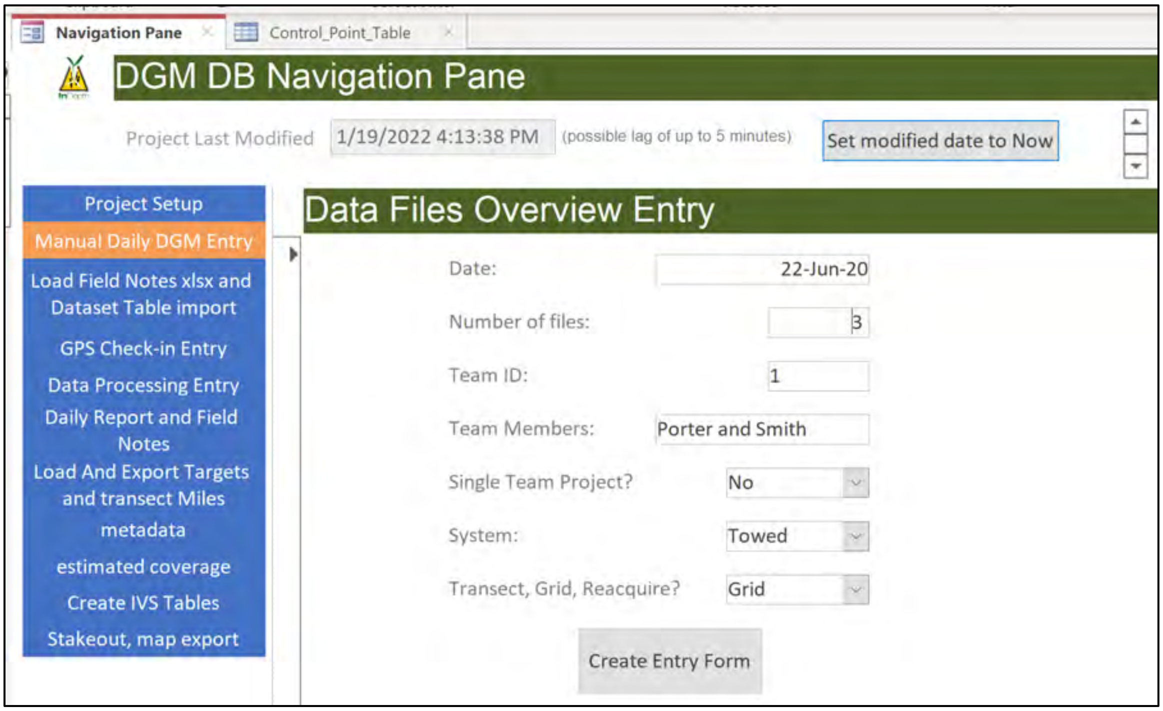


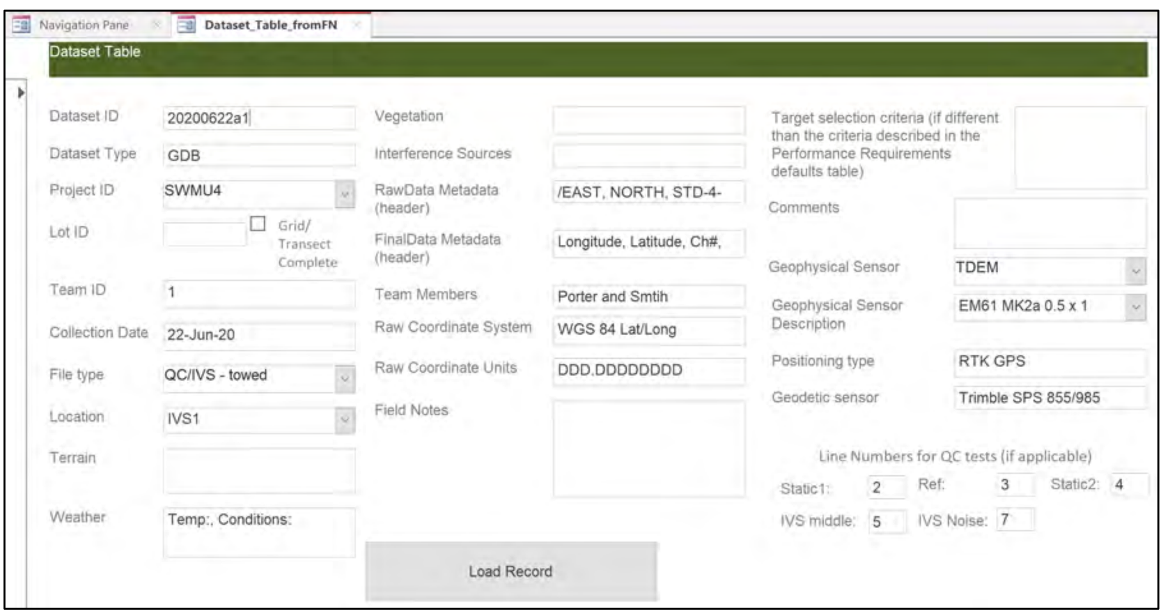
c. Once successfully loaded, double-check that the GPS check-in points are correct. To do this, look in the list of objects on the far left and open **Control_Point_Table**. Refer to the picture below as an example.



Control_Point_ID	Easting	Northing	Location	Comments	Source	Elevation	Click to Add
506	3343468.766	1599609.605	SWMU4 Step-O Base Station		Provided by EA	4676.27	
507	3343471.288	1599634.171	SWMU4 Step-O Check-in		Provided by EA	4676.63	

d. Next, click on the **Navigation Pane** tab, and click **Manual Daily DGM Entry** to the left in the blue column. Before inputting any values, make sure to check the field report first, which notes the specific lines and data file types (i.e., production or IVS). Now, input the proper **Date, Number of Files, Team ID, and Team Members** (this parameter should automatically fill in once **Team ID** is input). Make sure **Single Team Project?** Is set to **No**, and ensure that **System** and **Transect, Grid, Reacquire?** have the correct option selected for the specific project. Once done, click **Create Entry Form**.

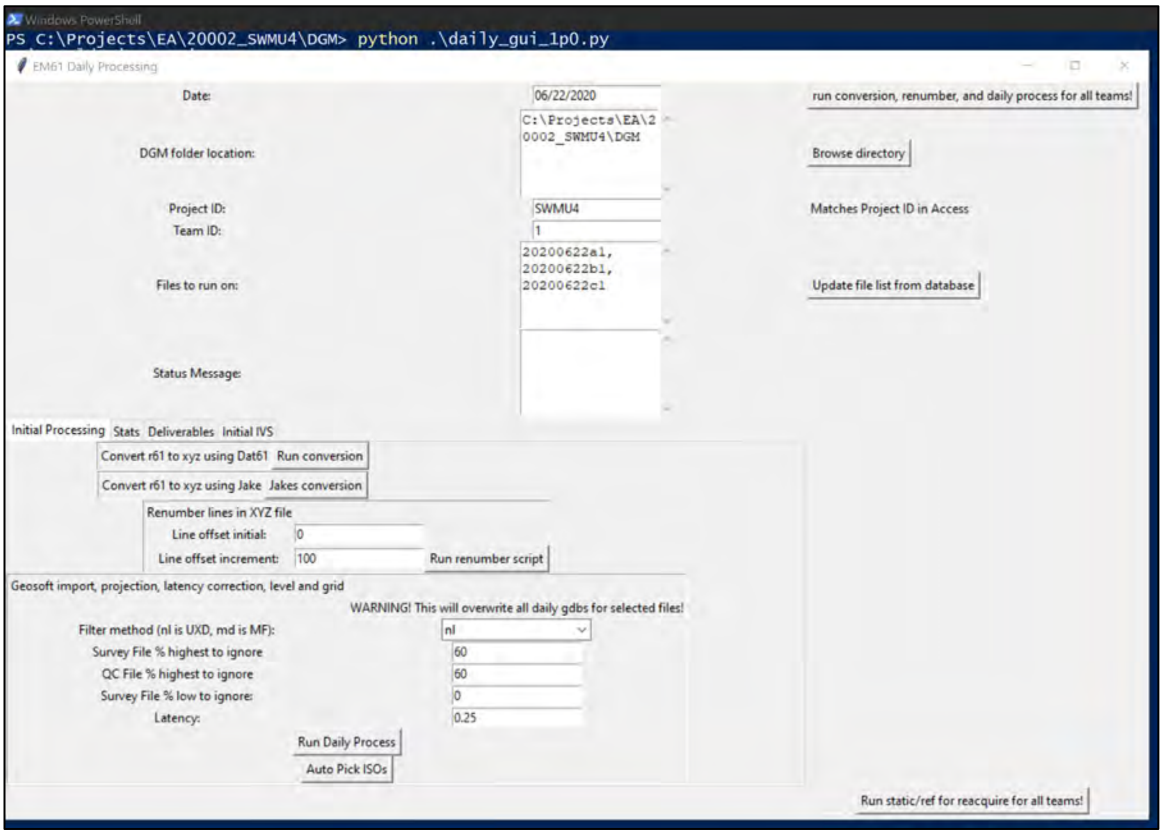

Navigation Pane
Control_Point_Table
DGM DB Navigation Pane
Project Last Modified
1/19/2022 4:13:38 PM
(possible lag of up to 5 minutes)
Set modified date to Now
Project Setup
Manual Daily DGM Entry
Load Field Notes xlsx and Dataset Table import
GPS Check-in Entry
Data Processing Entry
Daily Report and Field Notes
Load And Export Targets and transect Miles
metadata
estimated coverage
Create IVS Tables
Stakeout, map export
Data Files Overview Entry
Date:
22-Jun-20
Number of files:
3
Team ID:
1
Team Members:
Porter and Smith
Single Team Project?
No
System:
Towed
Transect, Grid, Reacquire?
Grid
Create Entry Form


Navigation Pane
Dataset_Table_fromFN
Dataset Table
Dataset ID
20200622a1
Dataset Type
GDB
Project ID
SWMU4
Lot ID
Grid/ Transect Complete
Team ID
1
Collection Date
22-Jun-20
File type
QC/IVS - towed
Location
IVS1
Terrain
Weather
Temp:, Conditions:
Vegetation
Interference Sources
RawData Metadata (header)
/EAST, NORTH, STD-4-
FinalData Metadata (header)
Longitude, Latitude, Ch#,
Team Members
Porter and Smtih
Raw Coordinate System
WGS 84 Lat/Long
Raw Coordinate Units
DDD.DDDDDDDD
Field Notes
Load Record
Target selection criteria (if different than the criteria described in the Performance Requirements defaults table)
Comments
Geophysical Sensor
TDEM
Geophysical Sensor Description
EM61 MK2a 0.5 x 1
Positioning type
RTK GPS
Geodetic sensor
Trimble SPS 855/985
Line Numbers for QC tests (if applicable)
Static1:
2
Ref:
3
Static2:
4
IVS middle:
5
IVS Noise:
7

5.3.4 Run Daily Process

a. Open File Explorer and locate the project folder that contains the Python script, daily_gui_1p0. In the blank space below, press shift + right click. Select Open PowerShell window here.

b. Once open, ensure the proper directory is selected and type python .\daily_gui_1p0.py, then press Enter. The EM61 Daily Processing GUI will open, as shown below.



c. Make sure the correct date is inputted, then click **Update file list from database**. The same number of files specified earlier in the Access Database should appear in the **Files to run on** box. If not, double-check that the **Daily DGM Entry** was input correctly in Access Database.

d. Click Run renumber script button before running the daily process. This will renumber the production files such that every line number in each file has a unique number that can be utilized once the data is appended to the master GDB.

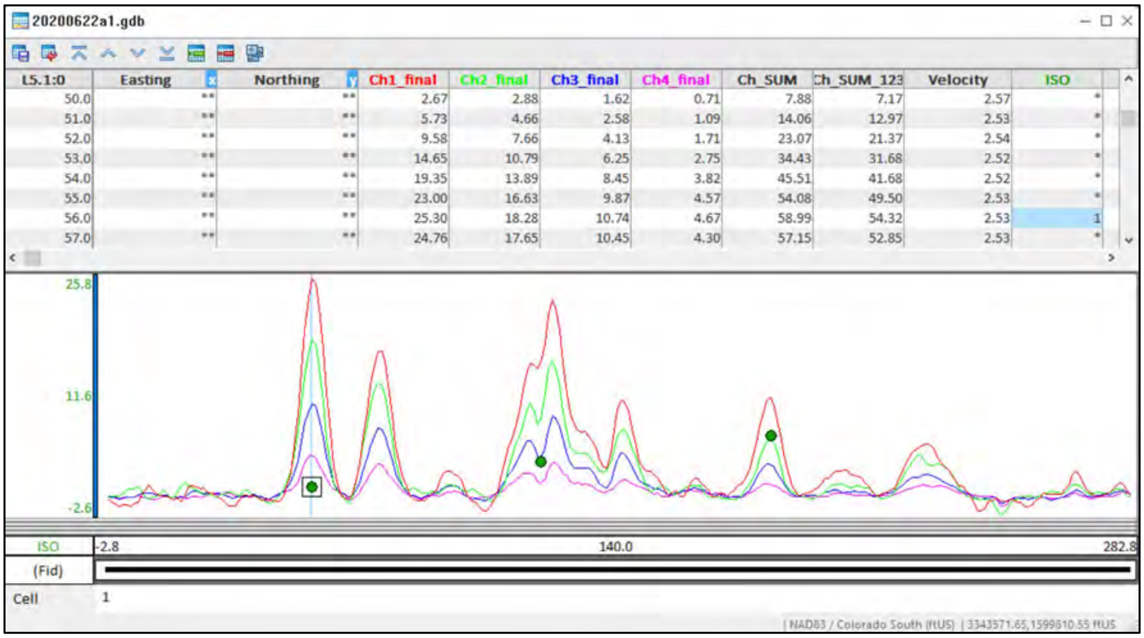
e. Once the correct files are loaded, click **Run Daily Process** under the **Initial Processing** tab. The script will automatically run. The script imports the XYZ files into Geosoft and creates databases for those files; it then converts the data into the correct coordinate system, applies instrument drift correction and instrument latency correction to the data, and grids and maps the data. The daily process script is finished. If the parameters within the script need to be updated for any reason (e.g., change the filter cutoff values), this can be done by going into the **DGM** folder in File Explorer, opening the **parameters** text file in Notepad or Notepad++ and adjusting the parameters accordingly. Once changes are made to the parameters, either run the **update_parameters_gui** first and then run the **daily_gui_1p0**, or just rerun **daily_gui_1p0**, as it will automatically run the **update_parameters_gui** in the script.

f. Note, it is always good to double-check the **DGM_fieldnotes** table and the **Dataset Table**, as well as if the **Daily DGM Entry** has the correct inputs for each file and the correct number of files. This is where known common issues occur. For example, if the script is run with the incorrect number of files, one must go into Access Database and delete all inputs from that date in each tab to the far left. Once all of those inputs are deleted, go back to the **Navigation Pane,** and recreate the entry form with the correct number of files. Next, rerun the daily process and move on to the next step. Further note, if all of those inputs were not deleted from when the daily processing script was first run, other errors may occur in the daily processing script when being run a second time.

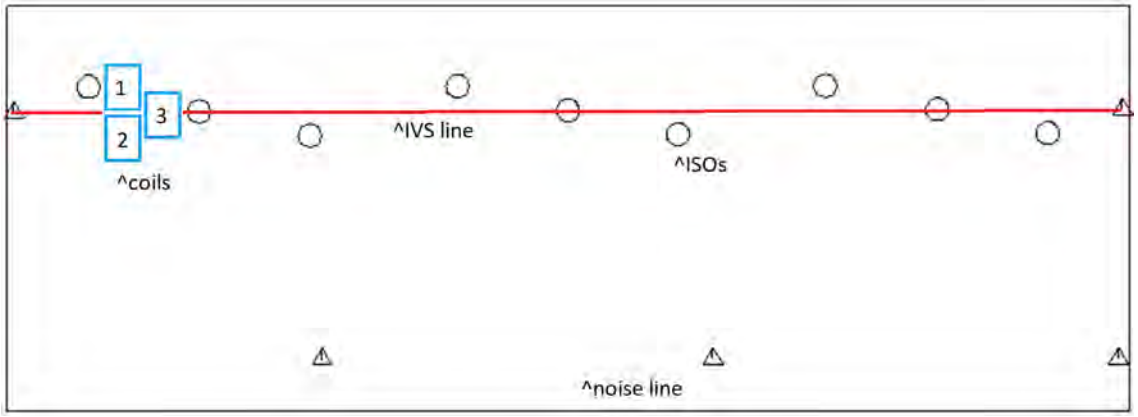
5.3.5 PICK ISOS

a. Before running the next script, the ISOs need to be picked in Geosoft for the AM and PM IVS database (.gdb) files.

b. The .gdb files should already be open in Geosoft due to the script. If not, go to the **Project Explorer** to the left, under the **Data** tab, expand **Databases**, and open the proper .gdb files for the AM and PM IVS. Once open, ensure that there is an **ISO** column present in the database. If not, scroll to an empty column, right-click the header, select **List…**, select **ISO**, then click **OK**. Note, make sure that **ISO** is also set to a **mask** channel (**mask** should already be typed next to **Class** in the **Edit Channel** pop-up). A new column will appear, filled with asterixis, and headered **ISO** – it should look like the picture below. Right-click the **ISO** header and select **Show Symbol Profile**. This will help in the picking of the ISOs.



c. Next, ensure the proper line number is selected. Typically, and in this particular case, for the AM .gdb, the ISOs will be picked on L5.1:0, L5.2:0, and L5.3:0. NOTE: double-check the daily field logs for the correct line number, as this line number could vary. The middle numbers after the 5 represent the respective coil number. In this example, for L5.1:0, ISOs 1, 4, and 7 are picked; for L5.2:0, ISOs 3, 6, and 9 are picked; and for L5.3:0, ISOs 2, 5, and 8 are picked. NOTE: not all projects will use the same number of ISOs as in this example. Further note, in this example, one should pick all of the ISOs to the left of the IVS line for coil 1, to the right of the IVS line for coil 2, and in the middle of the IVS line for coil 3, as seen in the diagram below. These ISOs are picked in Geosoft by going to the line profile below the database window, clicking the respective peaks for a vertical ISO (or trough, in the case of an in-line horizontal ISO), and inputting the corresponding numbers in the ISO column, as shown above. If the whole profile is not shown or is compacted, right-click the empty space to the left and click **Rescale All**.



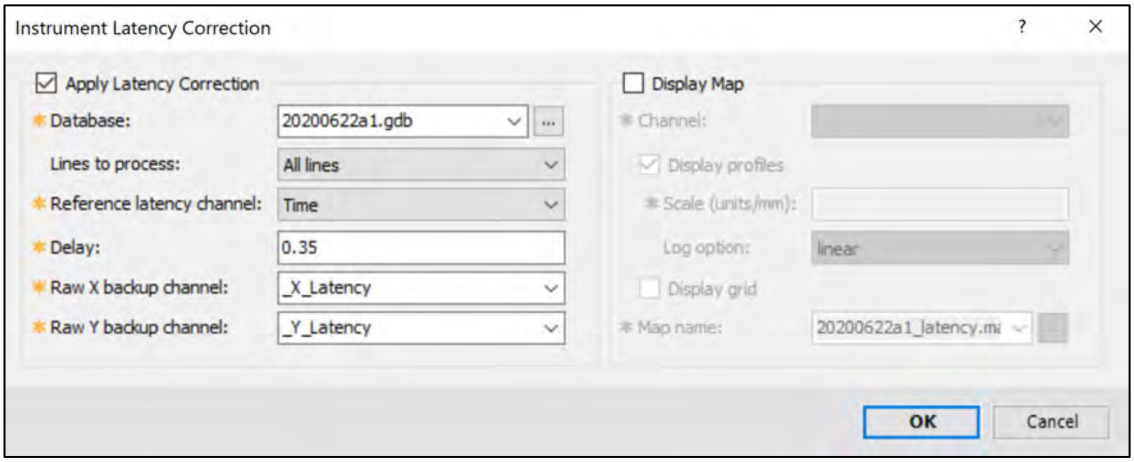
d. It is important to note that the overall IVS layout for a specific project and which coils pass over which ISOs in which direction should always be reviewed first. This will ensure the proper ISOs are picked for the proper line.

e. Repeat for the PM .gdb. Again, typically and in this particular case, the ISOs will be picked on L7.1:0, L7.2:0, and L7.3:0. NOTE: double-check that this is the correct line number in the daily field logs. The same ISO numbers are picked for the same coil number as before. Once done, double-check that all ISO numbers are correct for each coil in the AM and PM .gdb. Save work and close Geosoft.

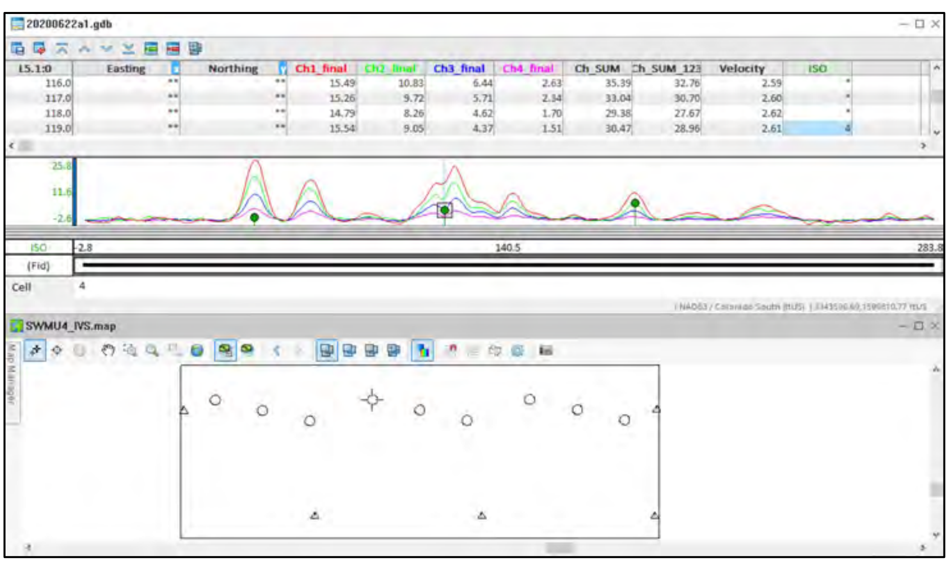
f. Note, if the wrong line was picked during the ISO selection or the ISO number was input incorrectly in the ISO column, the next step (run daily stats) will fail. To avoid this mistake, go back to each line and coil for the AM and PM .gdb and double-check that the correct line/coil has the correct ISO number selected.

g. Furthermore, it is important to check if the latency parameter is appropriate for that specific day's dataset since it can vary immensely due to other factors. Pick an ISO on the upgoing line and another on the downgoing line for the same file. The latency can then be checked by adjusting it accordingly in the **Instrument Latency Corrections** window.

h. In the case that latency needs to be adjusted, go to the **Data Preparation > Path Corrections > Instrument Latency Corrections…** – here, a pop-up should appear like the one shown below.



i. Adjust the **Delay** parameter to see how close or far apart the picks are relative to the ground truth location, and then click **OK**. Typical **Delay** parameters are **0.15-0.40**. Adjust this accordingly until the best fit is found for both ISOs (which is when the picked ISOs locations are as close as possible to the ground truth locations). Once latency is adjusted, replot the picks on the map. NOTE: when picking ISO locations manually, the ground truth locations are unknown. The manual ISO picking is based solely on the line profile's peaks/troughs. After picking, the latency can then be checked and adjusted by opening up the project's IVS map and seeing how close all of the ISO picks are to the ground truth locations, as shown below.

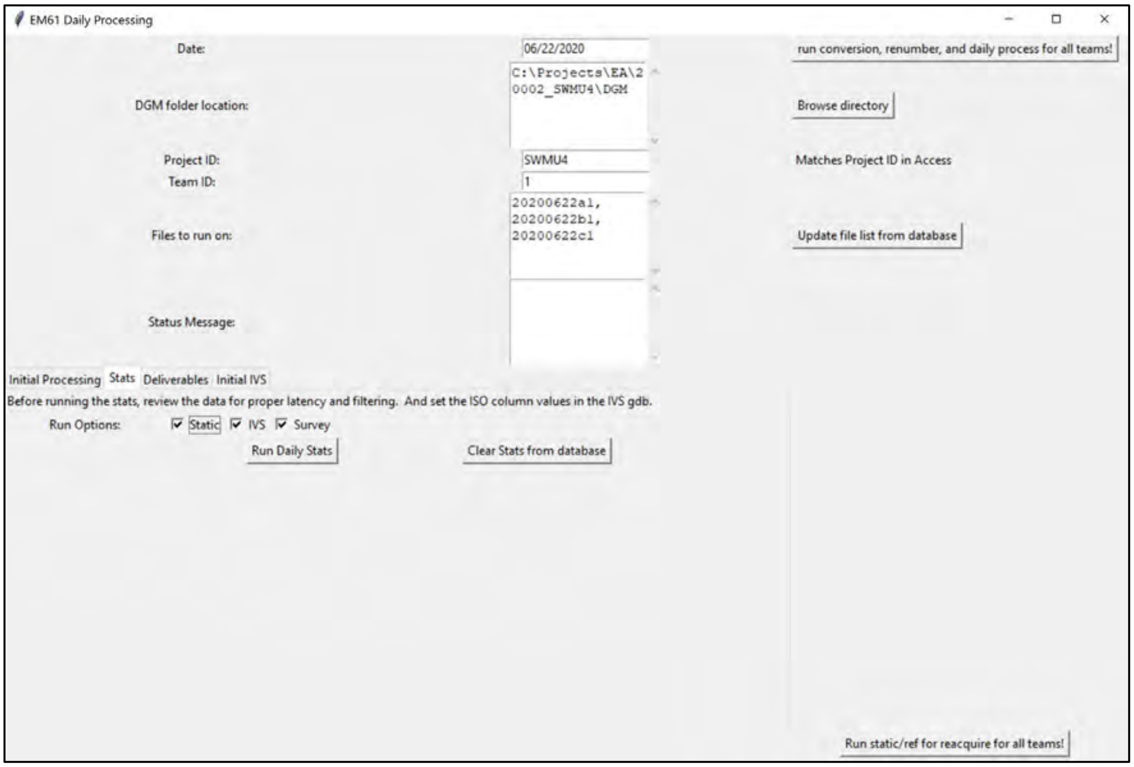


j. NOTE: The daily process will need to be repeated if the latency was not initially suitable.

5.3.6 RUN STATS

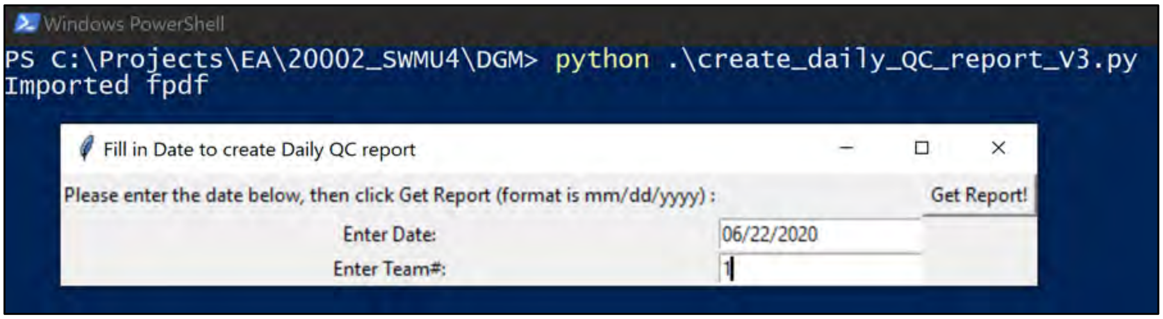
a. Return to PowerShell and run the daily GUI, again. Make sure all the information is the same as before, but this time, click the **Stats** tab. Ensure that **Static**, **IVS**, and **Survey** are all checked in the **Run Options**. Click **Clear Stats from database**. Next, click **Run Daily Stats**. The script will automatically run. The script generates a velocity map, a data separation map, a footprint coverage map, response and positioning table, and ISO response history, as well as performing a static calibration test for each coil. NOTE: the progress of the script and the generation of said maps can be visually checked by accessing the output (deliverables) folder. The maps will appear in that folder successively as they are generated. The **Run Stats** script is finished.

b. Note, this step can take up to 40 minutes to complete, if not longer. Most of the time, an error is not realized until after the script is finished running. That is why it is important to double-check everything. If an error does occur, for example, only with data from the **Survey**. When one decides to rerun the stats, after fixing the error, they can uncheck **Static** and **IVS** under the **Stats** tab in the daily GUI pop-up, then click **Clear Stats from database** before clicking **Run Daily Stats**. In terms of locating the errors, Windows PowerShell states on which line the error(s) occurred in the script. The script can then be opened in Notepad++ to observe what is causing the script to fail. From there, the error(s) can be fixed accordingly. A common error that occurs is picking/mistyping the wrong ISO in Geosoft. Therefore, when this error occurs, go into Geosoft to fix this mistake. Save and close. Then run the daily stats again.



5.3.7 Create Daily Report

a. Return to the same File Explorer as before that contains the python scripts. The script **create_daily_QC_report_V3** should be there. In the blank space below, press **shift + right click**. Select **Open PowerShell window here**.
b. Once open, ensure the proper directory is selected and type **python .\create_daily_QC_report_v3.py**, then press **Enter**. The Daily QC report GUI will open, as shown below.
c. Input the correct date and team number, then click **Get Report!**. The script will automatically create a daily QC report, which will appear in the **pdfs** folder in the same directory as the scripts. The Daily Report script is finished.
d. Double-check that all .jpg map files were properly exported to their respective folder.



5.3.8 QC

a. The next step is to QC the data to ensure that the parameters meet all project specific MQO's for the IVS data, and production data.
b. Check IVS data for proper **Speed**, **Positioning**, **Repsonse**, and **Along-line Spacing**.
c. Check production data for proper **Coverage**, **Speed**, and **Along-line Spacing**.
d. Note, if the data do not pass the acceptance criteria, the non-conforming data must be evaluated. The non-conforming data will be addressed according to the required actions for each MQO.
e. Further note, before moving onto the last section for target picking, make sure all previous steps are repeated for each day of the project.

5.3.9 Create Deliverables

a. The last step is to create deliverables by running the **daily_gui_1p0**, again. This time, make sure that the **Deliverables** tab is selected. Before clicking **Create Daily deliverables**, ensure that the data review and stats are completed and the Daily QC report is generated, otherwise this step will not work, and the initial processing and stats might have to be run again from the beginning. If all is okay, click **Create Daily deliverables**. This tool will append the daily survey data to the **master.gdb** and move the velocity, data separation, and footprint coverage maps to the Maps\QC folder. Additionally, everything is zipped and packaged nicely into files for delivery. These can be found in the **GDB** folder in the respective project folder in File Explore.

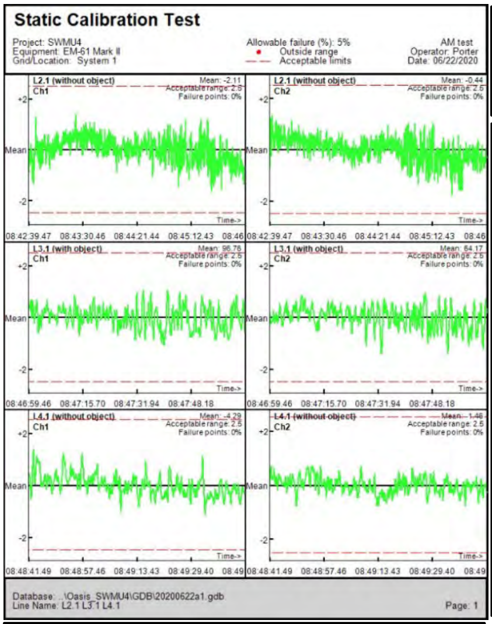
2 DELIVERABLES

For each IVS dataset, the following will be generated:

- 2.a Static Calibration Tests
- 2.b Response and Positioning Table
- 2.c ISO Response History

For each survey dataset, each of the following will be generated:

- 2.d Sample Separation Map
- 2.e Velocity Grid Map
- 2.f Footprint Coverage Map

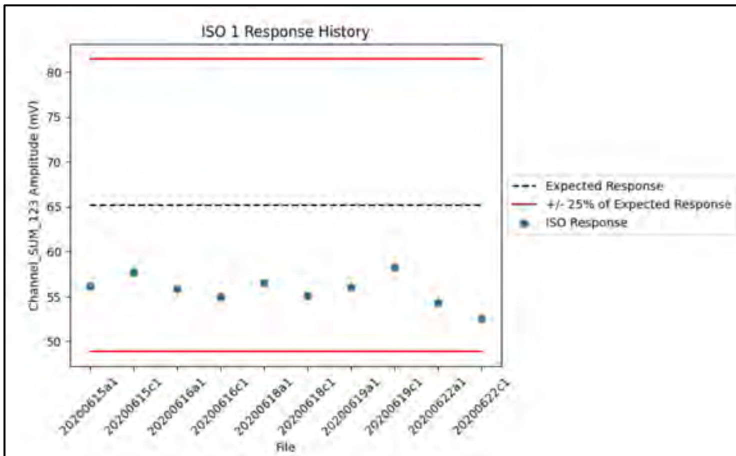


a) Static Calibration Test

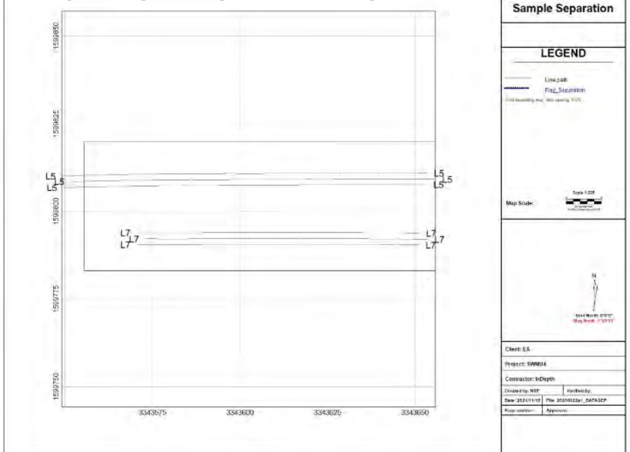
b) Response and Positioning Table

File Name	Date	ISO ID	Sensor ID	Response (mV)	X	Y	Offset	Expected Response (mV)	Response % Dif.
20200622a1	06/22/20	1	1	54.32	3343571.65	1599810.55	0.24	65.18	-16.66
20200622a1	06/22/20	4	1	28.96	3343596.69	1599810.77	0.19	56.88	-49.09
20200622a1	06/22/20	7	1	21.52	3343621.89	1599810.83	0.09	18.54	16.07
20200622a1	06/22/20	3	2	59.45	3343587.01	1599807.4	0.15	60.45	-1.65
20200622a1	06/22/20	6	2	27.83	3343611.81	1599807.51	0.05	44.41	-37.33
20200622a1	06/22/20	9	2	13.16	3343636.83	1599807.55	0.07	19.94	-34.0
20200622a1	06/22/20	2	3	58.83	3343579.38	1599809.01	0.03	54.29	8.36
20200622a1	06/22/20	5	3	26.64	3343604.44	1599809.09	0.08	43.43	-38.66
20200622a1	06/22/20	8	3	16.81	3343629.36	1599809.22	0.09	16.7	0.66
20200622c1	06/22/20	1	1	52.58	3343571.97	1599810.56	0.17	65.18	-19.33
20200622c1	06/22/20	4	1	26.79	3343596.67	1599810.82	0.23	56.88	-52.9
20200622c1	06/22/20	7	1	20.49	3343621.92	1599811.01	0.26	18.54	10.52
20200622c1	06/22/20	3	2	60.47	3343586.73	1599807.47	0.15	60.45	0.03
20200622c1	06/22/20	6	2	33.46	3343611.93	1599807.54	0.11	44.41	-24.66
20200622c1	06/22/20	9	2	15.13	3343636.67	1599807.57	0.23	19.94	-24.12
20200622c1	06/22/20	2	3	60.25	3343579.6	1599809.08	0.26	54.29	10.98
20200622c1	06/22/20	5	3	26.97	3343604.26	1599809.13	0.1	43.43	-37.9
20200622c1	06/22/20	8	3	16.45	3343629.08	1599809.16	0.34	16.7	-1.5

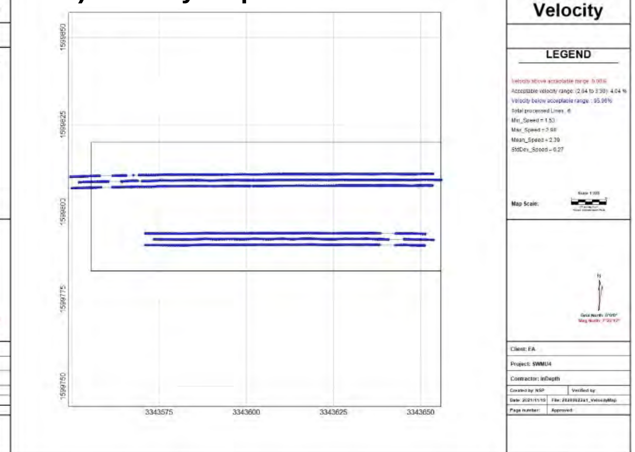
c) ISO Response History



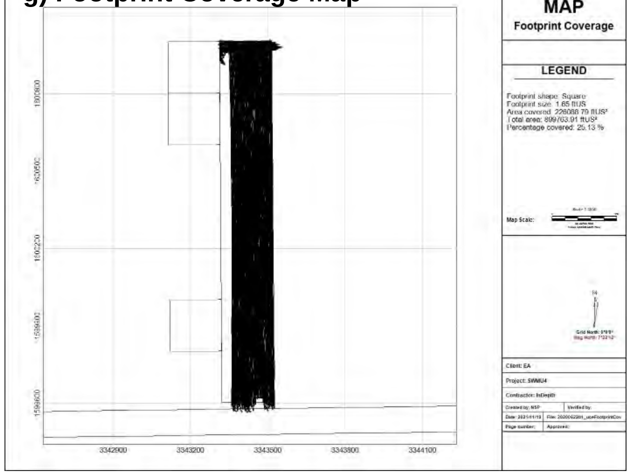
e) Sample Separation Map



f) Velocity Map



g) Footprint Coverage Map



5.4 DYNAMIC TARGET PICKING

Upon completion of the Dynamic Data Processing and review of the daily QC results target picking can be performed on completed grids within the survey area using the following procedures. These target picking scripts should automate the repetitive tasks, such as breaking the **master.gdb** into component grids, making gridded images, making the initial automated target selection, assigning target numbers, and exporting the files for delivery to the client. These scripts should be placed in the **.\Project\DGM folder**. These scripts expect certain files and folders to be in their respective places. If the files and folders are not properly developed system errors will be encountered. If errors occur, examine the error in the script to locate where the missing file/folder is and relocate the file/folder accordingly. Prior to running these scripts the following naming conventions should be verified:

Script Naming Nomenclature

- **3_FilestoGridpick.bat** - This file contains the list of grids to be worked on. Edit this first and then run **0_menu.bat**.
- **3a_FilestoTransectpick.bat** - This file contains the list of transects to be worked on. Edit this first and then run **0_menu.bat**.
- **0_menu.bat** - This is run in the command prompt. When running this script, it presents options on what process to run next.
- **GridPick_xx.gs** - These are several Geosoft scripts for picking, reviewing, and exporting targets from complete grids. They are split into multiple files, because they may have components that error out when rerun on a particular file. E to create a channel name that already exists in the database. If all of these were merged into one giant .gs file and then were run, an acceptable error out will occur and cause the entire process to stop. Because they are split up, when one errors out, the process will move on to the next file.
- **TransectPick_xx.gs -** These are scripts that do the same as **GridPick_xx.gs**, except these are for transect based data.
- **DailyProcess_xx.gs** - These are more scripts to process each team's daily raw EM61 data and to review that the data meet the quality standards.

5.4.1 FILL OUT 3_FILESTOGRIDPICK.BAT

a. Edit the file, **3_FilestoGridpick.bat**, in a text editor, such as Notepad or Notepad++. Note, the new update parameters script will also update this file. It will contain something like:

- **rem call %STEPNAME%_SLAVE ‘PROJECTID’ ‘GRID’**
- **call %STEPNAME%_SLAVE ‘PROJECTID’ ‘GRID’**

Note, REM is another way of saying this line is not meant to be run - the line is for comments to be read by humans. Another thing to note, all of the defined **PROJECTID** and **GRID** names being used below (e.g., SWMU4 and C44) are just examples being used in this SOP – the same goes for the math being used in **Channel Math** in Geosoft. Be careful to make sure that all of these values match those of the actual project being worked on, not the ones being shown here.

b. Where it says **PROJECTID**, change it to the name of the project (e.g., PROJECTID = SWMU4).

c. Where it says **GRID**, change it to the name of the grid where target picking will occur (e.g., GRID = C44) – these are the grid polygons. Note, multiple grids can be run at once; to do so, just remove **rem**. In the picture below, only grid C44 would be processed, not any of the other grids during this run for target picking.

```
rem call %STEPNAME%_SLAVE SWMU4 RR1
rem call %STEPNAME%_SLAVE SWMU4 RR2
rem call %STEPNAME%_SLAVE SWMU4 RR3
rem call %STEPNAME%_SLAVE SWMU4 RR4
rem call %STEPNAME%_SLAVE SWMU4 RR5
rem call %STEPNAME%_SLAVE SWMU4 RR6
rem call %STEPNAME%_SLAVE SWMU4 RR7
rem call %STEPNAME%_SLAVE SWMU4 RR8
rem call %STEPNAME%_SLAVE SWMU4 RR9
rem call %STEPNAME%_SLAVE SWMU4 RR10
rem call %STEPNAME%_SLAVE SWMU4 RR11
rem call %STEPNAME%_SLAVE SWMU4 RR12
rem call %STEPNAME%_SLAVE SWMU4 RR13
rem call %STEPNAME%_SLAVE SWMU4 RR14
rem call %STEPNAME%_SLAVE SWMU4 RR15
rem call %STEPNAME%_SLAVE SWMU4 RR16
rem call %STEPNAME%_SLAVE SWMU4 RR17
rem call %STEPNAME%_SLAVE SWMU4 RR18
rem call %STEPNAME%_SLAVE SWMU4 RR19
rem call %STEPNAME%_SLAVE SWMU4 RR20
rem call %STEPNAME%_SLAVE SWMU4 RR21
rem call %STEPNAME%_SLAVE SWMU4 RR22
rem call %STEPNAME%_SLAVE SWMU4 RR23
rem call %STEPNAME%_SLAVE SWMU4 RR24
rem call %STEPNAME%_SLAVE SWMU4 RR25
rem call %STEPNAME%_SLAVE SWMU4 C41
rem call %STEPNAME%_SLAVE SWMU4 C42
rem call %STEPNAME%_SLAVE SWMU4 C43
call %STEPNAME%_SLAVE SWMU4 C44
rem call %STEPNAME%_SLAVE SWMU4 C45
rem call %STEPNAME%_SLAVE SWMU4 C46
rem call %STEPNAME%_SLAVE SWMU4 C47
rem call %STEPNAME%_SLAVE SWMU4 B42
rem call %STEPNAME%_SLAVE SWMU4 B46
rem call %STEPNAME%_SLAVE SWMU4 B47
```

5.4.2 RUN 0_MENU.BAT

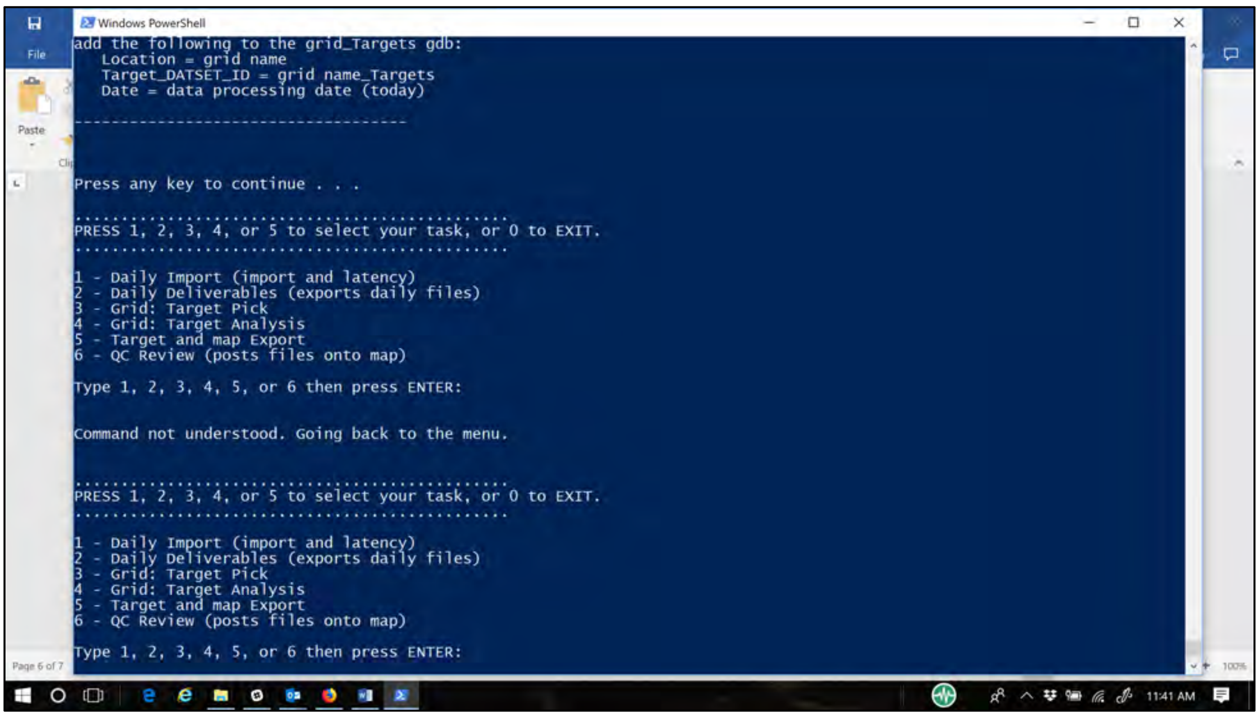
a. First, in Geosoft, make sure the **ProjectName_Master.gdb** has the channels **transect_mask** and/or **grid_mask** included and populated with the value **1**, using Channel Math. Save and close.

b. Next, open the scripts folder in File Explorer, right-click and pick **Windows PowerShell,** and then type in **./0_menu.bat** or **0_menu.bat** in the PowerShell window. A text menu will appear with a list of following inputs (also shown in the picture below):

1. **Daily Import (imports XYZ files and applies latency)**
2. **Daily Deliverables (exports daily fiies)**
3. **Grid: Target Pick**

4. **Grid: Target Analysis**
5. **Target and Map Export**
6. **QC Review (posts files onto map)**

Note, inputs 1 and 2 should already have been completed using the **daily_gui_1p0.py**. Therefore, begin the next step with selecting input **3 (Grid: Target Pick)**.



5.4.3 RUN INPUT 3 (GRID: TARGET PICK) IN SCRIPT

a. In PowerShell, select input **3 (Grid: Target Pick)** by typing **3** and pressing **Enter**, as shown in the instructions in the PowerShell window. This step takes the **project_master.gdb** and makes another .gdb that contains solely the grid area (and on occasions, a little outside of the grid area). Then it grids the data for **ch1**, **ch2**, **ch3**, **ch4**, **ch_sum**, and **ch_sum_123** using the strict grid boundaries and also using a slight buffer (determined by the **grid.ply** and **grid_buff.ply** files). It then picks anomalies based on a set threshold that can be found in the scripts folder. Then the anomalies are plotted on the

project_target.map. Note, this step will run all the **GridPick_3xx.gs** scripts for a grid before repeating the process for the next grid listed in the **3_FilestoGridPick**.

b. Next, keep the PowerShell window open and open the respective Geosoft project. In the **project_target.map**, or more specifically, the **project_grid.map**, review the targets and add any targets that are missing. To add targets, use the tool in the menu bar **Parameters Determination > Target Selection > Digitize Targets from a Map** (e.g., Target database = grid#_targets.gdb, mask channel – mask, grid value ch = Grid#_buff_ch_sum_123, grid to sample = grid#_buff_ch_sum_123.grd, survey database- leave blank). It is helpful to also plot the Debris Zone (DZ), unsurveyable areas, site boundaries, and grid outlines on the map.

c. Note, target classes can be added during this time, or Step 4 has been run. The target class is an integer value and is put into a channel that is called **Manual_Target_Class**. A description of the target classes is in the **class_categories.xlsx** file in the scripts folder. Target classes, like 8-out of bounds, tells the script to add or not add the target to the dig list no matter what.

d. After any targets have been added, fill out the following Oasis GDB channels:

Date = today's date

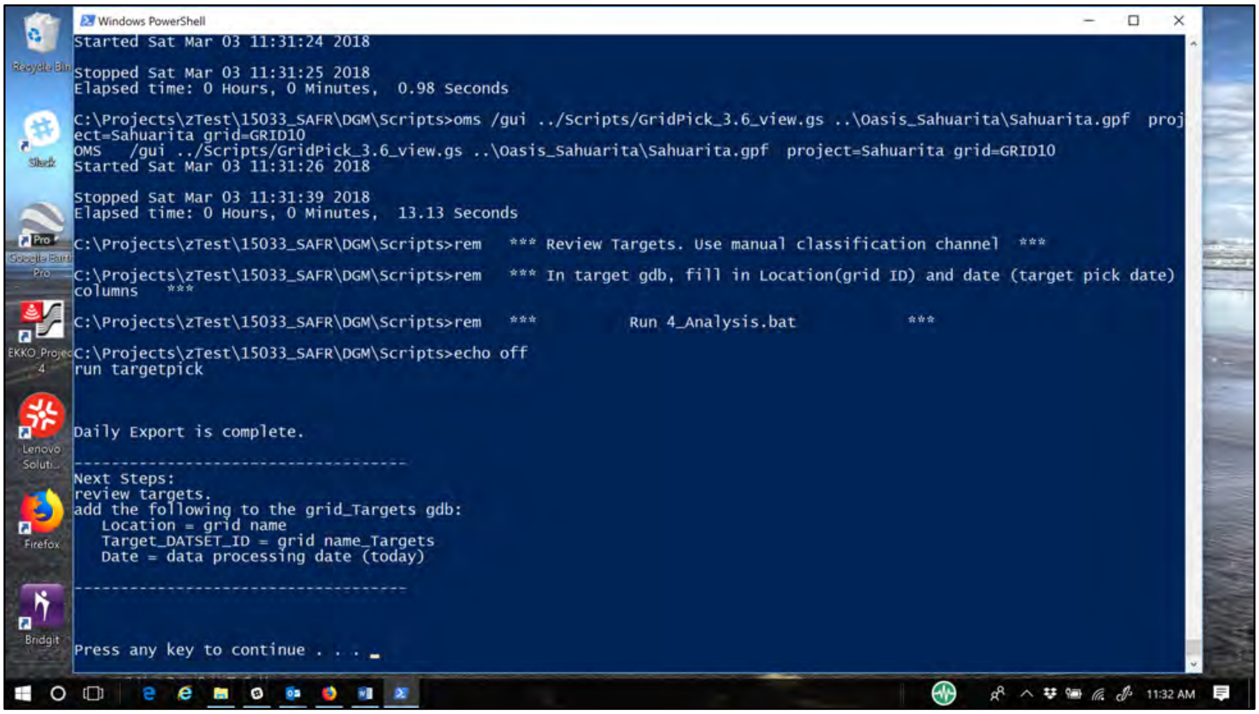
Target_Picker = First initial last name (e.g. BHecker)

Location = Grid / Transect number (must be the same format as used in the polygon file)

Target_Dataset_ID = Name of the current GDB containing the targets, (e.g., GRID1_Targets)

e. Prior to running input 4, you need to review your work one last time. Also, repeat the above process if necessary.

f. Save your work, close all the windows in Geosoft, close Geosoft, and backup DGM folder.



5.4.4 RUN INPUT 4 (GRID: TARGET ANALYSIS) IN SCRIPT

a. Before running the script for all grids, go into Geosoft and make sure that all of the **target.gdbs** are set to mask with a value of **1**. To do this, go into Channel Math and type **mask = 1** for all grids being processed. Save and close.

b. Then in PowerShell, select input **4** to run.

c. Once the script analyzes the targets, go back into Geosoft. Sort the data based on 2 channels (using **DIG** and target picking channel (e.g. **CH_SUM_123**) as the channels). Then reset target_id based on mask, and then repeat for composite target ID. Next unselect non-target lines – only have the targets selected.

d. Plot the targets on the map and make sure all the targets you want are selected.

e. Note, if new targets are needed, you can pick these by going to parameter determination, target selection, then digitize from map. Select target database (might be grid specific), group **= Targets**, **Append not overwrite**, **mask = Mask**, **grd val ch = ch** you are picking on (threshold specific).

f. Save your work, close your all the windows in geosoft, and close geosoft.

g. Note, rerun Step 4 if you added, removed, or reclassified anomalies.

h. Open Geosoft, then go to Channel Math to modify the following: **Dig = 1 if Ch2_Final > 60.9**, **class = 1**, **Tau = 1**, and **decay = 1**.

i. Also, add the following in Channel Math to create a list of targets to dig (edited per project based on anomaly/target thresholds:

- **Dig = ((Ch2_Final>4.9)&&(class==1)&&(Anom_Tau==1)&&(Anom_Decay==1))?(1):(DUMMY);**
- **Anom_Threshold = (Ch2_Final >4.9)?(1):(DUMMY);**
- **Class = (Anom_Threshold !=1)?(0):(Class);**
- **Mask= Dig;**

j. Close Channel Mask, and then sort by **one channel dig, descending**. Then **Reset_TargetIDs** in **target list management**, unselect **mask check box**, and unselect **premerge_line**.

k. Save and close your work in Geosoft.

5.4.5 Run Input 5 (Target and Map Export) in Script

a. Once this script is running, it exports various files into the **.\Oasis_project\Deliverables\Grids\ folder**. The list file types are: .jpg, .tiff, .gdb, .csv. Note, you can actively check the correct files are being exported in real time by viewing the Deliverables folder as Step 5 is being run.

b. After the exports are complete, load the **grid_access_targets.csv** file into the project accdb using the **targets upload** function in the project database.

c. The exported files listed above are bundled up into a zip file and can be delivered as appropriate.

6. DATA MANAGEMENT

6.1 Data Input

The data inputs required for performing DGM data processing and analysis are:

- A site boundary file
- A grid layout file

- If it becomes necessary to subset a grid, the subset grids will be identified with a new unique identifier and processed as a distinct production unit. The grids will be split in such a way as to maintain the original coverage with no gaps.

- A file containing the coordinates of the IVS endpoints and seed locations.
- Amplitude response minimum detection threshold (derived from the MEC QAPP Addendum)
- Raw dynamic data files for the opening IVS, field data, and the closing IVS
- Digital field notes for data acquisition activities.

6.2 DATA OUTPUT

The data outputs of the DGM data processing and analysis for each day of survey data collection are:

- Daily QC Report containing:
    - Data Summary with QC statuses
    - Static Function Tests for opening (AM) and closing (PM) IVS data.
    - Table of Interpreted ISO locations and responses from AM/PM IVS data
    - Profile views of the IVS data
    - Graph of ISO response history throughout the project
    - Figure plotting the GPS check-in accuracy for each day.
    - Sample separation map for all data.
    - Footprint coverage map for all data
    - Velocity Map for all data
    - A Completed Dynamic DGM Data Processing QC Checklist (Appendix B).

The data outputs of the DGM data processing for each delivered production survey unit (contiguous subset of the survey site) are:

- Un-surveyable areas and/or areas of signal density saturation

- Daily QC Reports for all data in survey unit documenting the performance objectives relative the MQOs in the MEC QAPP Addendum Worksheet #22 and Site Specific Work Plan (SSWP).
- Dynamic Data Processing Results
  - Target map on color shaded grid
  - target anomaly list (target ID, x, y)

Upon completion of the daily processing and the associated, processed data and updated processing information will be distributed to the Site Specific Data Manager along with a notification email to the appropriate parties.

7. QUALITY CONTROL

The MEC QAPP Addendum, Attachment B GEO SOP 6 – DGM Data Processing for Towed-array Systems, Three Phase QC Checklist, is presented as Appendix B to this SOP, will be filled out and delivered as part of the reporting requirement for this SOP. The MQOs for dynamic data measurements and target selection are presented in Worksheet #22 of the MEC QAPP Addendum and SSWP. Performance relative to the MQOs will be assessed during the processing of the dynamic data. Dynamic data will not be used to select targets until these MQOs are met, or if not met, until the suspect data are recollected, or the project team agrees on modifications to these MQOs.

Measurement Performance Criteria for DGM data acquisition using a towed array can be found in Worksheet #12 of the MEC QAPP Addendum. See Worksheet #31, 32, 33 of the MEC QAPP Addendum for a description of who will conduct the QC inspection for this DFW and the frequency of the Follow-up Phase QC inspections.

8. REPORTING

Data processing and analysis consist of the daily distribution of the files and document indicated in Section 6.2. Reporting activities associated with this SOP include a target selection memorandum as described below.

Target Selection Memorandum detailing:

- Specific approach to the target selection process

- Target list - final list of identified anomalies within the area subset with verification of submittal to the target management system
- Cumulative final map presenting the individual target distribution across the project investigation footprint
- Cumulative final map presenting the target density analysis across the project investigation footprint
- Final grids of amplitude response within the area subset
- Final grids of any other detection metric used for analysis within the area subset.
- Final data archive .gdb or .xyz format for data within the area subset
- Inclusion of the QC Report as an appendix for data within the area subset

9. HEALTH & SAFETY

The acquisition of towed array DGM data in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items.

10. REFERENCES

- USACE, 2024, Environmental Quality – Technical Guidance Military Munitions Response Actions, EM 200-1-15, Washington, D.C.

Version	Change Summary	Change Reason	Prepared By	Approved By	Published
Rev-1.00	Initial Release	No Change	Hecker	Smith, Welk	20240819

Appendix A
SOP Signature Page

The following individuals have read and understand this SOP:

Signature:	Date:

Appendix B
QC Checklist

Three Phase Quality Control Checklist

GEO SOP 6 – DGM Data Processing for Towed-Array Systems

Team Information		
Data Processor:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	Reference	Inspection Point	Yes	No	NIA	Comments
1	Signature Page	Verify that all personnel have signed the SOP Signature Page				*(P)*
2	4.2	Verify Geosoft Oasis Montaj is being used for all final data processing				*(P)*
3	4.3	Field forms are complete and contain all of the specified information				*(I),(F)*
4	5.2	Separate folders and project files have been created for the day's function tests				*(I),(F)*
5	5.3	Function test xyz files have been imported into a Geosoft database using the appropriate template				*(I),(F)*
6	5.3	Raw data from all towed array sensors have been imported				*(I),(F)*
7	5.3	Preliminary auto leveling corrections to the function test data have been performed according to specifications				*(I),(F)*
8	5.3	Static background and static spike statistics have been calculated and exported				*(I),(F)*
9	5.3	Preliminary lag correction has been performed for IVS tests				*(I),(F)*
1O	5.3	IVS data for targeting channel has been gridded and Geosoft maps have been created				*(I),(F)*
11	5.3	IVS target locations and peak responses have been compared to the expected values				*(I),(F)*
12	5.3	IVS target lists and processed xyz data have been exported				*(I),(F)*
13	5.3	Separate folders and project files have been created for the day's field data				*(I),(F)*
14	5.3	Field data xyz files have been imported into a Geosoft database using the appropriate template				*(I),(F)*
15	5.3	Raw data from all towed array sensors have been imported				*(I),(F)*
16	5.3	Data density statistics have been calculated and displayed on a map				*(I),(F)*

Three Phase Quality Control Checklist

GEO SOP 6 – DGM Data Processing for Towed-Array Systems

17	5.3	GPS Quality map has been created				*(I),(F)*
18	5.3	Preliminary auto leveling corrections to the field data have been performed according to specifications				*(I),(F)*
19	5.3	Preliminary lag correction has been performed for IVS tests				*(I),(F)*
2O	5.3	Field data for targeting channel has been gridded and Geosoft maps have been created				*(I),(F)*
21	5.4	Culture files have been plotted on the preliminary contour maps				*(I),(F)*
22	5.4	Targets have been selected over all anomalous features meeting the targeting criteria				*(I),(F)*
23	5.4	Targets have been sorted according to amplitude from highest to lowest and given unique target IDs				*(I),(F)*
24	5.4	Final contour maps have been created by grid in pdf and GeoTIFF formats				*(I),(F)*
25	5.4	Final processed data files and final target lists have been exported				*(I),(F)*
26	5.4	Deliverables package has been created including all specified files and has been transferred to project FTP site				*(I),(F)*
27	5.4	All processing information has been documented in the Ahtna Database				*(I),(F)*
28	6.2	Updated processing information has been sent to the Site Specific Data Manager				*(I),(F)*
29	6.2	Processed data email has been sent to the appropriate parties				*(I),(F)*

Punch list Items	
No.	

Conducted by: ______________________________ DATE: ______________________________

Approved by: ______________________________ DATE: ______________________________

GEO SOP 7
DGM TARGET REACQUISITION USING A PERSON-PORTABLE SYSTEM

GEO SOP 7

Standard Operating Procedure

DGM Target Reacquisition Using a Person-Portable System

Original Issue Date: August 2024
Last Review/Implementation Date: August 2024

InDepth Corporation

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San Diego, California 92127
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Table of Contents

Appendices

Acronyms

bgs	Below Ground Surface
cm	Centimeter(s)
BSI	Blind Seed Items
DGM	Digital Geophysical Mapping
Ft	Feet
GPS	Global Positioning System
ID	Identifier
ISO	Industry Standard Object
in	Inches
IVS	Instrument Verification Strip
m	Meter(s)
MQO	Measurement Quality Objective
MEC	Munitions and Explosives of Concern
MEC QAPP	Munitions and Explosives of Concern Quality Assurance Project Plan
QC	Quality Control
RCA	Root-cause Analysis
RTK	Real-Time Kinematic
SLAM	Simultaneous Localization and Mapping
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SSWP	Site Specific Work Plan
USACE	United States Army Corpe of Engineers
UXO	Unexploded Ordnance

1. POLICY

InDepth and project personnel will follow procedures established in this Standard Operating Procedure (SOP) for all work related to target reacquisition operations that are to be conducted using the EM61-MK2 in support of Munitions and Explosives of Concern (MEC) remediation projects. This SOP must be distributed to and signed by all personnel performing activities related to this SOP and must be adhered to as field activities are performed.

2. PURPOSE & SCOPE

2.1 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to detail the procedures and operational methodologies associated with the marking and reacquisition of targets resulting from Digital Geophysical Mapping (DGM) in areas that are potentially contaminated with MEC. This SOP does not detail the use of positioning equipment that is described herein. This SOP assumes that experienced personnel that will be using this SOP are familiar with the equipment and are competent in their use.

2.2 SCOPE

The information presented in this SOP is applicable to all MEC related project sites. Positional accuracy specifications may vary depending on equipment and contract requirements.

3. MAINTENANCE

InDepth personnel are responsible for the maintenance of this SOP.

4. PERSONNEL, EQUIPMENT & MATERIALS

4.1 PERSONNEL

Personnel performing target reacquisition will generally consist of a two-person team consisting of a Field Geophysicist and UXO Technician or two UXO Technicians, and the two-man rule is to always be followed. The key personnel implementing this SOP are documented in the MEC Quality Assurance Project Plan (MEC QAPP) Addendum Worksheets 4, 7, and 8.

4.2 EQUIPMENT

Equipment required for DGM target reacquisition using a personal-portable system includes the following:

- Geonics EM61-MK2 person-portable DGM system.
- Global Positioning System (RTK-GPS) or Simultaneous Localization and Mapping (SLAM) system, as required.

4.3 MATERIALS

Materials required for reacquisition are non-metallic pin flags for marking target locations after target reacquisition.

5. PROCEDURES

Target reacquisition will be performed using the same equipment (Geonics EM61-MK2) and positioning method RTK-GPS or SLAM positioning as was used during geophysical data collection. The instrument will be mounted on manufacturer-supplied wheels and operated by one person. The second team member will operate the RTK-GPS / SLAM or assist the EM61-MK2 operator when GPS positioning is not used.

5.1 INSTRUMENT SETUP

The instrument is set up according to the Geonics EM61-MK2 Manual. All cables are taped to the instrument to keep them from getting tangled and to minimize cable movement and reduce the potential for snagging vegetation. If the DGM data were collected using RTK-GPS or SLAM positioning, the target locations are loaded onto the controller in advance.

5.2 NAVIGATION

Navigation to each selected target is accomplished through the use of RTK-GPS or SLAM equipment. The RTK-GPS rover or SLAM sensor is mounted on a range pole and provides a visual reference of the distance and direction to the next selected target location. Regardless of the positioning method used, all targeted anomalies will be marked in the field using a non-metallic pin flag labeled with the target identifier (ID).

5.3 REACQUISITION STEPS

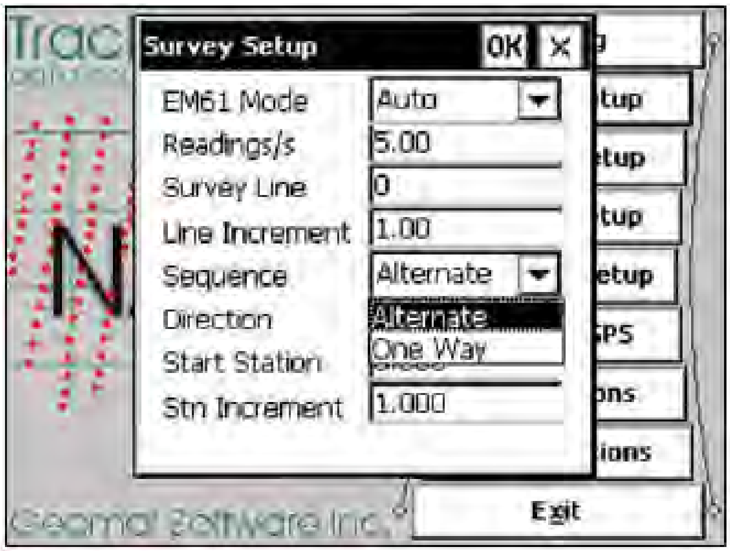
The following steps are followed to begin target reacquisition with the EM61-MK2:

1. Turn on instrument by rotating the master/slave selector on the instrument console/electronics from slave to master.

2. Allow the instrument to warm up for at least 15 minutes.

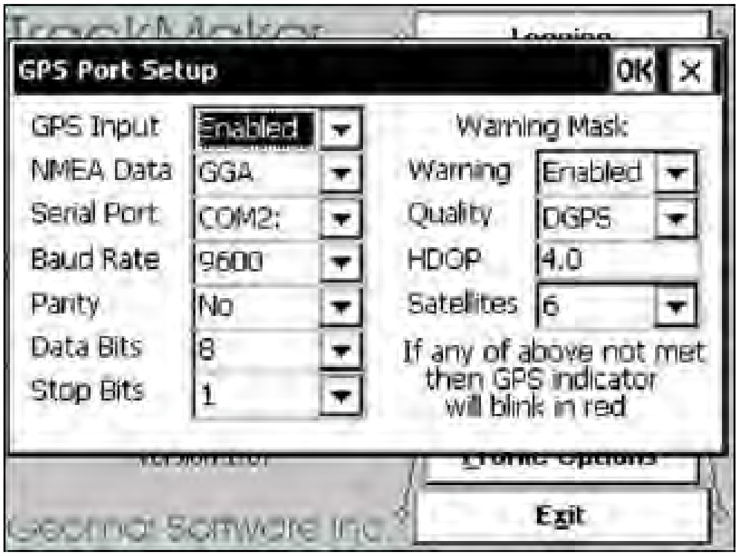
3. Turn on Juniper Systems TK6000 and open NAV61MK2 program. The screen below will be displayed.

4. Click on **"Survey Setup"** and specify the below options. For target reacquisition, the Mode is set to "**Auto**" and Readings/s is set to "**5"**.

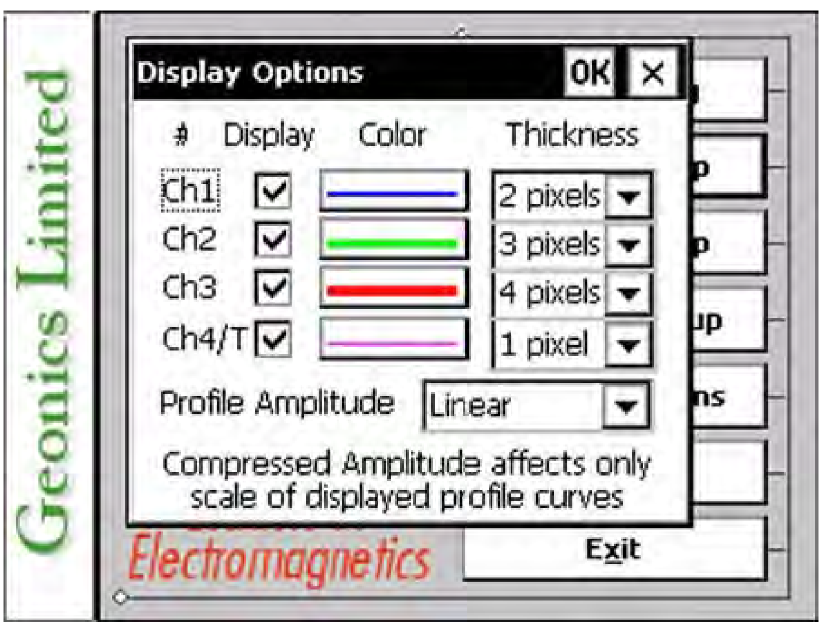


5. Click on "**Logger Setup**" and specify the below options. These settings will remain the same throughout the project.

6. Click on “**GPS Port Setup**”, and make sure the GPS Input is set to “**Disabled**”, and all other options are grayed out.

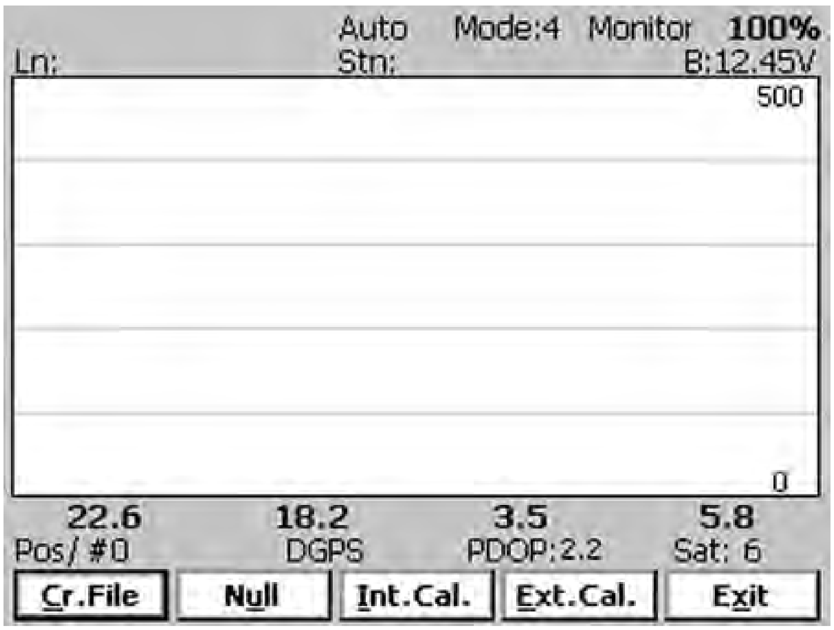


7. Click on “**Display Options**” and specify the following options. These options are also operator preferences for aesthetics and do not affect the collected data.



8. Once all parameters are set, click on “**Monitor/Log**”. The screens shown below are displayed while the instrument is normalizing.

9. Once the Instrument has finished normalizing, find a quiet spot (area with low mV reading that is similar to that of the background) and null the instrument. Then click on “**Cr. File**” and name and save the file.



10. Go to the first flagged location and search a three-foot radius for the peak response by monitoring the values in the targeted channel on the Monitor/Log screen

11. Once the peak has been located, turn the instrument 90 degrees, and look for the peak again. Each target will be checked in at least two perpendicular directions, but more orientations may be used at the operator’s discretion.

12. Once the absolute peak has been identified, record the response from the targeted channel along with any offset from the original targeted location.

13. Move the pin flag to the new location, record the new flag location using the RTK GPS, and repeat this procedure at the next target.

6. FALSE POSITIVES AND FALSE NEGATIVES

6.1 FALSE POSITIVES

A false positive is a detected DGM anomaly that results in no identifiable anomaly source being able to be located during target reacquisition or during the intrusive investigation. During target reacquisition, if an anomaly is found to have no response above the target selection threshold, the reacquisition team will record that anomaly location as a “no-find.” All targets classified as no-finds by the reacquisition team will not have a pin-flag placed at their location and will not be investigated by the intrusive investigation team.

False positives will be minimized to the extent possible through use of the best available geophysical practices executed by qualified staff. All false positives (no-finds) will be documented in the project database. A false positive rate higher than 15% (calculated as a running average for the unit) will result in a root-cause analysis (RCA) and reevaluation of the data, detection methods, and overall project QC. The RCA will document the causes of the excessive false positive rate, and a Corrective Action Request and Corrective Action Plan (if appropriate) will be submitted to United States Army Corpe of Engineers (USACE) within 10 days.

6.2 FALSE NEGATIVE

A false negative is an item of interest that is not detected or identified as a DGM target anomaly. False negatives are missed items that fall within the detection limits of the deployed geophysical sensor systems and, therefore, should be detected, identified, and targeted for intrusive investigation. False negatives can be caused by equipment operator error, instrument malfunction, navigation issues, or procedural errors during the data processing and analysis phase of the project. The potential for false negatives will be assessed via the use of blind seeds placed by the QC Geophysicist within the survey area. It is anticipated that the USACE QA Geophysicist will also place blind seed items within the project area that will also be used to assess the potential for false negatives. Additionally, false negatives are also assessed through a comparison of the independently collected QA geophysical data with project DGM data. Anomalies that are detected in the QA DGM data that do not appear in the project DGM data would be considered false negatives in the project DGM database.

False negatives may be identified during other site activities such as MEC removals and other excavation activities. In any of these cases, the following procedures will be performed:

- A False Negative Report that includes the results of the RCA will be completed by the Field Geophysicist and submitted to the Ahtna Site Project Manager, the QC Geophysicist and the UXOQCS.
- The QC Geophysicist and UXOQCS will investigate and prepare a memo report for delivery to USACE describing the activities associated with the discovery. This report will also provide recommendations for further or corrective action (if necessary). Technical information/data related to this memo will be provided by the Project Geophysicist and UXOQCS upon request.

7. QUALITY CONTROL

The QC checks listed below are to be conducted after the instrument has been warmed up for at least 15 minutes. The QC function checks are to be conducted at the beginning and end of each day (unless otherwise noted) for each EM61-MK2 at a location that is known to be free of anomalous responses:

- GPS (if used) Static Positional Test
- Static Repeatability Test
- Cable Shake Test
- Personnel Test

Below is a description of each of the QC checks listed above. QC check data is to be digitally recorded, stored offsite, and reviewed by the QC Geophysicist on a daily basis. The results of the daily QC checks are to be recorded in both the QC documentation and in the MMRP database.

1. GPS Static Positional Test (AM and PM): InDepth will conduct static repeatability tests of their RTK-GPS system. This test will be completed at the beginning of each day at the IVS. The data for these GPS Static Positional Tests will be digitally

recorded, observed in the field and results of these tests are to be documented on the geophysical contractor's daily internal Geophysical QC test form (Appendix B Checklist).

2. Static Repeatability Test (AM and PM): InDepth will conduct static repeatability tests (background and spike) for each person-portable system. These tests are to be completed twice daily at the IVS and will include 1 minute for background, 1 minute for spike, and 1 minute for an additional background reading. The baseline mV value for the static tests will be the average of AM and PM static tests conducted during the first week that the person-portable system(s) is operational. The data for these static repeatability tests will be digitally recorded, observed in the field and results of these tests are to be documented on the geophysical contractor's daily internal Geophysical QC test form (Appendix B Checklist).

3. Cable Shake Test (AM only): On a daily basis the EM61MK2 and GPS instrument cables will be tested to verify that cable vibrations do not have a negative effect on the quality of the data. The cable vibration test will be conducted at the beginning of each workday prior to the commencement of that day's operation. The data for these cable shake tests will be digitally recorded, observed in the field and results of these tests are to be documented on the geophysical contractor's daily internal Geophysical QC test form (Appendix B Checklist).

4. Personnel Test (AM only): On a daily basis personnel operating the EM61-MK2 will be tested to verify that when in close proximity to the sensor they do not have a negative effect on the quality of the data. This personnel test will be conducted at the beginning of each workday prior to the commencement of that day's operation. The data for these personnel tests will be digitally recorded, observed in the field and results of these tests are to be documented on the geophysical contractor's daily internal Geophysical QC test form (Appendix B Checklist).

All QC checks will be digitally recorded and analyzed to verify that all data is within acceptable operational parameters as outlined in the MEC QAPP Addendum.

Inspection checklists specific to this SOP are located at the end of this SOP. Measurement Performance Criteria for DGM target reacquisition using a person-portable system can be found in Worksheet #12 of the MEC QAPP Addendum. See Worksheet #31, 32, 33 of the MEC QAPP Addendum for a description of who will conduct the QC inspection for this Definable Feature of Work and the frequency of the Follow-up Phase QC inspections.

8.REPORTING

Reporting for the DGM target reacquisition activities include all daily GPS and DGM quality control checks: AM and PM GPS Check-ins, AM and PM DGM static-reference-static instrument response checks and the stakeout list for all reacquired targets including the final position and millivolt response for each completed target location.

9.HEALTH & SAFETY

The reacquisition of targets in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items.

10. REFERENCES

- USACE, 2024, Environmental Quality – Technical Guidance Military Munitions Response Actions, EM 200-1-15, Washington, D.C.

11. REVISION HISTORY

Version	Change Summary	Change Reason	Prepared By	Approved By	Published
Rev-1.00	Initial Release	No Change	Hecker	Smith, Welk	20240819

Appendix A
SOP Signature Page

The following individuals have read and understand this SOP:

Signature:	Date:

Appendix B
QC Checklist

Three Phase Quality Control Checklist

GEO SOP 7 – DGM Target Reacquisition Using Person-Portable Systems

Team Information		
Team:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	Reference	Inspection Point	Yes	No	NIA	Comments
1	Signature Page	Verify that all personnel have signed the SOP Signature Page				*(P)*
2	4	Verify Geonics EM61-MK2 is being used and that all necessary equipment listed is present and serial numbers recorded as being specific to a team				*(P)*
3	4	Verify RTK-GPS / SLAM is being used and that all necessary equipment listed is present and serial numbers recorded as being specific to a team				*(P)*
4	5.1	Instrument setup according to manufacturer specification and cables have been secured				*(I),(F)*
5	5.1	Instrument coil height has been measured				*(I),(F)*
6	5.1	Target list have been loaded onto GPS survey controller (GPS collection)				*(I),(F)*
7	5.1	Hard copies of target lists have been printed (fiducial collection)				*(I),(F)*
8	5.2	GPS antenna has been mounted on range pole (GPS)				*(I),(F)*
9	5.2	Tape measures have been laid out on opposite sides of the grid referenced to surveyed corner marks (Fid)				*(I),(F)*
1O	5.3	Instrument warmed-up for at least 15 minutes				*(I),(F)*
11	5.3	EM61 data collection rate set to at least 5 Hz				*(I),(F)*
12	5.3	Instrument nulled in area known to be clear of anomalous response				*(I),(F)*
13	5.3	Peak response searched for in at least 2 perpendicular directions				*(I),(F)*
14	5.3	Peak response and offset from targeted location have been recorded				*(I),(F)*
15	6 (1)	GPS Static Positional Test performed showing location within expected parameters (GPS)				*(I),(F)*

16	6 (2)	Morning Static Repeatability Test performed showing expected response				*(I),(F)*
17	6 (3)	Cable Shake Test performed showing no effect on the data quality				*(I),(F)*
18	6 (4)	Personnel Test performed showing no effect on the data quality				*(I),(F)*
19	6 (2)	Afternoon Static Repeatability Test performed showing expected response				*(I),(F)*
2O	6	All function test data for the day have been transferred to a field computer				*(I),(F)*
21	6	Function test data have been converted to xyz format				*(I),(F)*
22	6	All raw function test data for the day have been transferred to the project FTP site for final data processing				*(I),(F)*

Punch list Items	
No.	

Conducted by: ________________________________ DATE: ______________________________

Approved by: ________________________________ DATE: ______________________________

GEO SOP 8
GEOPHYSICAL QUALTIY CONTROL

GEO SOP 8

Standard Operating Procedure

Geophysical Quality Control (QC)

Original Issue Date: August 2024
Last Review/Implementation Date: August 2024

InDepth Corporation

10954 Via Frontera
San Diego, California 92127
(858) 716 -0299

Table of Contents

Appendices

Appendix A - SOP Signature Page

Acronyms

APP	Accident Prevention Plan
BSI	Blind Seed Items
CAP	Corrective Action Plan
CAR	Corrective Action Request
CQCS	Contractor Quality Control Supervisor
DDESB	Department of Defense Explosives Safety Board
DFW	Definable Feature of Work
DGM	Digital Geophysical Mapping
EM	Engineering Manual
EZ	Exclusion Zone
ESTCP	Environmental Security Technology Certification Program
GPS	Global Positioning System
GSV	Geophysical System Verification
ISO	Industry Standard Object
IVS	Instrument Verification Strip
MEC	Munitions and Explosives of Concern
MEC QAPP	Munitions and Explosives of Concern Quality Assurance Project Plan
MQO	Measurement Quality Objective
OESS	Ordnance and Explosives Safety Specialist
PM	Project Manager
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCA	Root Cause Analysis
RTK	Real-Time Kinematic
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SSWP	Site-Specific Work Plan
TP	Technical Paper
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer

1. POLICY

Project personnel will follow procedures established in this Standard Operating Procedure (SOP) for the Quality Control (QC) of geophysical operations. This SOP must be distributed to and signed by all personnel performing activities related to this SOP and must be adhered to during the performance of all field activities.

2. PURPOSE & SCOPE

2.1 PURPOSE

The purpose of this SOP is to describe the equipment and general methodologies that are to be used by the Quality Control (QC) Geophysicist and site personnel during the performance of QC tasks related to geophysical operations. This SOP does not detail the use of the equipment that is described herein. This SOP assumes that experienced personnel that will be using this SOP are familiar with the equipment and are competent in their use.

2.2 SCOPE

This SOP provides technical guidance on the performance of QC activities related to geophysical operations, including, but not limited to, the following:

- Instrument Verification Strip (IVS) installation.
- Blind Seed Item (BSI) installation and assessment (for Digital Geophysical Mapping [DGM] areas).
- Instrument daily function tests.
- DGM using a person-portable system.
- DGM using a towed array system.
- DGM data processing.
- DGM target reacquisition.

This document is not intended to contain all requirements and procedures necessary for QC activities. This document should be used in conjunction with the documents listed in Section 10.0 (Associated SOPs) and Section 11 (Documentation) below, and with QC metrics described in Worksheet #12 of the Munitions and Explosives of Concern (MEC) Quality Assurance Project Plan (MEC QAPP) Addendum. The information presented in this SOP is applicable to all MEC related project sites.

3. MAINTENANCE

InDepth personnel are responsible for the maintenance of this SOP.

4. EQUIPMENT

- Logbook
- Digital tablet with Global Positioning System (GPS) capability (if used)
- QC inspection forms
- Real-time Kinematic (RTK) GPS rover unit (if used)

5. QC PERSONNEL, ORGANIZATION, QUALIFICATIONS AND RESPONSIBILITIES

5.1 PERSONNEL

The overall project organization and reporting structure is presented in Worksheet #3 and 5 of the MEC QAPP Addendum. The QC personnel, organization, qualifications, and responsibilities are addressed in more detail in this SOP.

The Contractor Quality Control Supervisor (CQCS) will assist the QC Geophysicist and Unexploded Ordnance Quality Control Specialist (UXOQCS) with QC related documentation and compliance with the MEC QAPP Addendum. The QC Geophysicist is responsible for the QC of field activities and data related to geophysical operations. The UXOQCS is responsible for the QC of field activities related to MEC and explosives operations. The Geophysical QC team will include the following personnel:

- CQCS (Prime Contractor - Ahtna)
- QC Geophysicist (Subcontractor - InDepth)
- UXOQCS (Prime Contractor - Ahtna)

5.1.1 CQCS

The CQCS is responsible for developing, maintaining, and ensuring implantation of the quality program. This responsibility includes periodic reviews of the processes being implemented, evaluation of any recommendations made by the project team over the course of the project regarding use of these processes, and continuous improvement evaluations of the quality program. The CQCS is also responsible for providing support to the project team in ensuring the quality of products and services is provided to the government. The CQCS will have the authority to act in all Contractor Quality Control matters, including stopping work for any item, feature, or practice not meeting quality standards. The CQCS will communicate Contractor Quality Control non conformances with the Ahtna MMRP Project Manager, Site Project Manager, and the InDepth Senior Geophysicist.

5.1.2 QC Geophysicist

The QC Geophysicist is responsible for the implementation and the operation of the field quality management program for geophysics related operations. This includes the planning and execution of QC activities over geophysical operations and ensuring compliance with geophysical requirements as detailed in the MEC QAPP Addendum. Specifically, the QC Geophysicist is responsible for the following:

- Perform QC oversight of project plans as they relate to DGM operations.
- Reviewing and approving the qualifications of proposed geophysical staff and subcontractors.
- Assisting the UXOQCS in planning and ensuring the performance of preparatory, initial, follow-up, and completion inspections for the geophysical definable features of work (DFW)s.
- Planning and ensuring the acceptable performance and completion of all geophysical QC activities as specified in the MEC QAPP Addendum, and Site-Specific Work Plans (SSWPs).
- Review of the DGM data, target lists, and dig results in concert with the Senior Geophysicist.
- Establishing and maintaining the location of DGM related BSIs for the project.
- Identifying non-conformance and verifying that appropriate root cause analysis (RCA) has been completed and corrective actions are implemented for geophysical activities.
- Performing periodic visual monitoring of data acquisition operations and review of data processing and interpretation activities to ensure conformance with the MEC QAPP Addendum, and SSWPs.
- QC reprocessing of a percentage of the DGM data in accordance with Worksheet #12 of the MEC QAPP Addendum.

- Ensuring that the requisite documentation, including submittals, is generated, and retained as prescribed.

The QC Geophysicist will have access to all geophysical QC and DGM related data. It is expected that the QC Geophysicist will provide detailed review at the onset of the project, especially with regard to visual observations of the DGM data collection process. Once the project performance levels are acceptable, the level of effort for QC may be reduced; however, should deficiencies in the DGM operations occur, the frequency of QC checks will be increased until the performance level is back to acceptable levels. The QC Geophysicist reports to the Senior Geophysicist. The QC Geophysicist will also assist the CQCS and UXOQCS with the generation of any Corrective Action Requests (CAR)s, Corrective Action Plans (CAPs), Root Cause Analysis (RCAs) that relate to DGM operations.

5.1.3 UXOQCS

The UXOQCS is responsible for the implementation and operation of the field quality management program for MEC and explosives related operations (Section 5.6 below), and also the MEC QAPP Addendum, Attachment B UXO SOP 10, QC of MEC and Explosives Related Operations

5.2 PERSONNEL QUALIFICATIONS AND TRAINING

In accordance with EM 200-1-15, project staff will possess the necessary qualifications in order to perform their assigned jobs and tasks. Geophysical personnel will meet the qualifications listed in EM 200-1-15 (USACE 2024). UXO personnel will meet the qualifications described in Technical Paper (TP) 18 (Department of Defense Explosives Safety Board [DDESB], 2020).

5.3 DOCUMENTATION OF QUALIFICATIONS AND TRAINING

The Unexploded Ordnance Safety Officer (UXOSO) will maintain records documenting that each worker (including subcontractor personnel) has the required qualifications and training, including site-specific and routine training for personnel and visitors. The UXOSO will monitor certification expiration dates so as to provide advance warning to the PM of when employees will require refresher training or other requirements. These records will be maintained on-site for audit purposes.

5.4 STANDARD DGM QUALITY MANAGEMENT PROGRAM

The project will be conducted following these standard DGM quality management procedures:

- Any revisions or changes to this SOP must be approved by the COR prior to being implemented.
- Site specific QC testing and inspection requirements, data objectives and control measures will be detailed in the MEC QAPP Addendum, SOPs and SSWPs.
- The QC Geophysicist or designee will establish and maintain an on-site project file in accordance with contract requirements and Contractor policies for document control.
- The QC Geophysicist or designee is responsible for verifying compliance with this SOP through implementation of the Three Phase QC Inspection Process on all field-related DFWs. SOPs have been generated for each DFW that include SOP-specific QC checklists at the end of each SOP (MEC QAPP Addendum, Attachment B).
- Prior to client delivery or use, project submittals are to be reviewed and approved by the CQCS or designee.
- Prior to submittal, technical documents (e.g., reports, plans, and engineering drawings) are to be reviewed by qualified staff.
- The QC Geophysicist or designee will notify the USACE QA Geophysicist, and the BRAC Office, two business days prior to the commencement of any preparatory or initial phase QC inspection.
- To conduct and document the Preparatory Phase QC Inspection, the QC Geophysicist or designee is to use the Preparatory Phase QC Inspection checklist that is specific to each SOP. The Preparatory Phase QC Inspection Checklist generic form is located in the MEC QAPP Addendum, Attachment C Forms. During the Preparatory Phase QC Inspection, the QC Geophysicist or designee is responsible for reviewing the specifications and requesting clarification from USACE, where necessary.
- The QC Geophysicist or designee is to perform an Initial Phase inspection the first time a field related DFW is performed. To conduct and document the inspection,

the QC Geophysicist or designee uses the Initial Phase Checklist that is specific to each SOP.

- The QC Geophysicist or designee may perform periodic Follow-up Phase inspections for work in progress, or each time a DFW has a significant change in location, equipment, and/or personnel. If the change is substantial, the QC Geophysicist or UXOQCS or designee may conduct an additional preparatory meeting. The purpose of this additional preparatory meeting is to ensure continuous compliance and that an acceptable level of workmanship is achieved.
- The final inspection is performed upon conclusion of the DFW and/or prior to closeout to verify that project requirements relevant to the particular feature of work have been met. Outstanding and nonconforming items are to be identified and documented on the Final Inspection Outline (MEC QAPP Addendum, Attachment C Forms).
- The UXOQCS or designee is responsible for tracking all inspections using the Inspection Schedule and Tracking Form and report QC field surveillance activities using the Contractor Quality Control Daily Report located in the MEC QAPP Addendum, Attachment C Forms.
- Tasks which require specific training, calibration, maintenance, and certifications will be documented by the task leader performing the activity with copies of applicable documentation provided to the UXOQCS or designee for retention in the project QC file.
- The QC Geophysicist will encourage project staff at all levels to provide recommendations for improvements in established work processes and techniques.
- The CQCS will respond to any member of the project personnel that submits a CAR (MEC QAPP Addendum, Attachment C Forms).
- The CQCS or designee will determine whether a written CAP (MEC QAPP Addendum, Attachment C Forms) is necessary based on whether any of the following criteria are met is necessary, based on whether any of the following criteria are met:
    - o the CAR priority is high;

- the deficiency requires a rigorous corrective action planning process to identify similar work product, or activities affected by the deficiency; or
- the deficiency requires extensive resources and planning to correct the deficiency and to prevent recurrence.

5.5 FIELD QUALITY MANAGEMENT PROGRAM FOR DGM RELATED OPERATIONS

For the investigation and management of MEC, and other explosives related operations, the QC Geophysicist is responsible for the installation of BSIs in areas that are to have DGM operations conducted over them. The QC Geophysicist is also responsible for assisting the UXOQCS in verifying that all DGM related BSIs in select areas where intrusive investigation of DGM targets is conducted have been excavated and have been properly identified and reported by the intrusive investigation team. The QC Geophysicist will work with the CQCS and UXOQCS with the generation of any CARs, RCAs and CAPs that relate to DGM operations. The QC Geophysicist is not required to be onsite full-time.

The geophysical related operations for this project will be conducted following these standard field quality management procedures:

- Ensure equipment used by the DGM and Reacquisition teams is in good working condition and that team members are familiar with their use.
- Verify that DGM equipment is tested daily at the IVS and/or daily function checks are completed.
- Verify unit/area grid stakes are correctly placed (visual inspection).
- Place BSIs at the rate/density specified in the MEC QAPP Addendum and SSWP. If production rates change modify BSI rate/density accordingly. Document BSI resolution.
- Work with the UXOQCS to complete the Preparatory, Initial and Follow-up QC Inspections.
- Conduct periodic surveillance of DGM and Reacquisition teams to ensure compliance with SOPs, MEC QAPP Addendum, and SSWP requirements.

- Using QC metrics described in Worksheet #12 of the MEC QAPP Addendum, conduct inspections to verify that all Measurement Quality Objectives (MQO)s are being achieved.
- Using QC metrics described in Worksheet #12 of the MEC QAPP Addendum, reprocess a percentage of the DGM data to verify that the DGM “system” is functioning properly. The DGM “system” includes field data collection, data processing, data storage, and DGM related deliverables.
- Ensure that any areas that are not able to be DGM surveyed are recorded and include an explanation.
- Conduct periodic inspections of DGM and Reacquisition team documentation.
- Conduct periodic inspections of DGM and Reacquisition team data submissions.
- Conduct periodic inspections of the project database.
- Assist CQCS and UXOQCS with corrective actions that relate to DGM, target reacquisition or the project database.

Additionally, the QC Geophysicist will also be responsible for reprocessing a percentage of the DGM data. MQOs for DGM data are described in Worksheet #12 of the MEC QAPP Addendum. Using the geophysical data collected by the field teams, the QC Geophysicist will initially reprocess the first data set collected by each geophysical field team (up to eight full 100-foot x 100-foot grids [1.84 acres]). QC maps (and target lists when appropriate) will then be compared with the DGM map (and target list when appropriate) generated by the geophysical data processor(s). If significant discrepancies between the two data sets exist, the QC Geophysicist and the geophysical data processor will compare processing techniques. This initial duplicative process will ensure that geophysical interpretation techniques are correct and consistent among the data processors working on the project. Throughout the remainder of the project, the QC Geophysicist will continue to randomly select and reprocess individual grids at the rate specified in Worksheet #12 of the MEC QAPP Addendum. If the QC Geophysicist finds processing techniques that have been applied incorrectly, then the corrective action process will be initiated as described in Section 8 (Deficiency Identification and Resolution) below.

5.6 FIELD QUALITY MANAGEMENT PROGRAM FOR MEC AND EXPLOSIVES RELATED OPERATIONS

The UXOQCS reports directly to the CQCS. Although the UXOQCS communicates directly with the MMRP Project Manager and Site Project Manager, the UXOQCS has the authority to act independently in all MEC and explosives related QC matters. The UXOQCS has the authority to stop work if operations are found to be out of compliance with the MEC QAPP Addendum, or if any operations are deemed unsafe. The UXOQCS is onsite full time.

6. BLIND SEEDING

In accordance with the Geophysical System Verification (GSV) process (Environmental Security Technology Certification Program [ESTCP], 2009), the QC Geophysicist will be responsible for emplacing BSIs in areas where DGM is to be conducted. BSI Installation is discussed in the MEC QAPP Addendum, Attachment B GEO SOP 2 (Blind Seed Item Installation).

Once an area has been investigated the QC Geophysicist will verify that all BSIs have been located and have been accurately identified. Once it has been verified that the BSIs have been successfully detected, their location and other associated information will be supplied to the Site-specific Data Manager (SSDM) for inclusion in the project database. Upon finding a failure (i.e., missed BSI), the QC Geophysicist will use procedures described in Section 8.0 below (Deficiency Identification and Resolution) to determine the extent of the failure, why it occurred, and if corrective actions are warranted.

7. THREE PHASE INSPECTION PROCESS

InDepth is responsible for verifying compliance with approved project documents through the implementation of a three-phase control process, which ensures that project activities comply with the approved plans and procedures. The QC monitoring requirements for each field DFW related to geophysical operations are discussed in general below. A list of project-specific DFWs can be found in Worksheet #12 of the MEC QAPP Addendum. The UXOQCS or designee will ensure that the Three Phase QC Process is implemented for each field-related DFW. SOPs have been generated for each DFW that include SOP-specific QC checklists. This section specifies the minimum inspection requirements that must be met and to what extent QC monitoring must be conducted and documented by the QC Geophysicist or designee.

Each QC inspection phase is considered relevant for obtaining necessary product quality. However, the preparatory and initial inspections are particularly invaluable in preventing problems. Work will not be performed on a DFW until the preparatory phase inspections have been completed and any nonconformance issues have been resolved.

7.1 PREPARATORY PHASE QC INSPECTION

Prior to performing the Preparatory Phase QC Inspection, the QC Geophysicist or designee will review the appropriate sections of the MEC QAPP Addendum, SOPs, and SSWP. The Preparatory Phase QC Inspection is completed by the QC Geophysicist or designee through the verification that the following has been completed prior to the commencement of field activities associated with a field DFW (related to the investigation and management of MEC, and other explosives related operation):

- Authorization to proceed has been obtained;
- Required permits and notifications have been obtained or given;
- Required submittals have been approved;
- Plans, procedures, specifications and required documentation have been approved and are available to the workers;
- Required materials and equipment are on site;
- Field equipment is appropriate, available, functional, and properly tested for its intended/stated use;
- Workers needed to perform the work have been designated and are available;
- Staff responsibilities have been assigned and communicated;
- Staff members have the necessary knowledge, expertise, and information to perform their jobs;
- Arrangements for support services have been made (if required);
- All necessary procurements are in place; and
- Training in accordance with the requirements of the MEC QAPP Addendum, and SOPs has occurred.

The UXOQCS or designee will coordinate and perform a Preparatory Phase meeting before beginning each field-related DFW. The purpose of this meeting is to ensure that all critical staff involved in the work are familiar with applicable specifications and plans; and to verify that the necessary resources, conditions, and controls are in place and compliant before work activities start. Upon completion of the inspection, the QC Geophysicist or designee will complete a Preparatory Phase Inspection Checklist that is specific to each SOP. Generic Preparatory Phase QC Inspection Checklists can be found in the MEC QAPP Addendum, Attachment C Forms.

Project personnel must correct or resolve discrepancies between existing conditions and the approved Site Specific MEC QAPP Addendum that are identified by the QC Geophysicist or designee during the Preparatory Phase QC Inspection. The inspection results will be documented by the QC Geophysicist or designee in the form of QC checklists and daily reports. Should the results of the inspection be unsatisfactory, work will be stopped, corrective actions will be initiated, and deficiencies corrected. The CQCS or designee will verify that unsatisfactory and/or nonconforming conditions have been corrected prior to the commencement of the operation being inspected.

7.2 INITIAL PHASE QC INSPECTION

The Initial Phase QC inspection occurs at the startup of field activities associated with a field DFW. The Initial Phase QC inspection is completed by the QC Geophysicist or designee through the verification and inspection of the following:

- Check preliminary work for compliance with procedures, specifications, and requirements detailed in MEC QAPP Addendum, SOPs, and SSWP.
- Establish an acceptable level of workmanship; and
- Check for omissions and resolve differences of interpretation.

At the onset of a particular DFW, the QC Geophysicist or designee will perform an Initial Phase inspection and complete an Initial Phase Inspection Checklist that is specific to each SOP. Generic Initial Phase QC Inspection checklists can be found in the MEC QAPP Addendum, Attachment C Forms.

During the Initial Phase inspection, the QC Geophysicist or designee will ensure that discrepancies between site practices and approved plans or specifications are identified and resolved. The resolution of discrepancies is field conditions and verifies that appropriate safe work practices are being followed.

The inspection results will be documented by the QC Geophysicist or designee in the form of QC checklists and daily reports. Should the results of the inspection be unsatisfactory, work will be stopped, corrective actions will be initiated, and deficiencies corrected. Furthermore, an additional Initial Phase Inspection may be rescheduled, and more frequent Follow-up Inspections may be conducted to verify the quality of work.

7.3 Follow-up Phase QC Inspection

The Follow-up Phase QC inspection occurs as field activities associated with a specific DFW related to geophysical operations related to the investigation and management of MEC, and other explosives related operations) are ongoing. The Follow-up Phase QC inspection is completed by the QC Geophysicist or designee through the verification and inspection of the following:

- Check ongoing work for compliance with procedures, specifications, and requirements detailed in the MEC QAPP Addendum.
- Verify that the current level of workmanship is acceptable; and
- Check for omissions and resolve differences of interpretation.

As a particular field DFW is in operation, the QC Geophysicist or designee will perform a Follow-up Phase inspection and complete a Follow-up Phase Inspection Checklist that is specific to each SOP. Generic Follow-up Phase QC Inspection checklists can be found in MEC QAPP Addendum, Attachment C Forms.

During the Follow-up Phase inspection, the QC Geophysicist or designee will ensure that discrepancies between site practices and approved plans or specifications are identified and resolved. The Follow-up Phase inspection will continue to verify that the APP adequately identifies all hazards associated with actual field conditions and verifies that appropriate safe work practices are being followed.

The inspection results will be documented by the QC Geophysicist or designee in the form of QC checklists and daily reports. Should the results of the inspection be unsatisfactory, work will be stopped, corrective actions will be initiated, and deficiencies corrected. Furthermore, an additional Initial Phase Inspection may be scheduled, and more frequent Follow-up Inspections may be conducted to verify the quality of work.

7.4 Final Inspection

The final inspection is performed upon conclusion of a DFW and prior to closeout to verify that project requirements relevant to the particular DFW have been satisfied. Outstanding and nonconforming items are to be identified and documented on the Final Inspection Outline (MEC QAPP Addendum, Attachment C Forms).

8. DEFICIENCY IDENTIFICATION AND RESOLUTION

While deficiency identification and resolution occur primarily at the operational level, QC audits provide a backup mechanism to address problems that either are not identified or cannot be resolved at the operational level. Deficiencies identified by the QC Geophysicist or designee are to be corrected by operational staff and documented either in the field activity daily log or CAR as determined by the QC Geophysicist or designee.

8.1 Corrective Action

A CAR (MEC QAPP Addendum, Attachment C Forms) can be issued by any member of the Project Team, including subcontractor employees. The CAR will be forwarded to the CQCS or designee who is then responsible for evaluating the validity of the request. If the CAR is valid the CQCS or designee will address the corrective action with the appropriate individuals to resolve the deficiency.

The CQCS or designee will determine if an RCA and/or CAP (MEC QAPP Addendum, Attachment C Forms) are necessary. The CAP will include assigning personnel and resources and will specify and enforce a schedule for corrective actions. Once a corrective action has been resolved, the CAR, CAP and supporting information will be forwarded to the CQCS for closure.

The recommendations provided in the CAPs that are to be implemented will be reviewed during Follow-Up QC inspections. The purpose of this CAP review is as follows:

- Ensure that established protocols are implemented properly;
- Verify that corrective actions have been implemented;
- Ensure that corrective actions are effective in resolving problems;
- Identify trends within and among similar work units; and
- Facilitate system RCA of potential larger systemic problems.

8.2 CAR AND CAP TRACKING

Each CAR and subsequent CAP, if needed, will be given a unique identification number, and tracked until corrective actions have been implemented and verified by the CQCS or designee prior to closure of the CAR and CAP.

9. ASSOCIATED SOPS

- DATA SOP 1 – Field Data Management
- GEO SOP 1 – IVS Installation and Use
- GEO SOP 2 – BSI Installation
- GEO SOP 3 – DGM Using a Person-Portable System
- GEO SOP 4 – DGM Using a Towed Array System
- GEO SOP 5 – DGM Data Processing using a Person-Portable System
- GEO SOP 6 – DGM Data Processing using a Towed Array System
- GEO SOP 7 – DGM Target Reacquisition using a Person-Portable System
- GEO SOP 9 – RTK GPS Positioning Systems
- GEO SOP 10 – Simultaneous Localization and Mapping (SLAM) Positioning System

10. DOCUMENTATION

The following information is to be recorded during QC of geophysical operations:

- QC Checklists (specific to each SOP)
- QC Surveillances
- BSI information (installation and DGM results)
- CAR (if required)
- RCA (if required)
- CAP (if required)
- Logbook entries

11. HEALTH AND SAFETY

Conducting QC of geophysical operations in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items. Safety measures are to be addressed in the AP) and Site Safety and Health Plan (SSHP) to mitigate these hazards. Procedures for establishing Exclusion Zones (EZ)s are described in the MEC QAPP Addendum UXO SOP 9 (Exclusion Zones).

12. REFERENCES

- DDESB, 2020, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel, Technical Paper 18, Revision 1, June.
- ESTCP, 2015. Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response 2009, Addendum, September.
- USACE, 1995. Construction Quality Management, ER 1180-1-6, September.
- USACE, 2021. Military Engineering and Design Quality Management., ER-1110-3-12, March.
- USACE, 2024. Environmental Quality – Technical Guidance Military Munitions Response Actions, EM 200-1-15, Washington, D.C.

13. REVISION HISTORY

Version	Change Summary	Change Reason	Prepared By	Approved By	Published
.Rev-1.02	Initial Release	No Change	Hecker	Smith, Welk	20240819

Appendix A
SOP Signature Page

The following individuals have read and understand this SOP:

Signature:	Date:

GEO SOP 9
RTK-GPS POSITIONING SYSTEMS

GEO SOP 9

Standard Operating Procedure

RTK GPS Positioning Systems

Original Issue Date: August 2024
Last Review/Implementation Date: August 2024

InDepth Corporation

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Table of Contents

Appendices

Acronyms

ASTM	American Society for Testing and Materials
bgs	Below Ground Surface
BSI	Blind Seed Items
CSV	Comma separated values
DGM	Digital Geophysical Mapping
GPS	Global Positioning System
ISO	Industry Standard Object
IVS	Instrument Verification Strip
MEC	Munitions and Explosives of Concern
MEC QAPP	Munitions and Explosives of Concern Quality Assurance Project Plan
MQO	Measurement Quality Objective
NMEA	National Marine Electronics Association
QC	Quality Control
RTK	Real-Time Kinematic
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
USB	Universal Serial Bus
UXO	Unexploded Ordnance

1. POLICY

InDepth and project personnel will follow processes established in this Standard Operating Procedure (SOP) during setup of positioning systems associated with field activities. This SOP must be distributed to and signed by all personnel performing activities related to this SOP and must be adhered to during the performance of all field activities.

2. PURPOSE & SCOPE

2.1 PURPOSE

The purpose of this SOP is to describe the equipment and general methodologies that are to be used by field personnel when using Real-Time Kinematic (RTK) positioning systems associated with site mapping activities, Digital Geophysical Mapping (DGM) data acquisition target reacquisition and intrusive investigations. This SOP does not detail the use of equipment other than positioning equipment, as this is covered in other equipment SOPs and Manuals. This SOP assumes that experienced personnel that will be using this SOP are familiar with the equipment and are competent in their use.

2.2 SCOPE

The scope of this SOP applies to all DGM project mapping activities and intrusive investigations that require the use of RTK-Global Positioning System (GPS) positioning. Positional accuracy specifications may vary depending on equipment and contract requirements.

3. MAINTENANCE

InDepth personnel are responsible for the maintenance of this SOP.

4. PERSONNEL AND EQUIPMENT

4.1 PERSONNEL

The following personnel will be involved in the set-up, maintenance, and verifying the correct operation of the both RTK-GPS positioning systems:

- Senior Geophysicist
- Quality Control (QC) Geophysicist
- Field Geophysicist
- Field Technician
- InDepth Data Processor
- Unexploded Ordnance (UXO) Technicians (Ahtna)
- GIS Manager (Ahtna)

The Senior Geophysicist is responsible for ensuring SOP guidelines are followed and the data acquisition staff is adequately trained to operate the equipment.

4.2 Equipment and Materials

This section describes the equipment and materials required to implement this SOP. The following is a list of required equipment and materials:

- A Trimble SPS 855 RTK capable GPS base station, or other capable base station, complete with radio antenna, GPS antenna (Geodetic Zephyr Model 2), one fixed-height tripod, one radio antenna tripod (or radio antenna mounting equipment for use with the fixed height tripod) and all cables necessary to connect the antennas to the base station.
- A Trimble SPS 855 or Trimble SPS 985 RTK capable GPS rover, or other capable rovers, complete with a radio antenna (rubber ducky), 2-meter rover pole, data logger mount, and batteries
- A handheld field computer with Trimble Access Software installed.
- Universal serial bus (USB) device compatible for use with the field computer
- Established Control Points, or other required data point files, loaded onto a USB device in comma separated values (CSV) format.
- Sandbags as needed.
- Survey Control Points set by a Professional Land Surveyor (PLS) for base station setup and check in.

5. PROCEDURES

Section 5 presents the basic instrument controls, data logger setup and operation of the RTK GPS systems for use during DGM and intrusive investigation field activities, and site mapping activities as applicable.

5.1 Initialization of RTK GPS

5.1.1 Hardware Setup

a. Load USB drive with established control points from a licensed surveyor or known monuments formatted into a csv file with no header.
b. Set the fixed-height tripod on an established control point for the base station.
c. Install base station (SPS855) and satellite antenna (Geodetic Zephyr Model 2) on the 2m fixed-height survey tripod, connect cable from the satellite antenna to the RTK base station.
d. Setup radio tripod with the radio antenna, connect cable from the radio antenna to the RTK base station.

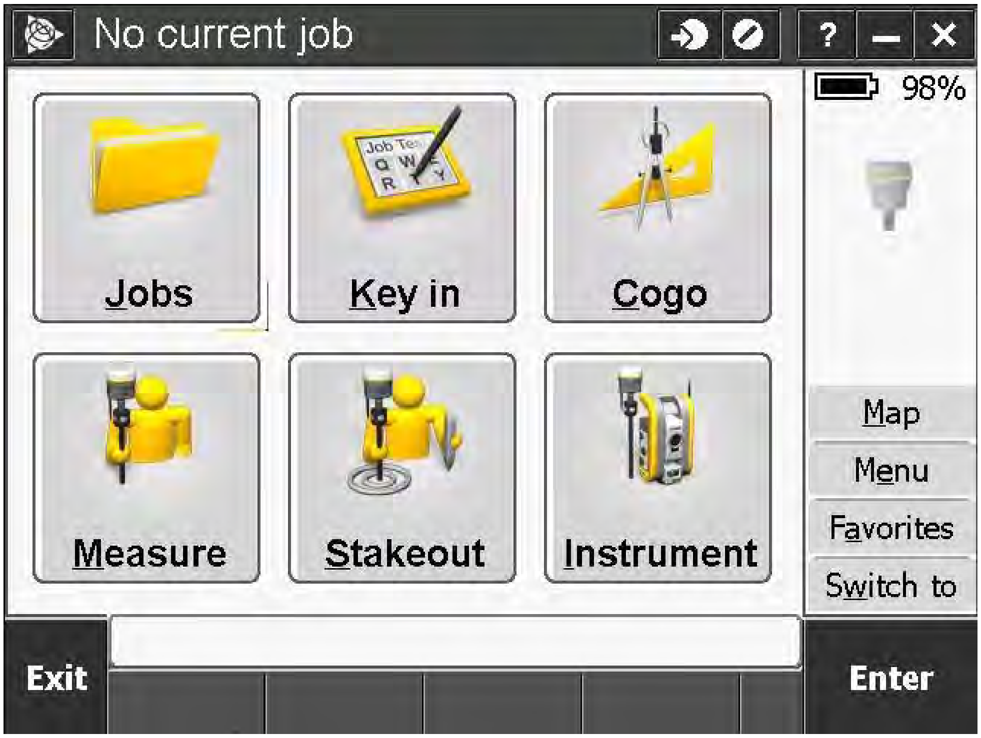
e. Secure the position of the tripod with sandbags, as needed.
f. Level the base station tripod so that the bubble is centered within the level outline, and level radio tripod so that the radio antenna is vertical and stable.

5.1.2 SOFTWARE SETUP

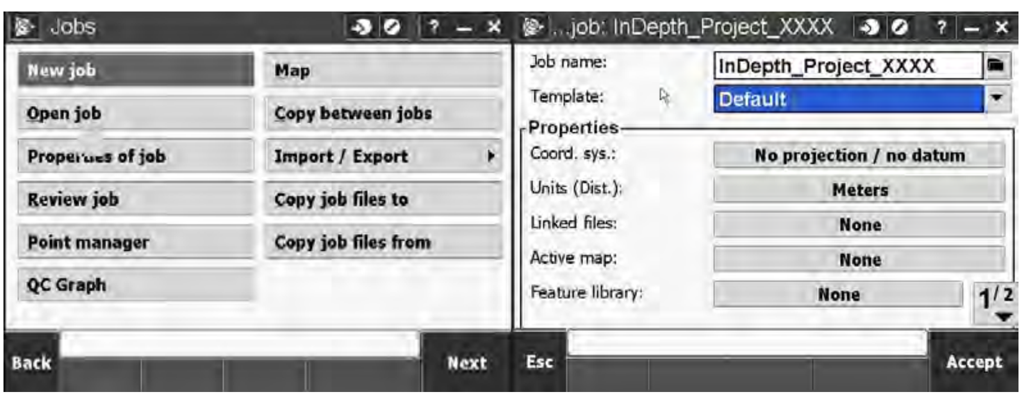
To set up a JOB in Trimble Access software, follow these steps:

a. Open Trimble Access
b. Click "**General Survey**" on the Home Screen

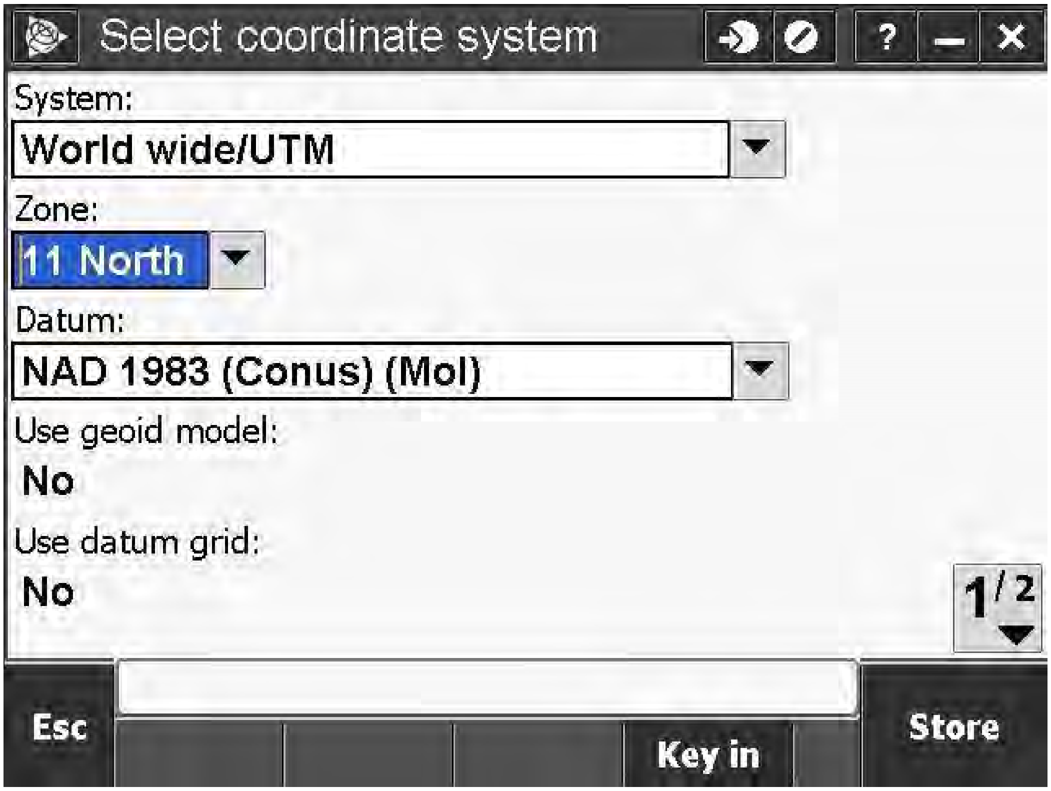
c. On the "**General Survey**" screen, click "**Jobs**" to start a new job.



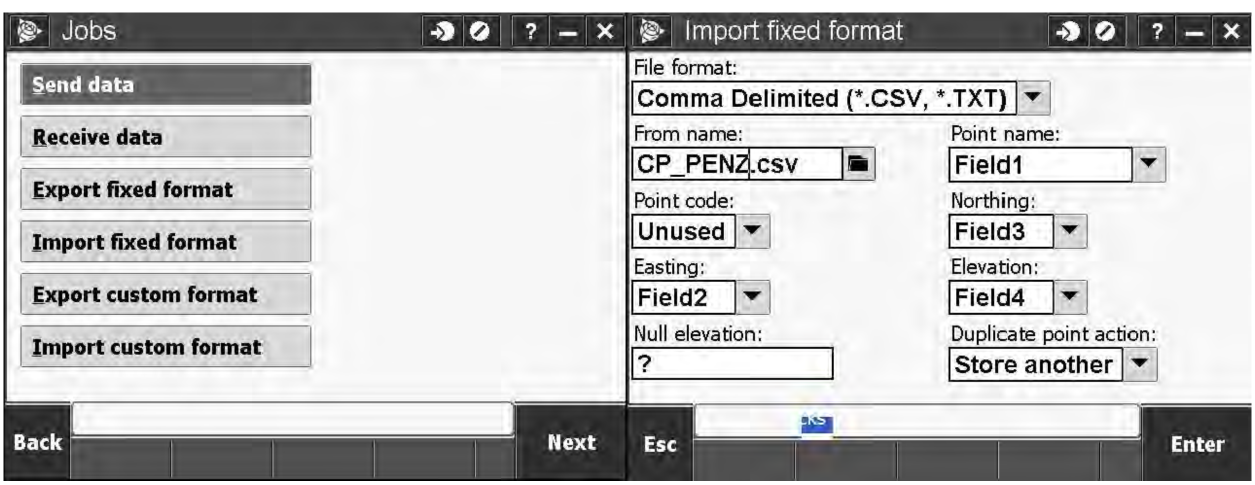
d. On the “**Jobs**” screen, click “**New Job**,” and name it, ex, Project_000X



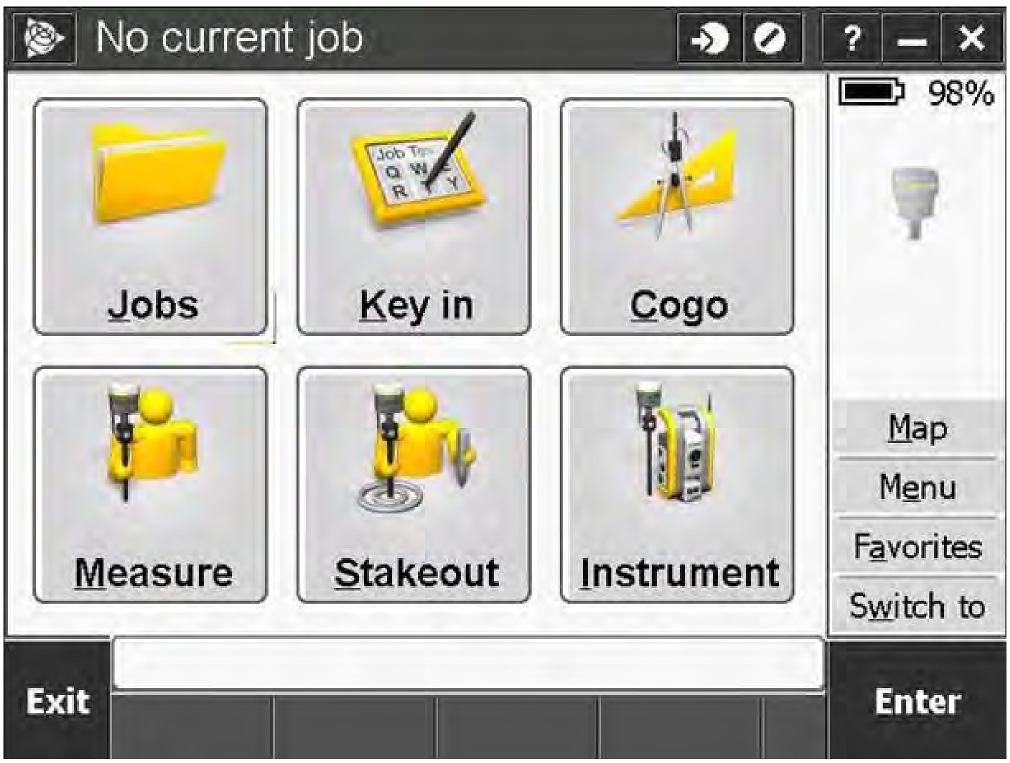
- On the “New Job” screen, click “Coordinate System,” and select from the library, the coordinate system used by the project in accordance with project plans. Most AGC projects mandate the UTM coordinate system **but verify and do not guess at this.**



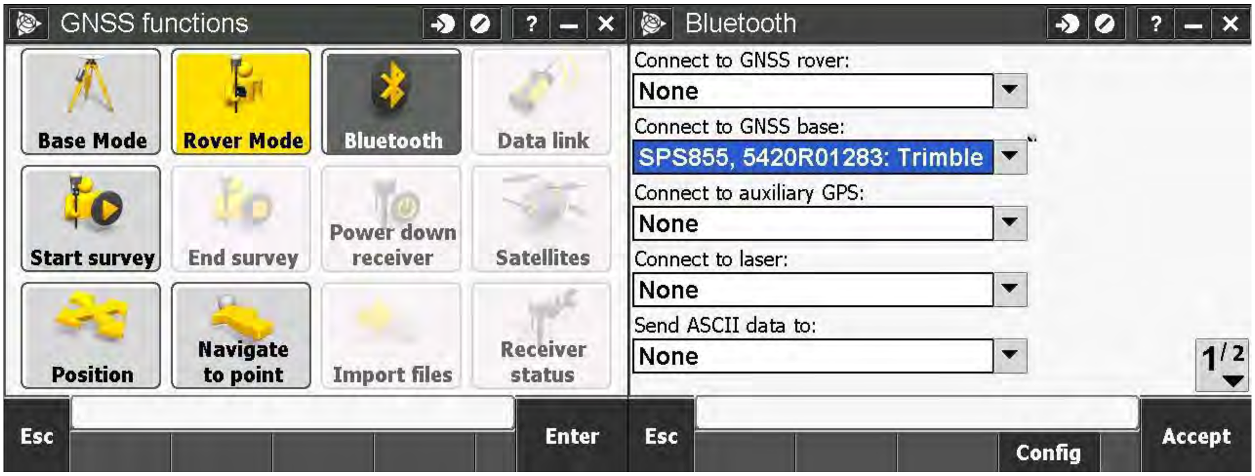
e. After selecting the proper coordinate system and specifying the correct project height, specify units.
f. The project boundary (ESRI shapefile) can then be loaded in the active maps.
g. Load the control points into the newly created job using the field computer.



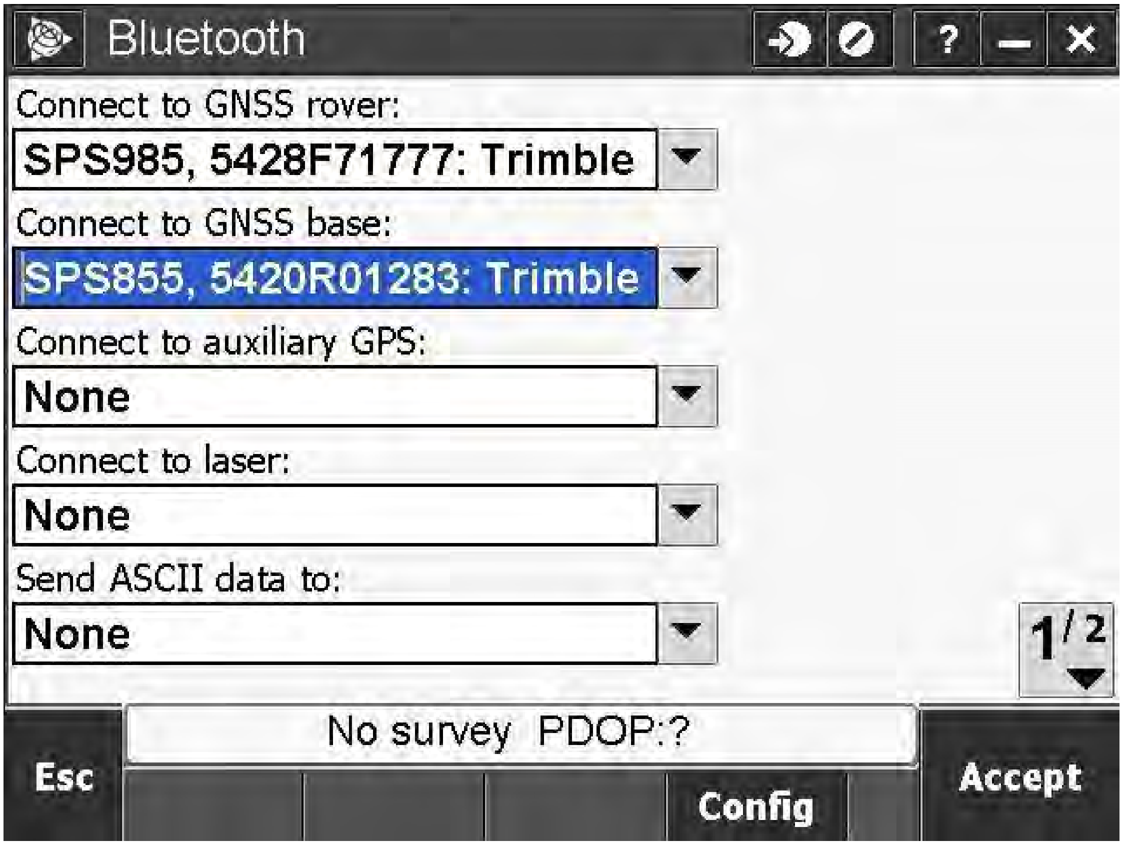
h. To load the control points, you need to insert a USB drive containing your data into the TSC3 and go into the "**Jobs**" settings and click on "**Import/Export**" and click "**Import Fixed Format**" to load the required csv file.



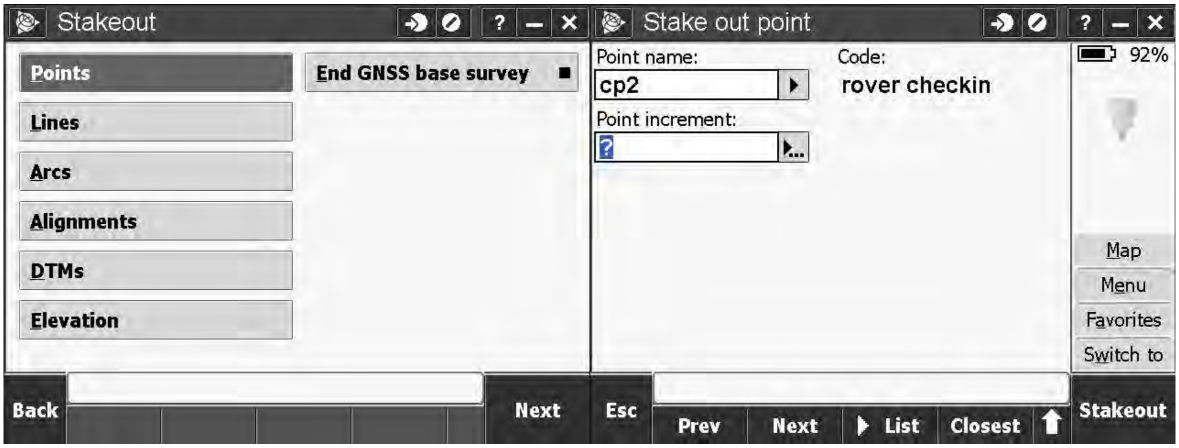
i. Initiate the base start up procedure from the general survey screen by clicking "**Instrument.**"



j. Click “**GNSS Functions**,” and under “**Bluetooth**,” deselect all instruments under Rover, and select the base you want to connect to under “**Base Options**.”
k. Go Back to “GNSS Functions,” click “Base Mode,” click “Start Survey,” and select the appropriate survey style.
l. Select the proper control point that the base is setup on and click “Start.”
m. Go Back to “GNSS Functions” -> “Bluetooth” and select the rover you want to use under Rover Options.

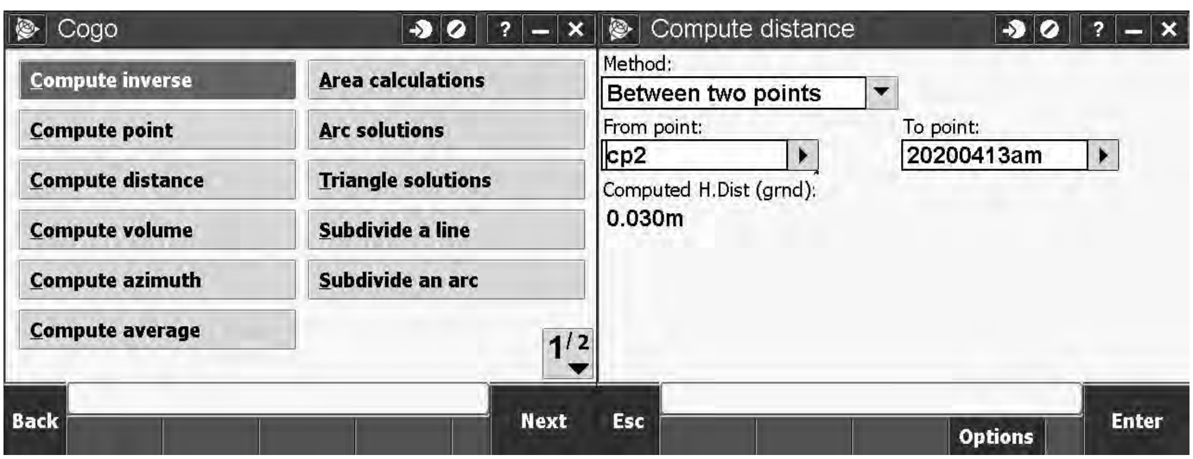


n. When connecting the rover and base, ensure that they both have the same network ID.
o. Go to the general survey home screen, select "**Stakeout**," choose appropriate survey style, select "**Points**," add points to stakeout list.



p. Select nearby control point to navigate to and measure it to ensure the RTK GPS was setup properly.

- Compute the distance between the measured control point and known position using the COGO function and ensure it meets all the project's Measurement Quality Objectives (MQOs).



5.2 DAILY CHECK-IN

After project initialization of RTK GPS is performed, two daily check-ins will take place on an established control at the beginning and end of each day. Ensure the opening check-in is recorded before and after any GPS field activities are performed; including but not limited to the opening IVS is performed and the closing check-in is recorded after closing IVS has been performed. These daily surveyed points must be verified each day in the field to make sure it falls within the required parameters of error offset. The procedures to conduct the check-in are detailed below:

a. Assemble RTK rover head with 2m survey pole and data logger.
b. Open Trimble Access, and load project job.
c. Add the established control point to the stake-out list.
▪ Select the control point for stake-out, navigate to the point and click **"Measure,"** enter the point name as the current date in YYYYMMDD format appended with **"am"** for opening check-in or **"pm"** for closing check-in (i.e., 20200101am)
d. Once point is collected with the bubble level click **"Accept,"** go back to the survey home screen and click **"COGO."**
▪ Under COGO, select "**Compute Distance,"** select the control point and daily check in point to make sure the difference passes the project's MQO's. If the reading fails the established MQO, verify the initial setup, correct any observed issues, document the reason for the initial error and remeasure the control point.
e. At the end of each day the check-in points will be exported to a csv file and transferred to the data processor.

VERIFY COMMUNICATION WITH DGM DATA ACQUISITION DEVICES

After the daily check-in process has been performed and RTK accuracy has been evaluated and accepted the RTK rover should be transferred to the geophysical data acquisition platform to begin the daily data acquisition process. This stage requires determining if the RTK GPS system is outputting the correct National Marine Electronics Association (NMEA) data sentence for the system being deployed. For DGM activities the established data sentence is the GGA global positioning system fix data containing the following information in the specified order. Start of field character $, XXGGA, UTC Timestamp, Latitude, N/S, Longitude, E/W, GPS Quality, number of Satellites, HDOP, Altitude, Altitude units, Geoidal Separation measure, Geoidal Separation units, Age of differential correction, DGPS reference station ID, end of field character *. This setting along with the baud rate, data transmission speed, must be verified within the data acquisition software for each geophysical system. After the NMEA data communication is confirmed daily DGM data acquisition can begin.

6. DATA MANAGEMENT

6.1 DATA INPUTS

The data inputs required for the RTK GPS are established prior to the project start and are required to contain the following information:

- Project Coordinate System.
- Project established units of measure.
- Established Control Points from licensed surveyor or known monuments.

6.2 DATA OUTPUTS

The output data for this SOP will be the daily check-in readings for each RTK GPS system initiated each day and are exported as a .csv file for delivery to the Data Processor each day. The Data Processor will be responsible for evaluation, management, and delivery of these data.

7. QUALITY CONTROL

QC for this SOP exists in the form of repeatable benchmark check-in measurements occurring daily, at the beginning and end of each day. The field technician data processor and GIS Manager will verify these check-in points are within the repeatable error allowed. Daily QC is monitored by comparing the positions of the daily check-in points to the known control points. The differences must meet the project-specific MQOs identified in the Munitions and Explosives of Concern (MEC) Quality Assurance Project Plan (MEC QAPP) Addendum Worksheet #22 and Site-Specific Work Plan. If the data fails the MQOs, a root cause analysis will be performed to determine the source of failure, and the appropriate corrective action will be proposed.

8.REPORTING

Daily RTK GPS check-in points will be stored in electronic format and provided for daily QC and production reports.

9.HEALTH & SAFETY

When operating equipment in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items.

10. REFERENCES

- Trimble Access Manual

11. REVISION HISTORY

Version	Change Summary	Change Reason	Prepared By	Approved By	Published
rev-1.00	Initial Release	No Change	Hecker	Smith, Welk	20240819

Appendix A
SOP Signature Page

The following individuals have read and understand this SOP:

Signature:	Date:

GEO SOP 10
SIMULTANEOUS LOCALIZATION AND MAPPING (SLAM) POSITIONING SYSTEM

GEO SOP 10

Standard Operating Procedure

Simultaneous Localization and Mapping (SLAM) Positioning System

Original Issue Date: August 2024
Last Review/Implementation Date: August 2024

InDepth Corporation

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Table of Contents

Appendices

Acronyms

CSV	Comma separated values
DGM	Digital Geophysical Mapping
GCP	Ground Control Point
GPS	Global Positioning System
ISO	Industry Standard Object
IVS	Instrument Verification Strip
MEC	Munitions and Explosives of Concern
MEC QAPP	Munitions and Explosives of Concern Quality Assurance Project Plan
MQO	Measurement Quality Objective
NEA	Near Earth Autonomy
QC	Quality Control
RTK	Real-Time Kinematic
SLAM	Simultaneous Localization and Mapping
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
UXO	Unexploded Ordnance

1. POLICY

InDepth and project personnel will follow processes established in this Standard Operating Procedure (SOP) during setup of positioning systems associated with field activities. This SOP must be distributed to and signed by all personnel performing activities related to this SOP and must be adhered to during the performance of all field activities.

2. PURPOSE & SCOPE

2.1 PURPOSE

The purpose of this SOP is to describe the equipment and general methodologies that are to be used by field personnel when assembling and using the Near Earth Autonomy (NEA) Topaz Simultaneous Localization and Mapping (SLAM) positioning systems associated with site mapping activities, Digital Geophysical Mapping (DGM) data acquisition and target reacquisition in areas and situations where traditional Real-Time Kinematic (RTK) Global Positioning System (GPS) cannot be used due to canopy cover or terrain. This SOP does not detail the use of equipment other than this positioning equipment, as this is covered in other equipment SOPs and Manuals. This SOP assumes that experienced personnel who will be using this SOP are familiar with the equipment and are competent in their use.

2.2 SCOPE

The scope of this SOP applies to all DGM projects and mapping activities that require the use of SLAM positioning. Positional accuracy specifications may vary depending on equipment and contract requirements.

3. MAINTENANCE

InDepth personnel are responsible for the maintenance of this SOP.

4. PERSONNEL AND EQUIPMENT

4.1 PERSONNEL

The following personnel will be involved in the set-up, maintenance, and verifying the correct operation of the SLAM positioning system:

- Senior Geophysicist
- Quality Control (QC) Geophysicist
- Field Geophysicist
- Field Technician
- InDepth Data Processor
- Unexploded Ordnance (UXO) Technicians

The Senior Geophysicist is responsible for ensuring SOP guidelines are followed and the data acquisition staff is adequately trained to operate the equipment. The Field Lead Geophysicist confirms that the sensor was assembled correctly, either in person or through review of notes, photographs, and QC checklist.

The Field Lead Geophysicist supervises assembly and operation of the sensor during data collection. The Data Processor, processes collected data and documents QC results.

The QC Geophysicist reviews QC testing results and verifies results are documented and meet the project specific measurement quality objectives (MQOs). The qualifications of the personnel implementing this SOP are documented in the Site Specific Munitions and Explosives of Concern (MEC) Quality Assurance Project Plan (MEC QAPP) Addendum Worksheet #4, 7 & 8.

4.2 Equipment and Materials

This section describes the equipment and materials required to implement this SOP. The following is a list of required equipment and materials:

- NEA Topaz SLAM Positioning System
- Field Notebook.
- Survey Control Points set by a Professional Land Surveyor (PLS) - surveyed targets on the ground or stakes along the path which you measure while creating the base map.

5. PROCEDURES

Assemble the NEA Topaz according to the procedures described in the user manual (Kaarta Stencil 2 User Guide for S2-20.02). The Kaarta Stencil 2 User Guide will be used until the Topaz manual is published, as this is a new model of the SLAM positioning system for which there is not a Topaz-specific manual. The following is a brief summary of the steps required to generate position data using the Mapping and Localization modes. Mapping is the process whereby Stencil determines how it needed to move to match up successive laser scans from a 3D lidar. In doing so, it can create a position estimate of where it is in a 3D registered point cloud. The Localization mode refers to the process where Stencil is able to match its current scan against a prior map. Detailed information of the method to create globally.

5.1 CREATE A BASEMAP

Use Method 3, to create Geo-referenced maps based on PLS established ground control points (GCPs).

a. Using Mapping Mode collect a basemap, starting ~50ft west of the first grid coordinate and then collecting eastward towards it.

b. Record keypose over known points during collection. Be sure to take key poses with the bottom of the monopod at the same reference level as the provided surveyed points. Use a bubble level to ensure pitch and roll are close to zero degrees (<1.0 degree). Wait until the collection window closes before moving the Topaz again.

c. Make turns in a wide, rounded pattern rather than sharp changes in direction. Do not rotate the stencil as you are scanning. Allow at least 50 feet after your last measured point before stopping data collection.

5.2 PROCESS THE BASEMAP

Convert GCPs to GPS; in same order as they were recorded during "**Record Keypose**."

a. Run Loop closure.

b. Set the Min# and Max# of poses per stack to 10 and uncheck the "**Enabled?**" checkbox under the Loop Closure tab.

c. Under the GNSS tab, change a) Trajectory time offset determination to "**Manual only – 0"**, b) GPS horizontal and vertical weights to 5.0, and c) Trajectory in Camera Coordinate system? to "**Laser coordinate system – 0".**

d. Evaluate the map using **CloudCompare.** Look for double registrations and separation of ground into two layers. Also check the trajectory file within **CloudCompare**. The confidence should be greater than 50,000 for the entire trajectory, except for the beginning and end portions.

e. Re-run loop closure or replay if necessary.

f. Check results using "UXO QC Tool;" MAX offset should not exceed .10 (m).

5.3 Localize Within a Basemap

Create grid starting locations in Excel, saving the resulting file as a commas separated values (CSV) format file. To create the starting locations file, perform the following:

a. Select the grid stake to use as the map origin. This is typically the Southwest corner.

b. Subtract global coordinates from the surveyed stake locations to find their relative starting positions for the local map.

c. Add height above ground that the Topaz will be placed to the elevation value.

d. Run the "**Create Grid Starting Locations**" script using the local CSV file that was created in Steps 1-3. If the grid system is not perfectly East-West trending, adjust the Initial heading to compensate when localizing grid corners.

e. Using Localization Mode, Choose Map for Localization. The direction the Stencil is facing will the local X axis of the point cloud. The Y axis will be to the left. It is recommended to start scanning pointing east, then X would be east, and Y would be north. It is required that the Topaz be within a half meter in X, Y and Z and 15 degrees yaw of the selected starting position.

f. Check Localization Confidence Value using Global Pose. Generally, below 10,000 is bad, 10,000 – 50,000 is marginal, above 50,000 is good and above 100,000 is excellent. The confidence value can go into the millions if there are a large number of edge and corner features in the environment. In open environments, the confidence may not get past marginal.

g. Confirm pseudo NMEA output.

h. Connect to metal detector, see *KAARTA REPORT 2020-11-001*.

5.4 Perform Positional QC Check

- Option 1 locate Topaz, load waypoint, place system at a waypoint, record waypoint.

- Option 2 locate Topaz, place system at known point record cued measurement.
- Option 3 locate Topaz, place system at know point, record seconds of dynamic measurements.

6. DATA MANAGEMENT

6.1 DATA INPUTS

- A listing of all the global grid coordinates for the sections to be mapped; Grid_ID, X_utm, Y_utm, and elevation. The grid coordinates should be divided into individual maps.
- Project Coordinate System.
- Established Control Points from licensed surveyor or known monuments.
- The current Kaarta user manual and supplemental positioning reports provide assembly, processing and testing steps required by this SOP and will be used until the NEA Topaz manual is released.

6.2 DATA OUTPUTS

- Basemap project folder containing keyposes, point cloud, settings, and pseudo-GPS files. Any edits to Topaz files will preserve the original filename with the final edited files retained with _edit added to filename.
- For daily surveys, the project folder is retained on an external hard drive in the field.
- Daily QC check file provided with geophysical data and field notes and complete scan files will be archived at end of project. Scan files will be available for transfer to the Senior Geophysicist, if required for post processing the data for positional corrections.

7. QUALITY CONTROL

QC procedures are performed throughout the project. Performance of the required QC checks will be documented by the Field or Senior Geophysicist. The QC Geophysicist will verify and document successful completion of the procedures in the Geophysics Daily QC Report.

The MQOs (MEC QAPP Addendum Worksheet #22) for this SOP is verification that the assembly and configuration instructions have been followed. The IVS data (MEC QAPP Addendum, Attachment B GEO SOP 1) will be used to observe the location accuracy of the predicted IVS items. Daily AM and PM positional QC checks will be performed.

8. REPORTING

Assembly and performance of the Topaz will be documented by the Field or Senior Geophysicist and will be verified by the QC Geophysicist.

The field geophysicist/technician will measure the location of a known point and compare the result to the actual location (ground truth). Offsets less than 10 cm will satisfy the MQO. This check will be performed each time a new point cloud is used, storing the recorded point identified with the date in the field log. If gloves are worn when operating the touchscreen, a stylus must be used to control the tablet. The file directory will be checked immediately after saving the file to ensure the command was recognized and the file was saved to the tablet.

9. HEALTH & SAFETY

When operating this equipment in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to project personnel from potential exposure to explosives, explosive components, and munitions items.

10. REFERENCES

- KAARTA REPORT 2021-06-001, Method 3: Using PLS Stakes to Create Geo-referenced Maps, Kaarta, Sept 8, 2021

- KAARTA REPORT 2020-11-001, Using Stencil for Positioning, Kaarta, May 12, 2021
- Kaarta Stencil 2 User Guide for S2-20.02, Kaarta, February 2020 – This manual will be used until the release of the Topaz-specific manual.

11. REVISION HISTORY

Version	Change Summary	Change Reason	Prepared By	Approved By	Published
rev-1.00	Initial Release	No Change	Hecker	Smith, Welk	20240819

Appendix A
SOP Signature Page

The following individuals have read and understand this SOP:

Signature:	Date:

UXO SOP 1
FCA INSTALLATION AND USE

UXO SOP 1:
FCA Installation and Use

Document Number	UXO SOP 1: FCA Installation and Use
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28, 2025

Approvals

February 28, 2025

Christopher Ohland Date
Southwest Environmental Quality Assurance and Compliance Program Manager

February 28, 2025

Bruce Wilcer Date
Southwest Environmental Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

“	inches
Ahtna	Ahtna Global, LLC
FCA	Function Check Area
GPS	Global Positioning System
ISO	industry standard object
MEC	munitions and explosives of concern
mm	millimeters
QAPP	Quality Assurance Project Plan
QC	quality control
RTK	real-time kinematic
SOP	standard operating procedure
SSDM	Site-Specific Data Manager
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this standard operating procedure (SOP) for work related to the installation and use of a Function Check Area (FCA). This SOP must be distributed to and the signature page in Appendix A signed by all personnel performing activities related to this SOP. Personnel must adhere to these procedures as field activities are performed.

2.0 Purpose

The purpose of this SOP is to describe the equipment and general methodologies that are to be used by the Unexploded Ordnance Quality Control Specialist (UXOQCS) when installing an FCA. Additionally, this SOP describes the use of an FCA. This SOP does not detail the use of the equipment described herein. This SOP assumes that experienced personnel using this SOP are familiar with the equipment and are competent in their use.

3.0 Scope

The information presented in this SOP is generally applicable to munitions and explosives of concern (MEC)-related project sites.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Equipment

The following equipment is associated with the installation and use of an FCA:

- Schonstedt GA-52Cx (or equivalent) and Whites DFX 300 (or equivalent) handheld metal detector
- Real-time kinematic (RTK)-Global Positioning System (GPS)
- Field logbook (or digital tablet)
- One 100-foot tape measure
- Shovel or other similar device for placing the FCA items
- Industry Standard Objects (ISOs; small, medium, and large size)

ISOs are Schedule 40 pipe nipples, threaded on both ends, made from black welded steel, manufactured to an ASTM International specification. Although only small ISOs are anticipated to be used on this project, three sizes of ISOs exist. They are described in Table 5-1 and shown on Figure 5-1.

Table 5-1: Three Sizes of ISOs

Item	Nominal Pipe Size	Outside Diameter	Length	Part Number[1]	ASTM Specification
Small ISO	1"	1.315" (33 mm)	4" (102 mm)	44615K466	A53/A773
Medium ISO	2"	2.375" (60 mm)	8" (204 mm)	44615K529	A53/A773
Large ISO	4"	4.500" (115 mm)	12" (306 mm)	44615K137	A53/A773

[1] Part number from the McMaster-Carr catalog.

Notes:
For acronym definitions, please refer to the Acronyms and Abbreviations list at the front of this document.

Figure 5-1: Three Sizes of ISOs

6.0 Personnel

The UXOQCS is responsible for the installation of an FCA. During the installation, one of the FCA installation team members is to be a UXO-qualified technician.

7.0 Procedures

The purpose of the FCA is to verify that handheld metal detection units being employed are operating properly. FCA tests are not considered part of the geophysical system verification process because they lack a recorded response, and the rigorous evaluations used for digital systems. An FCA may be constructed to perform additional function tests on analog handheld metal detector instruments while in the field. If installed, additional FCAs will include a minimum of two small ISOs buried vertically with their center of mass being 5 inches and 12 inches below ground surface. All ISOs used in FCAs will be of the small, medium and large size as described in Table 5-1 of this SOP.

Prior to the installation of an FCA, handheld metal detectors are to be verified to be functioning properly at the preexisting FCA that is located adjacent to Building 4522 area. This preexisting FCA is seeded with seven ISOs (Table 7-1).

Table 7-1: FCA Located Adjacent to Building 4522 Area

ID	Description	Easting (X)	Northing (Y)	Orientation 0 = horizontal 90 = nose down	Depth (inches) to top of item
1	Small ISO	5745543.833	2130830.407	0	3
2	Large ISO	5745544.140	2130835.135	45	12
3	Medium ISO	5745544.839	2130839.972	0	6
4	Small ISO	5745545.308	2130845.030	45	6
5	Medium ISO	5745545.638	2130850.451	90	12
6	Large ISO	5745546.637	2130854.933	0	26
7	Small ISO	5745546.653	2130860.019	90	5
Corner	Northeast Corner	5745555.009	2130900.729		
Corner	Northwest Corner	5745549.776	2130901.488		
Corner	Southeast Corner	5745545.765	2130826.957		
Corner	Southwest Corner	5745540.927	2130827.426		

Notes:
Coordinates are North American Datum of 1983/California State Plane Zone 4 (U.S. Survey Feet).

The following steps are to be followed during FCA installation operations:

- Procure ISOs.
- Verify that the FCA location is clear of anomalies prior to installation.
- Install FCA items.
- Record GPS coordinates and required information for all FCA items installed as described in Section 8.0 (Documentation).

Handheld metal detectors are to be tested by UXO team members prior to the start of each day at the FCA. If the handheld metal detector can detect all of the items in the FCA, then the instrument will be considered to be functioning properly. The Field Team Leader is to record the results of each team member's FCA test in their logbook (or digitally) daily. FCA data are to be provided to the Site-Specific Data Manager (SSDM) once the operation has been completed.

8.0 Documentation

The following information is to be recorded for each FCA item that is installed:

- FCA unique identification number
- GPS coordinate (X,Y)
- Seed type (ISO)
- Depth (center of mass [inches and centimeters])
- Orientation (0 = horizontal, 90 = nose down)
- Date installed
- Results of each team member's FCA test

Upon completion of FCA installation, FCA data are to be provided to the SSDM daily.

9.0 Quality Control

An inspection checklist specific to this SOP is located at the end of this SOP (Appendix B, Three-Phase Quality-Control Checklist). Measurement performance criteria for FCA installation can be found in Worksheet #12 of the MEC Quality Assurance Project Plan (QAPP) Addendum. Worksheets #31, #32, and #33 of the MEC QAPP Addendum describe who will conduct the quality control (QC) inspection for this definable feature of work, along with the frequency of the Follow-up-Phase QC inspections.

10.0 Health and Safety

The installation of FCA items in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items. Safety measures are to be addressed in the Accident Prevention Plan and Site Safety and Health Plan to mitigate these hazards.

11.0 References

Environmental Security Technology Certification Program, 2009. *Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response*. July.

United States Army Corps of Engineers, 2024. Engineering Manual (EM) 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions*. March.

Appendix A: SOP Signature Page

Project Information
UXO SOP 1 – FCA Installation and Use
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	Date:

Appendix B: Three-Phase Quality-Control Checklist

Project Information
UXO SOP 1 – FCA Installation and Use
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist

Item	Section	Inspection Point Verify the Following:	Yes	No	NA	Comments
1	Signature Page	All personnel have signed the SOP Signature Page (Appendix A).				*(P)*
2	5.0	Required equipment is available: • Schonstedt GA-52Cx and Whites DFX 300 hand-held metal detectors (or equivalent) • RTK-GPS • Field Logbook (or digital tablet) • One 100-foot tape measure • Shovel or other similar device for placing the FCA items in the subsurface • ISOs (small, medium, and large size)				*(I),(F)*
3	5.0	Small, medium, and larger ISOs are being used.				*(I),(F)*
4	7.0	A minimum of two ISOs are being installed vertically with the center of mass being 5 inches and 12 inches below ground surface.				*(I),(F)*
5	7.0	Handheld metal detectors are functioning properly at the pre-existing FCA located adjacent to Building 4522 area. Results of FCA tests are recorded digitally or in the Field Team Leader's logbook and provided to the SSDM daily				*(I),(F)*
6	7.0	The FCA location is clear of anomalies prior to installation.				*(I),(F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
7	7.0 and 8.0	The position of items and required information/data are recorded and provided to the SSDM daily.				*(I),(F)*

Punch list Items	
No.	

Conducted by: ______________________________ Date: ______________________________

Approved by: ______________________________ Date: ______________________________

UXO SOP 2
TECHNOLOGY AIDED SURFACE MEC REMOVAL

UXO SOP 2:
Technology-Aided Surface MEC Removal

Document Number	UXO SOP 2: Technology-Aided Surface MEC Removal
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28, 2025

Approvals

Christopher Ohland — February 28, 2025
Christopher Ohland — Date
Southwest Environmental Quality Assurance and Compliance Program Manager

Bruce Wilcer — February 28, 2025
Bruce Wilcer — Date
Southwest Environmental Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LLC
BRA	Basewide Range Assessment
FCA	Function Check Area
GPS	Global Positioning System
ID	identification
MD	munitions debris
MEC	munitions and explosives of concern
MPPEH	material potentially presenting an explosive hazard
MRS	Munitions Response Site
QAPP	Quality Assurance Project Plan
QC	quality control
RRD	range-related debris
RTK	real-time kinematic
SOP	standard operating procedure
SSDM	Site-Specific Data Manager
UXO	unexploded ordnance

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this standard operating procedure (SOP) for all work related to technology-aided surface munitions and explosives of concern (MEC) removal operations. This SOP must be distributed to and the signature page located in Appendix A signed by all personnel performing activities related to this SOP. Personnel must adhere to these procedures as field activities are performed.

2.0 Purpose

The purpose of this SOP is to describe the equipment and general methodologies that are to be used by the technology-aided surface MEC removal team. This SOP does not detail the use of the equipment that is described herein. This SOP assumes that experienced personnel using this SOP are familiar with the equipment and are competent in their use.

3.0 Scope

The information presented in this SOP is generally applicable to all MEC-related project sites.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Equipment

The following equipment is associated with technology-aided MEC removal:

- Schonstedt GA-52Cx (or equivalent) and Whites DFX 300 (or equivalent) handheld metal detectors
- Field logbook
- Digital tablet
- Real-time kinematic (RTK)-Global Positioning System (GPS)
- Rope (for lane delineation)
- Three 100-foot tape measures
- Shovels or other similar devices for removing items that protrude from the ground surface and are to be removed
- 5 gallon buckets
- Hand mattocks

6.0 Personnel

The Senior Unexploded Ordnance Supervisor, Unexploded Ordnance (UXO) Team Leader, and the UXO team are responsible for the technology-aided surface MEC removal operation. The Technology-Aided Surface MEC Removal Team will include the following personnel:

- One UXO Technician III Team Leader

- Two (minimum) UXO Technician IIs
- Four (maximum) UXO Technician Is

The two-person rule is always to be followed.

7.0 Procedures

Following vegetation removal, a technology-aided surface MEC removal operation will be conducted over the entire surface of the area to be investigated. Site conditions (e.g., difficult terrain, trees) may prevent technology-aided surface MEC removal from being conducted in certain areas. The Senior Unexploded Ordnance Supervisor and Unexploded Ordnance Safety Officer will evaluate areas where surface MEC removal is deemed unsafe on a case by case basis. The technology-aided surface MEC removal team will be equipped with both the Schonstedt GA-52Cx magnetometer (or equivalent) and the Whites DFX 300 handheld metal detectors (or equivalent), as specified in Section 5.0. Should non-ferrous ordnance items be anticipated, the Whites DFX 300 handheld instrument (or equivalent) (Section 5.0) is to be defined in the Site-Specific Work Plan as the instrument of choice.

Prior to conducting technology-aided surface MEC removal operations, handheld metal detectors are to be verified to be functioning properly at the Function Check Area (FCA) that is located adjacent to Building 4522 area. Results of these FCA tests are to be recorded digitally or in the UXO Team Leader's logbook.

During technology-aided surface MEC removal operations, the UXO Team Leader will use 100-foot lines (rope) to mark out search lanes within the grid to be investigated. Each search lane will be approximately 5 feet wide, with the Team Leader ensuring that each lane is swept in a manner that will cover the entire lane width. The UXO Technicians will investigate all anomalies identified by the handheld metal detector that exist on the soil surface. If masticated vegetation is covering the soil surface, the UXO Technician will remove the vegetation at the location of the anomaly identified by the handheld metal detector to expose the soil surface. Target vehicles and other range-related debris (RRD) will be inspected for MEC and material potentially presenting an explosive hazard (MPPEH). Target vehicles and large RRD items may be removed using mechanical equipment as necessary.

The location of each MEC and MPPEH item will be recorded using a RTK-GPS. In areas with limited or no GPS reception, the item will be recorded using tape measurement from the southwest grid corner location to acquire the item's georeferenced location. Each MEC and MPPEH item identified by the UXO teams will be tracked by item type, description, and weight. Munitions debris (MD) will be tracked by general item type and estimated weight on a grid-by-grid basis. If MD indicative of munitions with sensitive fuzes is noted, this information will be included on a grid-by-grid basis. The estimated weight of RRD per grid will be recorded. MEC, Discarded Military Munitions, MD, and MPPEH and that are located will be managed in accordance with the procedures described in MEC Quality Assurance Project Plan (QAPP) Addendum, Attachment B UXO SOP 5 (MEC and MPPEH Management).

8.0 Documentation

The following information is to be digitally recorded by the UXO Team Leader for each grid that is to have technology-aided surface MEC removal operations. This data is to be provided to the Site-Specific Data Manager (SSDM) at the end of each day.

- Date
- Contractor
- Team identification (ID)
- Team Leader
- Munitions Response Site (MRS) ID
- Unit ID
- Operation type
- Grid type
- Instrument type
- Grid ID
- Grid 100% done? (Yes or No)
- MD weight (pounds)
- RRD (pounds)
- Number of MPPEH items
- Types of items with sensitive fuzes
- Weight (pounds) of items with sensitive fuzes
- Field comments
- GPS coordinates of areas deemed unsafe or inaccessible

The following information is to be recorded for each located MEC/MPPEH item:

- Date
- Contractor
- Team ID
- Team Leader
- MRS ID
- Unit ID
- Operation type
- Grid type
- Instrument type
- Grid ID
- Item ID
- Is demolition required? (Yes or No)
- Is the item located within a burial pit? (Yes or No)
- Item type
- Initial disposition
- Item easting

- Item northing
- Item description
- Quantity
- Depth
- Comments

To assist in the Basewide Range Assessment (BRA), the Team Leader will document the following items that are found during technology-aided surface MEC removal operations:

- Presence of targets (e.g., pop-up target pull cables, targets, target line, hard target)
- Firing lines
- Firing points
- Range fan markers
- Berms
- Craters
- Pits
- Slabs
- Structures
- Disturbed area (not mastication)
- Survey benchmarks
- Areas with an indication of soil contamination from bullets, bullet fragments, bullet mists, and/or explosive constituent disposal or release of stained soil potentially indicative of petroleum hydrocarbon or bulk explosives contamination
- Areas of 10-percent spent ammunition based on visual evidence
- Asphalt
- Broken Window Glass
- Electrical Conduit
- Impact Hole
- Junction Box
- Mound
- Non-MD Debris (i.e. individual RRD items or other items of interest for the BRA)
- Other
- Pipelines
- Pipes
- Road
- Suspicious Bare Area
- Swale
- Trail
- Trench
- Utility Pole
- Wash
- Wood Debris

9.0 Quality Control

An inspection checklist specific to this SOP is located in Appendix B (Three-Phase Quality-Control Checklist). Measurement performance criteria for technology-aided surface MEC removal operations can be found in Worksheet #12 of the MEC QAPP Addendum. Worksheets #31, #32 and #33 of the MEC QAPP Addendum describe who will conduct the quality-control (QC) inspection for this definable feature of work, along with the frequency of the Follow-up-Phase QC inspections.

10.0 Health and Safety

Conducting technology-aided surface MEC removal operations in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items. Safety measures are to be addressed in the Accident Prevention Plan and Site Safety and Health Plan to mitigate these hazards. Procedures for establishing Exclusion Zones are described in the MEC QAPP Addendum, Attachment B UXO SOP 9 (Exclusion Zones).

11.0 References

United States Army Corps of Engineers, 2024. Engineering Manual (EM) 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions*. March.

Appendix A: SOP Signature Page

Project Information
UXO SOP 2: Technology-Aided Surface MEC Removal
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	**Date:**

Appendix B: Three-Phase Quality-Control Checklist

Project Information
UXO SOP 2: Technology-Aided Surface MEC Removal
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
1	Signature Page	All personnel have signed the SOP Signature Page (Appendix A).				*(P)*
2	6.0	Required equipment is available: • Schonstedt GA-52Cx and Whites DFX 300 handheld metal detectors (or equivalent) • Field logbook • Digital tablet • RTK-GPS • Rope (for lane delineation) • Three 100-foot tape measures • Shovels or other similar devices for removing items that protrude from the ground surface that are to be removed • 5 gallon buckets • Hand mattocks				*(I), (F)*
3	7.0	Schonstedt GA-52Cx (or equivalent) and Whites DFX 300 (or equivalent) instruments are being used.				*(I),(F)*
4	7.0	Handheld metal detectors were checked for functionality at the FCA prior to use.				*(I),(F)*
5	7.0	100-foot lanes (rope) were used to mark out search lanes within the grid to be investigated.				*(I),(F)*
6	7.0	Each search lane is approximately 5 feet wide.				*(I),(F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
7	7.0	Team members investigate all anomalies that exist on the surface as identified by the handheld metal detector.				*(I),(F)*
8	7.0	Vegetation on the surface is moved by the UXO Technician to expose the soil surface.				*(I),(F)*
9	7.0	Target vehicles and RRD are inspected for MEC and MPPEH.				*(I),(F)*
10	7.0	The location of MEC items is recorded (tape measurements or GPS).				*(I),(F)*
11	7.0	MEC, MPPEH, and MD are managed in accordance with UXO SOP 5 (MEC and MPPEH Management).				*(I),(F)*
12	8.0	Required data/documentation are recorded.				*(I),(F)*
13	8.0	Data are recorded for the BRA.				*(I),(F)*
14	8.0	Data are provided to the SSDM at the end of each day.				*(I),(F)*

Punch list Items	
No.	

Conducted by: ______________________________ Date: ______________________________

Approved by: _______________________________ Date: ______________________________

UXO SOP 3
INSTRUSIVE INVESTIGATION USING ANALOG METHODS

UXO SOP 3:
Intrusive Investigation Using Analog Methods

Document Number	UXO SOP 3: Intrusive Investigation Using Analog Methods
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28, 2025

Approvals

Christopher Ohland — February 28, 2025

Christopher Ohland — Date
Southwest Environmental Quality Assurance and Compliance Program Manager

Bruce Wilcer — February 28, 2025

Bruce Wilcer — Date
Southwest Environmental Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LLC
BRAC	Base Realignment and Closure
EM61	Geonics EM61 Series metal detector
EMM	earth moving equipment
FCA	Function Check Area
GPS	Global Positioning System
MD	munitions debris
MEC	munitions and explosives of concern
MPC	measurement performance criterion
MPPEH	material potentially possessing an explosive hazard
MRS	Munitions Response Site
OESS	Ordnance and Explosives Safety Specialist
QAPP	Quality Assurance Project Plan
QC	quality control
RRD	range-related debris
RTK	real-time kinematic
SOP	standard operating procedure
SSDM	Site-Specific Data Manager
SSWP	Site-Specific Work Plan
SUXOS	Senior Unexploded Ordnance Supervisor
TM	Technical Memorandum
USACE	United States Army Corps of Engineers
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this standard operating procedure (SOP) for all work related to intrusive investigations using analog methods (also known as “mag, flag, and dig”). This SOP must be distributed to and the signature page located in Appendix A signed by all personnel performing activities related to this SOP. Personnel must adhere to these procedures as field activities are performed.

2.0 Purpose

The purpose of this SOP is to describe the equipment and general methodologies that are to be used by the analog intrusive investigation team. This SOP does not detail the use of all equipment described herein. This SOP assumes that experienced personnel using this SOP are familiar with the equipment and are competent in their use.

3.0 Scope

The information presented in this SOP is generally applicable to all munitions and explosives of concern (MEC)-related project sites.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Equipment

The following equipment is associated with performing analog intrusive investigations:

- Schonstedt GA-52Cx (or equivalent) and Whites DFX 300 (or equivalent) handheld metal detectors
- Geonics EM61MK2 metal detector
- Juniper Systems TK600 data logger, or equivalent for EM61MK2 (if used)
- Two Geonics batteries (if used)
- Field logbook
- Digital tablet
- Real-time kinematic (RTK)-Global Positioning System (GPS)
- Rope (for lane delineation)
- Three 100-foot tape measures
- Pin flags
- Shovels or other similar devices for removing underground items
- 5 gallon buckets

6.0 Personnel

The Senior Unexploded Ordnance Supervisor (SUXOS), Unexploded Ordnance (UXO) Team Leader, and UXO Team are responsible for analog intrusive investigation operations. The analog intrusive investigation team will include the following personnel:

- One UXO Technician III Team Leader
- Two (minimum) UXO Technician IIs
- Four (maximum) UXO Technician Is

The two-person rule is always to be followed.

7.0 Procedures

An analog intrusive investigation may be conducted by utilizing analog detection instruments ("mag, flag, dig") or excavation and sifting. The procedures in this SOP relate only to an intrusive investigation based on the use of analog instruments.

Subsurface MEC removal areas will be identified in site-specific work plans, or Technical Memorandum (TM) developed following the completion of surface MEC removal and DGM survey. Factors such as topography (i.e., slope), munitions potentially presenting an explosive hazard (MPPEH) and MEC recovered during instrument aided surface MEC removal, anomaly density, and the potential presence of munitions with sensitive fuzes could be considered to determine, in coordination with USACE and the Base Realignment and Closure (BRAC) Office, whether analog methods should be used for subsurface MEC removal. The SUXOS and UXO Quality Control Specialist (UXOQCS), with input from the Ahtna Site Project Manager, will make the decision whether handheld metal detectors or the EM61MK2 in analog mode (or both) are to be used, based on the terrain and depth of clearance (as specified in the Site-Specific Work Plan [SSWP]). The SUXOS and UXOQCS (with input from the Ahtna Site Project Manager) will also decide if the EM61MK2 is to be used first.

In general, analog intrusive investigation team will use handheld metal detection instruments, including the Schonstedt GA-52Cx magnetometer (or equivalent) and the Whites DFX 300 handheld metal detector (or equivalent). The Schonstedt is the default instrument for the analog intrusive investigation team because the majority of anomalies on Military Munitions Response Program sites are ferrous in nature and because the Schonstedt easily pinpoints the anomaly location. If terrain allows, and if the Geonics EM61MK2 is not chosen as the primary metal detection instrument, the EM61MK2 is then to be used in analog mode to verify that all anomalies within a grid/area have been located and removed after the handheld analog intrusive investigation has been completed.

7.1 Intrusive Investigation

Prior to conducting analog intrusive investigation operations, all handheld metal detectors are to be verified to be functioning properly at the Function Check Area (FCA) that is located adjacent to Building 4522 area. If an EM61MK2 is to be used, it is to be function-checked prior to use in accordance with procedures described in Section 7.2.

The following basic techniques will be used during the analog intrusive investigation:

- The UXO Team Leader will use 100-foot lines (rope) to mark out search lanes within each grid to be investigated. Each search lane will be approximately 5 feet wide, with the UXO Team Leader ensuring that each lane is swept in a manner that will cover the entire lane width. If the EM61MK2 is to be used, the operator is to use the rope as the center of the lane for one pass and is to then go down the center of the lane for the next pass and is to repeat this procedure until the entire grid/area has been inspected.
- The UXO Technician will then locate anomalies along each lane with a handheld metal detector and/or the Geonics EM61MK2. If an anomaly is located with the EM61MK2 but is not able to be "found" with the Schonstedt, then the Whites DFX 300 (or equivalent) is to be used because the anomaly may be of a material that is non-ferrous (aluminum, brass, etc.), and can be detected with the Whites device. Pin flags may be placed by the UXO Technician at each anomaly location (but are not required).
- Until an anomaly is identified, it will be assumed that the anomaly is MEC, and the excavation will be initiated adjacent to the anomaly. The excavation will continue until the excavated area has reached a depth below the top of the anomaly as determined by frequent inspection with a handheld metal detector or until the maximum depth (as described in the SSWP) has been reached.
- Using progressively smaller and more delicate tools to carefully remove the soil, the excavation team will expand the sidewall to expose the metallic item in the wall of the excavation for inspection and identification without moving or disturbing the item.
- Once the item is exposed for inspection, the excavation team will determine if it is potential MEC or MPPEH requiring demolition. If the anomaly is MEC or MPPEH, the item will be managed in accordance with procedures described in the MEC Quality Assurance Project Plan (QAPP) Addendum, Attachment B UXO SOP 5 (MEC and MPPEH Management). If the anomaly is found not to be MEC or MPPEH, it will be removed, and the anomaly location will be rechecked with the handheld metal detector to ensure that a hazardous item does not still exist at that location. Once the anomaly location has been cleared, the UXO Technician will then continue their investigation of the lane, and the process will be repeated until the entire grid has been cleared. If the terrain allows, the Geonics EM61MK2 will be used to verify that the grid/area is clear of anomalies (see first bullet above). All items located in the field will be managed in accordance with the MEC QAPP Addendum, Attachment B UXO SOP 5 (MEC and MPPEH Management).
- The location of each MEC or MPPEH item will be recorded using a RTK-GPS. In areas with limited or no GPS reception, the item will be recorded using tape measurements from the southwest grid corner location to acquire the item's georeferenced location.
- The depth of all MEC or MPPEH items will be measured using tape measurements from the ground surface to the center of mass of the item. MEC, MPPEH, munitions debris (MD), and non-munitions-related items that are located will be managed in accordance with the procedures described in the MEC QAPP Addendum, Attachment B UXO SOP 5 (MEC and MPPEH Management).

Earth moving machinery (EMM) may be used to excavate anomalies that are believed to be at a greater depth than can be efficiently excavated by hand. Personnel who are not UXO-qualified may operate EMM only when supervised by a UXO Technician III or higher. If used, the EMM will be used no closer than 1 foot from adjacent anomalies that have been located during the investigation. The UXO Team Leader may assign additional workers to assist with the excavation. The excavation will be conducted similarly to the hand excavation methodologies described herein. EMM procedures are as follows:

- Upon arrival at the site, the analog intrusive investigation team will reacquire the anomaly using a handheld metal detector or the Geonics EM61MK2. The equipment operator will begin the excavation under the direction of the UXO Technician, who will serve as a spotter. The equipment operator will not excavate directly on the anomaly location but rather will excavate adjacent to the anomaly location.
- To prevent contacting the anomaly with the EMM, the UXO Technician serving as a spotter will frequently monitor the excavation to ensure the equipment operator does not dig directly over the anomaly. The objective of the direction by the UXO Technician is to remove the soil from a selected area adjacent to the anomaly while ensuring that the EMM does not disturb the anomaly.
- The UXO Technician will direct the equipment operator to stop excavation when the soil has been removed to within 1 foot of the anomaly as estimated by the response from the handheld metal detector or Geonics EM61MK2 instrument.

Once the excavation has reached within 1 foot of the anomaly location, the EMM will be shut down, and the excavation will be completed using hand tools as previously described. Once the anomaly has been exposed, it will be inspected by a UXO-qualified technician. The location of each MEC or MPPEH item will be recorded using RTK-GPS. In areas with limited or no GPS reception, the item will be recorded using tape measurements from the southwest grid corner location to acquire the item's georeferenced location. The depth of all MEC items will be measured using tape measurements from the ground surface to the center of mass of the item. MEC, MPPEH, MD, and other non-munitions-related items that are located will be managed in accordance with the procedures described in the MEC QAPP Addendum, Attachment B UXO SOP 5 (MEC and MPPEH Management).

If the maximum excavation depth (as described in the SSWP) is reached during excavation operations but the anomaly still exists, the Unexploded Ordnance Safety Officer (UXOSO) will consult the United States Army Corps of Engineers (USACE) Ordnance and Explosives Safety Specialist (OESS) to determine if further excavation is warranted. If an anomaly is abandoned prior to resolution for any reason, the anomaly location will be surveyed using tape measurements from the southwest grid corner stake or GPS. When the Geonics EM61MK2 instrument is being used for intrusive investigation operations the instrument signal level will be recorded for anomalies that are abandoned. Ahtna will inform the BRAC Office, USACE Project Manager Forward and USACE OESS of anomalies that have not been fully investigated.

7.2 Intrusive Anomaly Verification (Hole Clearance Using the Geonics EM61MK2 in Analog Mode)

After analog subsurface removal activities are completed, the intrusive investigation team will verify the resolution of every excavated target anomaly with a portable EM61MK2 in analog mode, using the methodologies described in this section. If the EM61MK2 sensor response is demonstrated to be below the target threshold (as described in the SSWP), the anomaly resolution verification is considered complete, and the excavation can be backfilled. If the sensor response remains above the target threshold, excavation activities will continue until the anomaly is removed and the sensor response is below the target threshold; excavation will continue until the anomaly is located and can be inspected, or the excavation will continue to the depth designated by the SSWP.

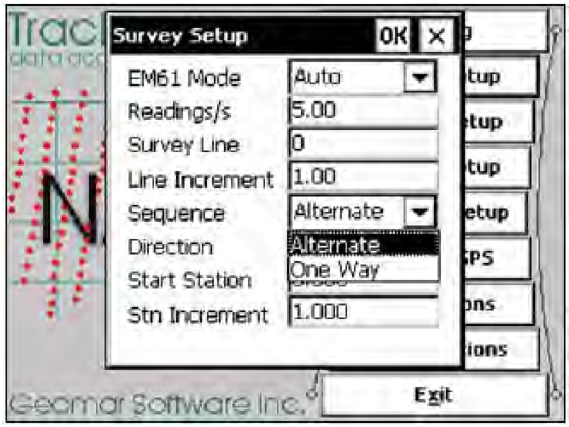
For the analog intrusive investigation, the Geonics EM61MK2 may be used to verify that all anomalies that have been intrusively investigated (or the entire grid) are below the target threshold (as described in the SSWP). The EM61MK2 (if employed in analog mode) is to be set up according to the Geonics EM61MK2 Manual. Function checks of the EM61MK2 are to be conducted after the instrument has been warmed up for at least 15 minutes. This function check is to be conducted in the morning and at midday for each EM61MK2 used for analog intrusive investigations at a location that is known to be free of anomalous responses. This function check will consist of a static spike check that will employ a jig that will be placed over the EM61MK2. The EM61MK2 static spike reading must be within the measurement performance criteria (MPCs) detailed in Worksheet #12 of the MEC QAPP Amendment or as detailed in the SSWP.

EM61MK2 static spike data will not be recorded in the EM61MK2 Juniper Systems TK6000; the UXO Team Leader will record static spike test millivolt readings (EM61MK2 channel to be described in the SSWP) in a digital tablet and/or logbook.

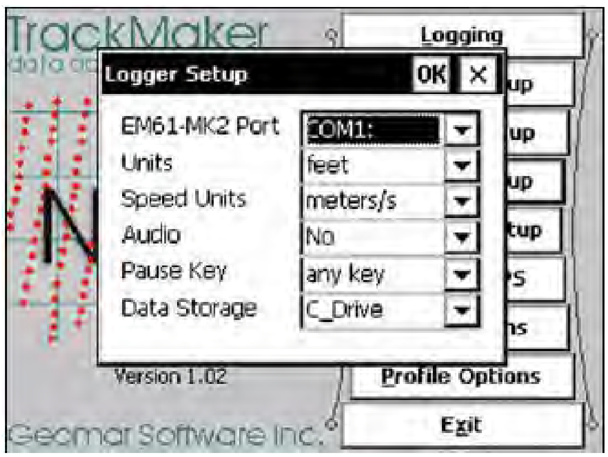
The following steps are to be followed by the analog intrusive investigation team when using the EM61MK2:

1. Turn on the instrument by pushing in the fuse on the top of the console/electronics.
2. Allow the instrument to warm up for at least 15 minutes.
3. Turn on Juniper Systems TK6000 and open the NAV61MK2 program. The following screen will be displayed.

4. Click on “Survey Setup” and specify the options as shown on the following figure. For analog operation, the Mode is set to “Auto” and Readings/s is set to “5”.

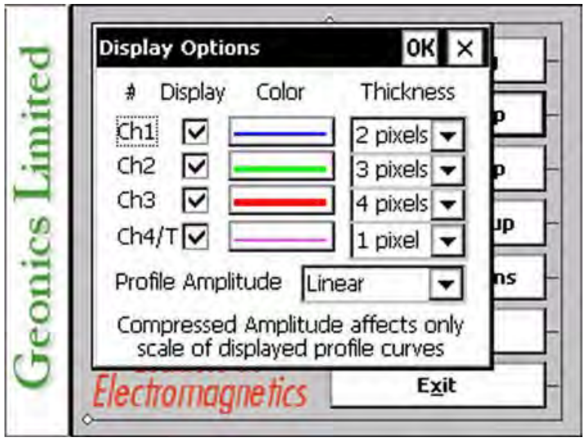


5. Click on “Logger Setup” and specify the options shown on the following figure. These settings will remain the same throughout the project.

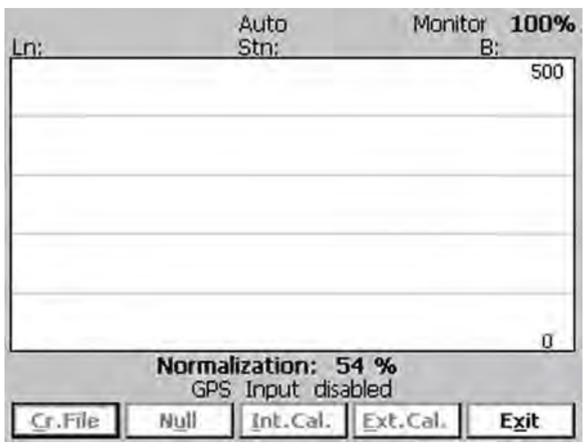


6. Click on “GPS Port Setup.” Make sure the GPS Input is set to “Disabled;” then all other options will be grayed out.

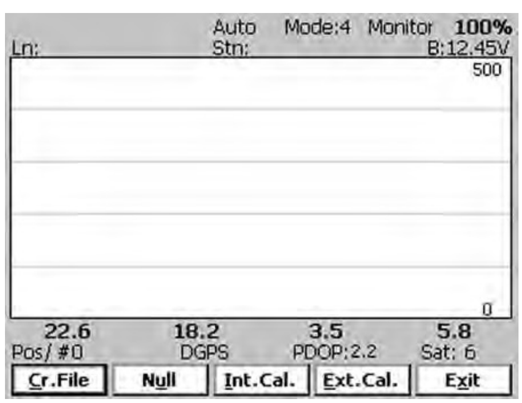
7. Click on "Display Options" and specify the options shown in the following figure. These options are operator preferences and do not affect the data.



8. Once all parameters are set, click on "Monitor/Log." The following screens are displayed while the instrument is normalizing.



9. Once the Instrument has finished normalizing, find a quiet spot (an area with a low millivolt reading similar to the background) and null the instrument. Then click "Cr. File," create a filename, and save the file. Although these recorded data will not be used, the Geonics EM61MK2 needs to store data within a file, hence the need to create a file.



10. After creating a file, use the Geonics EM61MK2in analog mode by monitoring the values in the targeted channel on the “Monitor/Log” screen as the anomaly is investigated.
11. If a peak response above the targeting threshold is identified, turn the EM61MK2 90 degrees and look for the peak again. Once the anomaly location has been pinpointed, the UXO Technician will place a pin flag at this location. The EM61MK2 target thresholds (and the EM61MK2 channel to use) will be described in the SSWP.
12. Once an anomaly has been identified that is above the target threshold, excavation procedures (described in Section 7.1) will be used until the instrument response is below the targeting threshold.
13. Once the anomaly has been removed (if safe to do so) and the anomaly location has been found to be below the targeting threshold, the process will then be repeated until the entire grid has been cleared. Analog intrusive investigation data that are to be recorded by the UXO Team Leader are described in Section 8.0 (Documentation).

If the maximum excavation depth (as described in the SSWP) is reached before the anomaly is exposed/identified, the UXOSO and UXOQCS will consult with the USACE OESS to determine if further excavation is warranted. If a known anomaly is abandoned prior to resolution for any reason, the anomaly location will be surveyed using RTK-GPS and the instrument signal level will be recorded. Ahtna will inform the BRAC Office, USACE Project Manager Forward and USACE OESS of anomalies that are not fully investigated.

8.0 Documentation

The following information is to be digitally recorded by the UXO Team Leader for each intrusive investigation location. These data are to be provided to the Site-Specific Data Manager (SSDM) at the end of each day.

- Date
- Contractor
- Team identification (ID)
- Team Leader
- Munitions Response Site (MRS) ID
- Unit ID
- Operation type
- Grid type
- Instrument type
- Depth of survey
- EMM required? (Yes or No)
- EMM completed? (Yes or No)
- Number of EMM excavations
- Grid ID
- Grid 100% done?(Yes or No)
- Number of investigations

- MD weight (pounds)
- Range-related debris (RRD) weight (pounds)
- Number of MPPEH Items
- Types of items with sensitive fuzes
- Weight (pounds) of items with sensitive fuzes
- Field comments
- Instrument signal of abandoned anomalies

The following information is to be recorded for each MEC and MPPEH item that is located:

- Date
- Contractor
- Team ID
- Team Leader
- MRS ID
- Unit ID
- Operation type
- Grid type
- Instrument type
- Grid ID
- Item ID
- Is demolition required? (Yes or No)
- Is the item located within a burial pit? (Yes or No)
- Item type
- Initial disposition
- Item easting
- Item northing
- Item description
- Quantity
- Depth
- Comments

9.0 Quality Control

An inspection checklist specific to this SOP is located in Appendix B, (Three-Phase Quality-Control Checklist). MPCs for analog intrusive operations can be found in Worksheet #12 of the MEC QAPP Addendum. Worksheets #31, #32 and #33 of the MEC QAPP Addendum describe who will conduct the quality control (QC) inspection for this definable feature of work, along with the frequency of the Follow-up-Phase QC inspections.

10.0 Health and Safety

Conducting analog intrusive investigation operations in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items. Safety measures are to be addressed in the Accident Prevention Plan and Site Safety and Health Plan to mitigate these hazards. Procedures for establishing Exclusion Zones are described in the MEC QAPP Addendum, Attachment B UXO SOP 9 (Exclusion Zones).

11.0 References

United States Army Corps of Engineers (USACE), 2013. Engineering Manual (EM) 385-1-97. *Explosives Safety and Health Requirements Manual.* May

USACE, 2024. Engineering Manual (EM) 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions*. February.

Appendix A: SOP Signature Page

Project Information
UXO SOP 3: Intrusive Investigation Using Analog Methods
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	**Date:**

Appendix B: Three-Phase Quality-Control Checklist

Project Information
UXO SOP 3 – Intrusive Investigation Using Analog Methods
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist

Item	Section	Inspection Point Verify the Following:	Yes	No	NA	Comments
1	Signature Page	All personnel have signed the SOP Signature Page.				*(P)*
2	5.0	Required equipment is available: • Schonstedt GA-52Cx and White DFX 300 handheld metal detectors (or equivalent) • Geonics EM61MK2 metal detector • Juniper Systems TK6000 data collector for EM61MK2 • Two Geonics batteries • Field logbook • Digital tablet • RTK-GPS • Rope (for lane delineation) • Three 100-foot tape measures • Pin flags • Shovels or other similar devices for removing items that are underground • 5 gallon buckets				*(I), (F)*
3	7.0	Vegetation has been removed prior to the analog intrusive investigation.				*(I),(F)*
4	7.0	GA-52Cx Schonstedt and White DFX 300 instruments (or equivalent) are available for use. EM61MK2 is available for use if the terrain allows.				*(I),(F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
5	7.0	All handheld metal detectors have been verified to be functioning properly at the FCA prior to use.				*(I),(F)*
6	7.1	100-foot lanes, 5 feet wide, have been installed.				*(I),(F)*
7	7.1	The SUXOS, UXOQCS, and Ahtna Site Project Manager have decided whether the handheld metal detectors or EM61MK2 (or both) are to be used.				*(I),(F)*
8	7.1	The Whites instrument (or equivalent) is being used if the Schonstedt cannot locate the anomaly that was found with the EM61MK2.				*(I),(F)*
9	7.1	The initiated excavation is adjacent to the anomaly location.				*(I),(F)*
10	7.1	If an item is MEC, procedures described in UXO SOP 5 (MEC and MPPEH Management) are being used.				*(I),(F)*
11	7.1	If the anomaly is able to be removed, the hole is rechecked to ensure the anomaly location is clear.				*(I),(F)*
12	7.1	If found, the position of MEC items is recorded (RTK-GPS or tape measurements).				*(I),(F)*
13	7.1	Verify if an EMM is used, it is not located within 1 foot of an adjacent anomaly.				*(I),(F)*
14	7.1	Proper EMM investigation procedures are being used.				*(I), (F)*
15	7.1	If maximum depth is reached (per the SSWP), yet the anomaly still exists, the OESS been consulted by the UXOSO to determine if further excavation is warranted.				*(I), (F)*
16	7.1	If an anomaly location is abandoned, the location has been surveyed.				*(I), (F)*
17	7.1	If anomaly location is abandoned, the BRAC Office, USACE Project Manager Forward and OESS have been informed?				*(I), (F)*
18	7.2	If an EM61MK2 is to be used, all anomalies identified during the analog intrusive investigation have been checked with the EM61. If the anomaly still exists, intrusive operations continue until the anomaly is removed.				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
19	7.2	The EM61 has been set up according to the Geonics manual.				*(I), (F)*
20	7.2	The EM61 function check has been completed in accordance with the procedures listed. Readings are within MPCs.				*(I), (F)*
21	7.2	EM61 function check (spike) readings are recorded in the UXO Team Leader's logbook.				*(I), (F)*
22	7.2	The EM61 operator is using the procedures described in this SOP.				*(I), (F)*
23	8.0	The UXO Team Leader has collected all required data.				*(I), (F)*
24	7.2	The data was provided to the SSDM at the end of each day.				*(I), (F)*

Punch list Items	
No.	

Conducted by: ______________________________ DATE: ______________________________

Approved by: ______________________________ DATE: ______________________________

UXO SOP 4
INSTRUSIVE INVESTIGATION OF DGM TARGETS

UXO SOP 4:
Intrusive Investigation of DGM Targets

Document Number	UXO SOP 4: Intrusive Investigation of DGM Targets
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28, 2025

Approvals

Christopher Ohland
February 28, 2025

Christopher Ohland — Date
Southwest Environmental Quality Assurance and Compliance Program Manager

Bruce Wilcer
February 28, 2025

Bruce Wilcer — Date
Southwest Environmental Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LLC
BRAC	Base Realignment and Closure
DGM	digital geophysical mapping
EM61	Geonics EM61 Series metal detector
EMM	earth moving machinery
FCA	Function Check Area
GPS	Global Positioning System
ID	identification
MD	munitions debris
MEC	munitions and explosives of concern
MPC	measurement performance criterion
MPPEH	material potentially possessing an explosive hazard
OESS	Ordnance and Explosives Safety Specialist
QAPP	Quality Assurance Project Plan
QA	quality assurance
QC	quality control
RCA	root-cause analysis
RRD	range-related debris
RTK	real-time kinematic
SOP	standard operating procedure
SSDM	Site-Specific Data Manager
SSWP	Site-Specific Work Plan
SUXOS	Senior Unexploded Ordnance Supervisor
USACE	United States Army Corps of Engineers
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this standard operating procedure (SOP) for all work related to the intrusive investigation of digital geophysical mapping (DGM) targets. This SOP must be distributed to and the signature page in Appendix A signed by all personnel performing activities related to this SOP. Personnel must adhere to these procedures as field activities are performed.

2.0 Purpose

The purpose of this SOP is to describe the equipment and general methodologies that are to be used by the intrusive investigation team when excavating DGM targets. This SOP does not detail the use of all equipment described herein. This SOP assumes that experienced personnel using this SOP are familiar with the equipment and are competent in their use.

3.0 Scope

The information presented in this SOP is generally applicable to munitions and explosives of concern (MEC)-related project sites.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Equipment

The following equipment is associated with the intrusive investigation of DGM targets:

- Schonstedt GA-52Cx and Whites DFX 300 handheld metal detector (or equivalent)
- Geonics EM61MK2 metal detector
- Juniper Systems TK600 data logger, or equivalent for EM61MK2 (if used)
- Two Geonics batteries
- Field logbook
- Digital tablet
- Real-time kinematic (RTK)-Global Positioning System (GPS)Three 100-foot tape measures
- Pin flags
- Shovels or other similar devices for removing items that are underground
- 5 gallon bucket

6.0 Personnel

The Senior Unexploded Ordnance Supervisor (SUXOS), Unexploded Ordnance (UXO) Team Leader, and UXO team are responsible for the intrusive investigation of DGM targets. The intrusive investigation team will include the following personnel:

- One UXO Technician III Team Leader
- Two (minimum) UXO Technician IIs
- Four (maximum) UXO Technician Is

The two-person rule is always to be followed.

7.0 Procedures

An intrusive investigation may be conducted by utilizing analog detection instruments ("mag, flag, dig"), use of DGM data, or excavation and sifting. The procedures in this SOP relate only to the intrusive investigation of DGM targets.

The intrusive investigation team will use handheld metal detection instruments, including the Schonstedt GA-52Cx magnetometer (or equivalent) and the Whites DFX 300 hand-held metal detector (or equivalent). The Schonstedt is the default instrument for analog intrusive teams because the vast majority of anomalies on Military Munitions Response Program sites are ferrous in nature and because the Schonstedt easily pinpoints the anomaly location. Upon completion of each target investigation, if terrain allows, the intrusive investigation team will verify that 100 percent of the targets investigated have no remaining anomaly in the excavation equal to or above the target millivolt threshold as specified in the Site-Specific Work Plan (SSWP).

7.1 Intrusive Investigation

Prior to conducting intrusive investigation operations, all handheld metal detectors are to be verified to be functioning properly at the Function Check Area (FCA) that is located adjacent to Building 4522 area. Procedures for conducting function checks for the EM61MK2 are described in Section 7.2.

The following basic techniques will be used during the intrusive investigation of DGM targets:

- All DGM anomalies will have been previously flagged by the reacquisition team. Until an anomaly is identified, it will be assumed that it is material potentially possessing an explosive hazard (MPPEH), and the excavation will be initiated adjacent to the anomaly. The excavation will continue until the excavated area has reached a depth below the top of the anomaly as determined by frequent inspection with a handheld metal detector or until the maximum depth (as described in the SSWP) has been reached.
- Using progressively smaller and more delicate tools to remove the soil carefully, the excavation team will expand the sidewall to expose the metallic item in the wall of the excavation for inspection and identification without moving or disturbing the item.
- Once the item is exposed for inspection, the excavation team will determine if it is potential MEC or MPPEH requiring demolition. If the anomaly is MEC or MPPEH the item will be managed in accordance with the MEC Quality Assurance Project Plan (QAPP) Addendum, Attachment B UXO SOP 5 (MEC and MPPEH Management). If the anomaly is found not to be a MEC or MPPEH item, it will be removed. The anomaly location will then be rechecked with the handheld metal detector and Geonics EM61MK2 to ensure that a hazardous item does not still exist at that location. Once the anomaly location has been cleared, the UXO Technician will continue investigation of the DGM

anomalies. The process will be repeated until the grid has been cleared. All items located in the field will be managed in accordance with the MEC QAPP Addendum, Attachment B UXO SOP 5 (MEC and MPPEH Management).

- The location of each MEC or MPPEH item will be recorded using a RTK-GPS. In areas with limited or no GPS reception, the item will be recorded using tape measurements from the southwest grid corner location to acquire the item's georeferenced location.
- The depth of all MEC and MPPEH items will be measured using tape measurements from the ground surface to the center of mass of the item. MEC, MPPEH, munitions debris (MD), and non-munitions-related items that are located will be managed in accordance with the procedures described in the MEC QAPP Addendum, Attachment B UXO SOP 5 (MEC and MPPEH Management).

An earth moving machinery (EMM) may be used to excavate anomalies that are believed to be at a greater depth than can be efficiently excavated by hand. Personnel who are not UXO-qualified may operate EMM only when supervised by a UXO Technician III or higher. The EMM will be used no closer than 1 foot from adjacent anomalies located during the investigation. The UXO Team Leader may assign additional workers to assist with the excavation. The excavation will be conducted similarly to the hand excavation methodologies described herein. EMM procedures are as follows:

- Upon arrival at the site, the intrusive investigation team will reacquire the anomaly using a handheld metal detector and/or the Geonics EM61MK2. The EMM operator will begin the excavation under the direction of the UXO Technician, who will serve as a spotter. The equipment operator will not excavate directly on the anomaly location but rather will excavate adjacent to the anomaly location.
- To prevent contacting the anomaly with the EMM, the UXO Technician serving as a spotter will frequently monitor the excavation to ensure the equipment operator does not dig directly over the anomaly. The objective of the direction by the UXO Technician is to remove the soil from a selected area adjacent to the anomaly while ensuring that the EMM does not disturb the anomaly.
- The UXO Technician will direct the equipment operator to stop excavation when the soil has been removed to within 1 foot of the anomaly as estimated by the response from the handheld metal detector or Geonics EM61MK2 instrument.

Once the excavation has reached within 1 foot of the anomaly location, the EMM will be shut down, and the excavation will be completed using hand tools as previously described. Once the anomaly has been exposed, it will be inspected by a UXO-qualified technician. The location of each MEC or MPPEH item will be recorded using RTK-GPS. In areas with limited or no GPS reception, the item will be recorded using tape measurements from the southwest grid corner location to acquire the item's georeferenced location. The anomaly location will then be checked with the EM61MK2 to ensure that a hazardous item does not still exist at that location. The depth of all MEC and MPPEH items will be measured using tape measurements from the ground surface to the center of mass of the item. MEC, MPPEH, MD, and non-munitions-related items that are located will be managed in accordance with the procedures described in MEC QAPP Addendum, Attachment B UXO SOP 5 (MEC and MPPEH Management).

If the maximum excavation depth (as described in the SSWP) is reached during excavation operations, the Unexploded Ordnance Safety Officer (UXOSO) will consult with the USACE Ordnance and Explosives Safety Specialist (OESS) to determine if further excavation is warranted. If an anomaly is abandoned prior to resolution for any reason, the anomaly location will be surveyed using GPS. When the Geonics EM61MK2 instrument is being used for intrusive investigation operations the instrument signal level will be recorded for anomalies that are abandoned. Ahtna will inform the Base Realignment and Closure (BRAC) Office, USACE Project Manager Forward and USACE OESS of anomalies that have not been fully investigated.

7.2 Intrusive Anomaly Verification (Hole Clearance Using the EM61MK2 in Analog Mode)

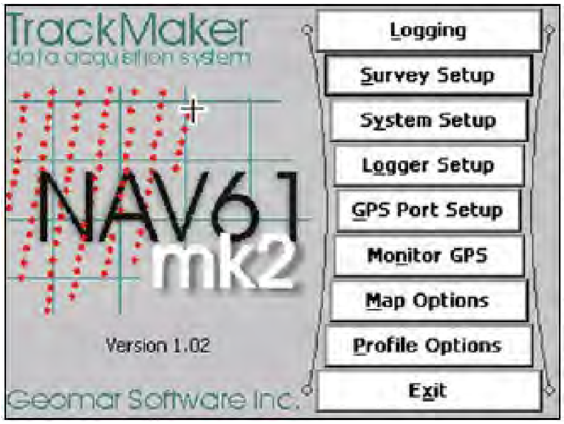
After completion of subsurface removal activities, the intrusive investigation team will verify the resolution of every excavated DGM target anomaly. The team will use a portable EM61MK2 in analog mode following the methodologies described in this section. If the EM61MK2 sensor response is demonstrated to be below the target threshold (as described in the SSWP), the anomaly resolution verification is considered complete, and the excavation can be backfilled. If the sensor response remains above the target selection threshold, excavation activities will continue until the anomaly is located and can be inspected, or the excavation will continue to the depth designated by the SSWP.

The Geonics EM61MK2 will be set up according to the Geonics EM61MK2 Manual. Function checks of the EM61MK2 are to be conducted after the instrument has been warmed up for at least 15 minutes. This function check is to be conducted in the morning and midday for each EM61 used for intrusive investigations at a location that is known to be free of anomalous responses. This function check will consist of a static spike check that will employ the use of a “jig” that will be placed over the EM61MK2. The EM61MK2 static spike reading must be within the measurement performance criteria (MPCs) detailed in Worksheet #12 of the MEC QAPP Addendum or as detailed in the SSWP.

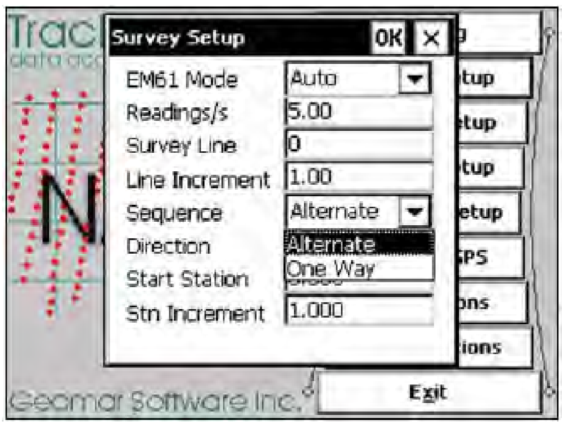
EM61MK2 static spike data will not be recorded in the EM61MK2 Juniper Systems TK6000; the UXO Team Leader will record static spike test millivolt readings (EM61 channel to be described in the SSWP) in a digital tablet and/or logbook.

The following steps are to be followed by the intrusive investigation team when using the Geonics EM61MK2 to verify that DGM anomalies have been cleared:

1. Turn on the instrument by pushing in the fuse on the top of the console/electronics.
2. Allow the instrument to warm up for at least 15 minutes.
3. Turn on Juniper Systems TK6000 and open the NAV61MK2 program. The following screen will be displayed.

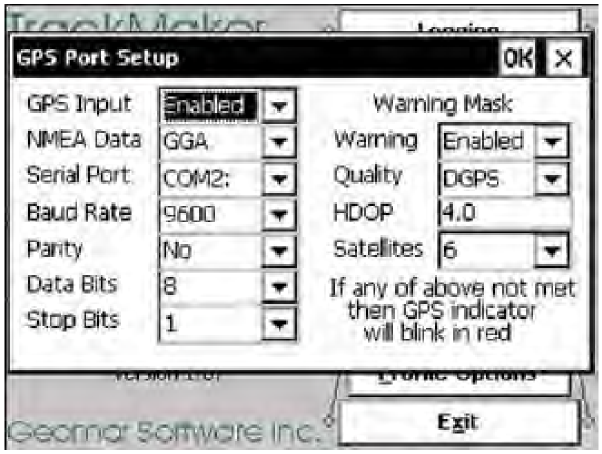


4. Click “Survey Setup” and specify the options on the following figure. For analog operation, the Mode is set to “Auto,” and Readings/s is set to “5.”

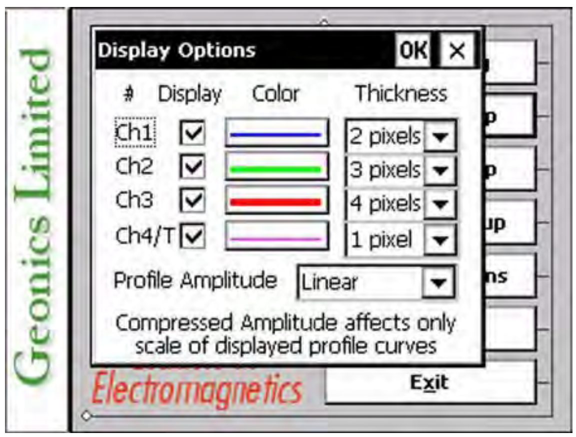


5. Click “Logger Setup” and specify the options shown on the following figure. These settings will remain the same throughout the project.

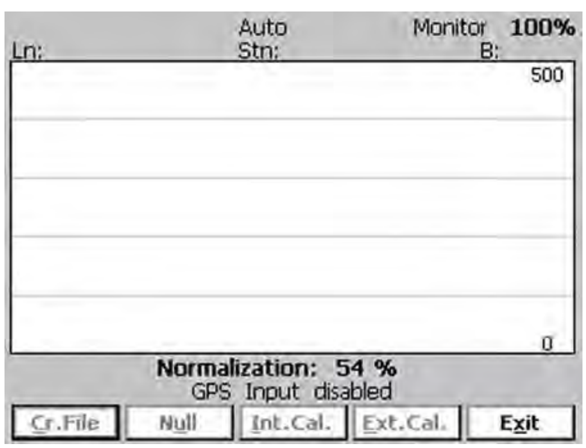
6. Click “GPS Port Setup” and make sure the GPS Input is set to “Disabled.” All other options will then be grayed out.



7. Click “Display Options” and specify the following options. These options are operator preferences and do not affect the data.

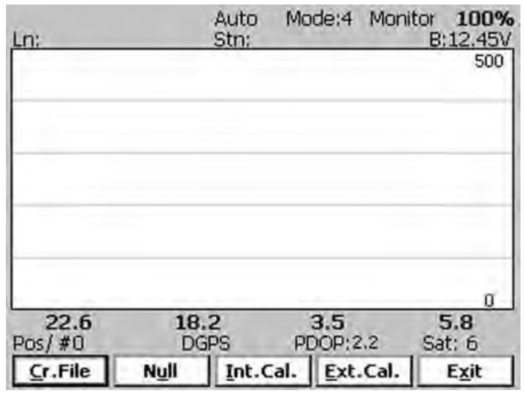


8. Once all parameters are set, click “Monitor/Log.” The following screens are displayed while the instrument is normalizing.



9. Once the Instrument has finished normalizing, find a quiet spot (an area with a low millivolt reading that is similar to that of the background) and null the instrument. Then click “Cr. File,” create a file name, then save the file. Although these recorded data will not be used, the

Geonics EM61MK2 needs to store data within a file, hence the need to create an initial blank file.



10. After creating a file, use the Geonics EM61MK2 in analog mode by monitoring the values in the targeted channel on the "Monitor/Log" screen as the anomaly is investigated.
11. Note: DGM anomaly locations will have been previously marked with pin-flags by the reacquisition team. When a signal peak above the targeting threshold is identified, turn the EM61MK2 90 degrees and look for the peak again to refine the location of the anomaly. Each excavation will be checked in at least two perpendicular directions, but more orientations may be used at the operator's discretion. The EM61MK2 target thresholds (and the EM61 channel to use) will be described in the SSWP.
12. Once an anomaly has been selected for excavation, the EM61MK2 operator will record the initial millivolt reading for that anomaly. Excavation procedures (described in Section 7.1) will be used until the instrument response is below the targeting threshold.
13. Once the anomaly has been removed (if safe to do so) and the anomaly location has been found to be below the targeting threshold, the UXO Team Leader will record the final millivolt reading (the channel will be recorded as detailed in the SSWP) and the process will then be repeated until all DGM anomalies have been cleared. Section 8.0 (Documentation) describes the intrusive investigation data that are to be recorded by the UXO Team Leader for each DGM anomaly.

If the maximum excavation depth (as described in the SSWP) is reached before the anomaly is able to be exposed/identified, the UXOSO will consult with the USACE OESS and Unexploded Ordnance Quality Control Specialist (UXOQCS) to determine if further excavation is warranted. If a known anomaly is abandoned prior to resolution for any reason, the anomaly location will be surveyed using RTK-GPS and the instrument signal level will be recorded. Ahtna will inform the BRAC Office, USACE Project Manager Forward and USACE OESS of anomalies that have not been fully investigated.

All data collected by the UXO Team Leader are to be provided to the Site-Specific Data Manager (SSDM) daily.

7.3 False Positives and False Negatives

7.3.1 False Positives

A false positive is a detected DGM anomaly that results in no identifiable anomaly source being able to be located during target reacquisition or during the intrusive investigation. During target reacquisition, if an anomaly is found to have no response above the target selection threshold, the reacquisition team will record that anomaly location as a "no-find." All targets classified as no-finds by the reacquisition team will not have a pin-flag placed at their location and will not be investigated by the intrusive investigation team. False positives will be minimized to the extent possible through the use of the best available geophysical practices executed by qualified staff. All false positives (no-finds) will be documented in the project database. A false positive rate higher than 15 percent (calculated as a running average for the unit) will result in a root-cause analysis (RCA) and reevaluation of the data, detection methods, and overall project quality control (QC). The RCA will document the causes of the excessive false positive rate, and a Corrective Action Request and Corrective Action Plan (if appropriate) will be submitted to USACE within 10 days.

7.3.2 False Negatives

A false negative is an item of interest that is not detected or identified as a DGM target anomaly. False negatives are missed items that fall within the detection limits of the deployed geophysical sensor systems and, therefore, should be detected, identified, and targeted for intrusive investigation. False negatives can be caused by equipment operator errors, instrument malfunction, navigation issues, or procedural errors during the data processing and analysis phase of the project.

The potential for false negatives will be assessed via the use of blind seeds placed by the QC Geophysicist within the survey area. It is anticipated that the USACE Quality Assurance (QA) Geophysicist will also place blind seed items within the project area that will also be used to assess the potential for false negatives. Additionally, false negatives are also assessed through a comparison of the independently collected QA geophysical data with project DGM data. Anomalies that are detected in the QA DGM data that do not appear in the project DGM data would be considered false negatives in the project DGM data.

False negatives may be identified during other site activities, such as MEC removals and other excavation activities. In any of these cases, the following procedures will be performed:

- A False Negative Report that includes the results of the RCA will be completed by the Field Geophysicist or Senior Geophysicist and submitted to the Ahtna Site Project Manager, the QC Geophysicist, and the UXOQCS.
- The QC Geophysicist and UXOQCS will investigate and prepare a memorandum report for delivery to USACE describing the activities associated with the discovery. This report will also provide recommendations for further or corrective action (if necessary). Technical information/data related to this memorandum will be provided by the QC Geophysicist and UXOQCS upon request.

8.0 Documentation

The following information is to be recorded for each DGM target that is investigated:

- Date
- Contractor
- Team identification (ID)
- UXO Team Leader
- Munitions Response Site ID
- Unit ID
- Operation type
- Grid Type
- Instrument type
- Grid ID
- Unique anomaly ID
- Local anomaly ID
- Target easting
- Target northing
- MD (pounds)
- MPPEH items found
- MD items found
- Range-related debris (RRD; pounds)
- RRD items found
- Depth to center of items
- Number of MPPEH items
- Ordnance and explosives type
- Types of items with sensitive fuzes
- Weight (pounds) of Items with sensitive fuzes
- EM61 Operator comments
- Final millivolt reading
- Target complete and ready for upload? (Yes or No)

Completion status of intrusive investigations will be recorded by the UXO Team Leader on a grid-by grid basis. This data is provided to the SSDM daily.

9.0 Quality Control

An inspection checklist specific to this SOP is located in Appendix B (Three-Phase Quality-Control Checklist). MPCs for the intrusive investigation of DGM targets can be found in Worksheet #12 of the MEC QAPP Addendum. Worksheets #31, #32, #33 of the MEC QAPP Addendum describe who will conduct the quality control (QC) inspection for this definable feature of work, along with the frequency of the Follow-up-Phase QC inspections. Health and Safety

Conducting intrusive investigation operations in areas that potentially contain MEC items may involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items. Safety measures are to be addressed in the Accident Prevention Plan and Site Safety and Health Plan to mitigate these hazards. Procedures for establishing Exclusion Zones are described in the MEC QAPP Addendum, Attachment B UXO SOP 9 (Exclusion Zones).

10.0 References

United States Army Corps of Engineers (USACE), 2013. Engineering Manual (EM) 385-1-97. *Explosives Safety and Health Requirements Manual.* May

USACE, 2024. Engineering Manual (EM) 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions*. March.

Appendix A: SOP Signature Page

Project Information
UXO SOP 4: Intrusive Investigation of DGM Targets
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	Date:

Appendix B: Three-Phase Quality-Control Checklist

Project Information
UXO SOP 4 – Intrusive Investigation of DGM Targets
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following**	**Yes**	**No**	**NA**	**Comments**
1	Signature Page	All personnel have signed the SOP Signature Page.				*(P)*
2	5.0	Required equipment is available • Schonstedt GA-52Cx and White DFX 300 hand-held metal detectors (or equivalent) • Geonics EM61MK2 metal detector • Juniper Systems TK6000 data collector for EM61MK2 • Two Geonics batteries • Field logbook • Digital tablet • RTK-GPS • Rope (for lane delineation) • Three 100-foot tape measures • Pin flags • Shovels or other similar devices for removing items that are underground • 5 gallon bucket				*(I), (F)*
3	7.0	Vegetation has been removed prior to the analog intrusive investigation.				*(I),(F)*
4	7.0	GA-52Cx Schonstedt and White DFX 300 instruments (or equivalent) are available for use.				*(I),(F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following**	**Yes**	**No**	**NA**	**Comments**
		If terrain allows, verify that the EM61MK2 is available for use.				
5	7.0	All handheld metal detectors have been verified to be functioning properly at the FCA prior to use.				*(I),(F)*
6	7.1	100-foot lanes, 5 feet wide, have been installed.				*(I),(F)*
7	7.1	The SUXOS, UXOQCS, and Site Project Manager have decided whether the handheld metal detectors or EM61 (or both) are to be used.				*(I),(F)*
8	7.1	The Whites instrument (or equivalent) is being used if the Schonstedt cannot locate the anomaly that was found with the EM61.				*(I),(F)*
9	7.1	The initiated excavation is adjacent to the anomaly location.				*(I),(F)*
10	7.1	If an item is MEC or MPPEH, procedures described in UXO SOP 5 (MEC and MPPEH Management) are being used.				*(I),(F)*
11	7.1	If the anomaly can be removed, the hole is rechecked to ensure the anomaly location is clear.				*(I),(F)*
12	7.1	If found, the position of MEC or MPPEH items is recorded (tape measurements or GPS).				*(I),(F)*
13	7.1	If an EMM is used, it is not located within 1 foot of the adjacent anomaly.				*(I),(F)*
14	7.1	Proper EMM investigation procedures are being used.				*(I), (F)*
15	7.1	If maximum depth is reached (per the SSWP), yet the anomaly still exists, the UXOSO has consulted with the OESS to determine if further excavation is warranted.				*(I), (F)*
16	7.1	If an anomaly location is abandoned, the location has been surveyed.				*(I), (F)*
17	7.1	If an anomaly location is abandoned, the USACE Project Manager Forward and OESS have been informed.				*(I), (F)*
18	7.2	If an EM61MK2 is to be used, all anomalies identified during the analog intrusive investigation have been checked with the EM61.				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following**	**Yes**	**No**	**NA**	**Comments**
		If the anomaly still exists, intrusive operations continue until the anomaly is removed.				
19	7.2	The EM61 has been set up according to the Geonics manual.				*(I), (F)*
20	7.2	The EM61 function check has been completed in accordance with the procedures listed. Readings are within MPCs.				*(I), (F)*
21	7.2	EM61 function check (spike) readings are recorded in the UXO Team Leader's logbook.				*(I), (F)*
22	7.2	The EM61 operator is using the procedures described in this SOP.				*(I), (F)*
23	8.0	The UXO Team Leader has collected all required data.				*(I), (F)*
24	7.2	The data was provided to the SSDM daily.				*(I), (F)*

Punch list Items	
No.	

Conducted by: ______________________________ DATE: ______________________________

Approved by: ______________________________ DATE: ______________________________

UXO SOP 5
MEC AND MPPEH MANAGEMENT

UXO SOP 5:
MEC and MPPEH Management

Document Number	UXO SOP 5 MEC and MPPEH Management
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
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Approvals

February 28, 2025

Christopher Ohland — Date

Southwest Environmental Quality Assurance and Compliance Program Manager

February 28, 2025

Bruce Wilcer — Date

Southwest Environmental Contractor Quality Control Specialist

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LLC
Army	United States Department of the Army
BRAC	Base Realignment and Closure
CWM	chemical warfare materiel
DD	United States Department of Defense
DDESB	Department of Defense Explosives Safety Board
DoD	United States Department of Defense
EOD	Explosive Ordnance Disposal
ESL	Explosive Storage Location
ESQD	Explosive Safety Quantity-Distance
EZ	Exclusion Zone
MD	munitions debris
MDAS	material documented as safe
MEC	munitions and explosives of concern
MMRP	Military Munitions Response Program
MPPEH	material potentially presenting an explosive hazard
MRA	Munitions Response Area
OD	other debris
OESS	Ordnance and Explosives Safety Specialist
PPE	personal protective equipment
QAPP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RRD	range-related debris
SOP	standard operating procedure
SSDM	Site-Specific Data Manager
SUXOS	Senior Unexploded Ordnance Supervisor
USACE	United States Army Corps of Engineers
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this standard operating procedure (SOP) for all work related to munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH) management. This SOP must be distributed to and the signature page in Appendix A signed by all personnel performing activities related to this SOP. Personnel must adhere to these procedures as field activities are performed.

2.0 Purpose

The purpose of this SOP is to describe the equipment and general methodologies that are to be used during MEC and MPPEH management operations. This SOP does not detail the use of the equipment that is described herein. This SOP assumes that experienced personnel using this SOP are familiar with the equipment and are competent in their use.

3.0 Scope

The information presented in this SOP is generally applicable to all MEC-related project sites.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Equipment

The following equipment is associated with MEC and MPPEH management:

- Lockable containers
- Locks
- Field logbook and/or digital tablet
- Shovels or other similar devices for excavation (should it be required)
- First-aid kit
- Two 10-pound B:C fire extinguishers
- Appropriate personal protective equipment (PPE)
- Vehicle chocks

6.0 Personnel

The Senior Unexploded Ordnance Supervisor (SUXOS), Unexploded Ordnance (UXO) Team Leader and UXO team are responsible for MEC and MPPEH management operations; however, MEC and MPPEH management is the responsibility of all UXO site personnel. Teams responsible for MEC and MPPEH management will include the following personnel (but may be reduced depending on the operation being performed):

- One UXO Technician III Team Leader

- Two (minimum) UXO Technician IIs
- Four (maximum) UXO Technician Is

The two-person rule is always to be followed.

7.0 Procedures

It is essential that the discovery of all MEC, and MPPEH items be immediately reported to the appropriate onsite personnel, accurately documented, and communicated to the United States Army Corps of Engineers (USACE). Daily production information will be provided to USACE and the Base Realignment and Closure (BRAC) Office, including the model, location, depth, and status of all MEC and MPPEH.

7.1 Regulatory Guidance

The following reference provides the regulatory framework for the processing and disposal of MEC and MPPEH including munitions debris (MD) and range-related debris (RRD) recovered from active or former military ranges:

- DoD 4140.72-M. Management of Material Potentially Presenting and Explosive Hazard (United States Department of Defense [DoD, 2021])
- DoD 4160.28-M, Volume 1. *Defense Demilitarization: Program Administration* (DoD, 2019a)
- DoD 4160.21-M, Volume 1. *Defense Materiel Disposition: Disposal Guidance and Procedures* (DoD, 2022)
- DoD Instruction 4140.62. *Material Potentially Presenting Explosive Hazard* (DoD, 2019b)
- DoD Defense Explosives Safety Regulation 6055.09. *DoD Explosives Safety Standards*. Edition 1, Change 1 (DoD, 2024)
- EM 200-1-15. *Technical Guidance for Military Munitions Response Actions* (USACE, 2024)
- EM 385-1-97. *Explosives Safety and Health Requirements Manual* (USACE, 2013)

7.2 MEC Identification

UXO Technicians will make every effort to identify MEC through visual examination of the item for markings and other identifying features such as shape, size, and external fittings. Items will not be moved during the inspection/identification process until the fuze condition has been ascertained. If the condition is questionable, the UXO Technicians will consider the fuze to be armed. The fuze is considered the most hazardous component of any MEC item, regardless of type or condition. The SUXOS and the Unexploded Ordnance Safety Officer (UXOSO) (with input from the USACE Ordnance and Explosives Safety Specialist [OESS] if available) will agree on the positive identification of the item and the disposition of the item prior to implementing demolition operations. MEC identification will be completed using the following general ordnance safety guidelines:

- In general, a projectile containing a base-detonating fuze is to be considered armed if the projectile has been fired.
- Arming wires and pop-out pins on unarmed fuzes will be secured in place prior to movement.

- Do not rely on the color coding of MEC to positively identify contents. Munitions having incomplete or improper color coding have been encountered; this is especially true of the 40-millimeter family of ordnance.
- Avoid the area forward of the nose of a munition until it can be ascertained whether the item contains a shaped charge or not. The explosive jet from a shaped charge can be fatal at great distances forward of the longitudinal axis of the item. Until the fuzing system is positively identified, assume any shaped charge munitions to contain a piezoelectric fuzing system. A piezoelectric fuze is extremely sensitive, can function at the slightest physical change, and may remain hazardous for an indefinite period of time.
- Examine a projectile for the presence or absence of an unfired tracer. Also, examine the item for the presence or absence of a rotating band and its condition.
- Assume a practice MEC item contains a live charge until it can be determined otherwise. Expended pyrotechnic/practice devices may contain red/white phosphorus residue. Due to incomplete combustion, phosphorus may be present and reignite spontaneously if subjected to friction or the crust is broken, and the contents exposed to air.
- Do not approach smoking white phosphorus MEC. Burning white phosphorus may detonate the burster or dispersal explosive charge at any time.
- The SUXOS and UXOSO, in consultation with the USACE OESS (if available), will decide whether MEC items are deemed acceptable to move. MEC approved to be moved will be transported to the Explosive Storage Location (ESL) as sited and approved under the Unit 5 Explosive Safety Submission (ESS; USACE 2022 and Department of Defense Explosive Safety Board [DDESB], 2022). A security guard may be required on site to guard MEC items deemed unacceptable to move, during hours when UXO personnel are not present, depending on location, accessibility by the public, and existing security.
- Demolition of MEC, and MPPEH items will be managed in accordance with procedures described in the MEC Quality Assurance Project Plan (QAPP) Addendum, Attachment B UXO SOP 6 (Demolition of MEC and MPPEH).

If an item with an unknown filler is encountered, procedures described in Section 7.6 will be followed. In the unlikely event of encountering Chemical Agent Identification Set kits, they will be handled in accordance with the procedures included in *Policy Guidance – Chemical Agent Identification Sets Containing Dilute Agent (Except Dilute Nerve) and Industrial Chemicals* (Army, 2008).

7.3 MEC Transportation

This section presents the vehicle requirements and onsite transportation procedures for MEC at the Munitions Response project area.

Offsite transportation of any MEC found on the former Fort Ord property is not anticipated.

7.3.1 Preparation

All vehicles transporting explosives outside the Munitions Response Area (MRA) will be properly inspected, equipped, and placarded prior to the loading of MEC and/or explosives onto the vehicle, and motor vehicle inspections (MEC QAPP Addendum, Attachment C Forms) will be completed. If UXO is transported outside the MRA over public traffic routes, USACE OESS will coordinate EOD approval as required prior to transport. For MPPEH deemed acceptable to move by the SUXOS and UXOSO with coordination from the USACE OESS, when available, transportation approval has been authorized by the responsible authority for the MMRP project. In these instances, DDESB approved explosive routes will be utilized between the Munition Response Site and the ESL. All appropriate safety and security procedures will be followed as outlined in the SSWP, ESS and SOPs. Transportation will be conducted in accordance with Engineer Manual 385-1-97, *Explosives Safety and Health Requirements* (USACE, 2013), and *DoD Defense Explosives Safety Regulation 6055.09. DoD Explosives Safety Standards. Edition 1, Change 1* (DoD, 2024). Transportation of UXO and MPPEH items is only anticipated to occur when items are being relocated to the ESL. The ESL is sited and approved under the Unit 5 ESS (USACE, 2022 and DDESB, 2022).

Recovered MEC will not be moved unless acceptable to do so and only with the specific concurrence of the SUXOS and UXOSO (and USACE OESS if available). The USACE OESS may require additional measures and inspection before movement and preparation for transportation.

7.3.2 Vehicle Requirements

Vehicles transporting MEC on the project site will comply with the following requirements:

- Vehicles transporting MEC or explosives outside of the MRA will be placarded when carrying any Class 1 explosives.
- Vehicles will be chocked and their engines turned off prior to loading/unloading explosives.
- All vehicles transporting explosives will be equipped with reliable communications, a first-aid kit, and two 10-pound B:C fire extinguishers. One extinguisher will be located in the driver's compartment, and the other will be located in the cargo compartment.
- Vehicles transporting explosives will be inspected daily when in use, and the inspections will be documented on a Motor Vehicle Inspection Form (MEC QAPP Addendum, Attachment C Forms).
- The vehicle used to transport the explosives will have a non-sparking bed liner, and all explosive loads will be covered and secured prior to departure.
- The SUXOS and UXOSO (and USACE OESS if available) will evaluate the appropriate transportation requirements for the item being transferred.

7.3.3 MEC Transportation Procedures

Persons transporting MEC on the project site will comply with the following requirements:

- A UXO Technician II or above will operate the vehicle with one other passenger, which can be a UXO Technician I or above and over the age of 21. No more than two persons may be in the vehicle.
- The driver of any vehicle carrying explosives or MEC will ensure that the load is properly braced and secured for transport (i.e., tie-downs).
- The driver and any passengers transporting explosives or MEC will not carry any smoking products or flame-producing devices. Smoking will be strictly forbidden among all personnel involved in the handling or transportation of explosives and MEC.
- 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 fire and explosion hazards.

- If an unfired rocket motor must be transported, it shall be positioned in such a manner as to offer maximum protection to personnel in the event of an accident.
- If base-ejection-type projectiles must be transported to a demolition area or collection point, the base will be oriented to the rear of the vehicle, and the projectile will be secured in the event the ejection charge detonates in route.
- All MEC items will be positively identified based on the type of munition, filler, and condition of the fuzing prior to any movement. Specific models of items that are subjected to detonation will be confirmed after detonation procedures.
- If MEC with exposed hazardous filler must be moved to a demolition area, the item will be placed in an appropriate container with packing materials to prevent migration of the hazardous filler. Padding will also be added to protect the exposed filler from heat, shock, and friction.
- Offsite transportation of small arms ammunition will incorporate applicable manifestation and placarding requirements.

7.4 MPPEH Management

MPPEH is defined as material that, prior to determination of its explosives safety status, potentially contains explosives or munitions, (e.g., munitions containers and packaging material; MD remaining after munitions use, demilitarization, or disposal; and RRD) or potentially contains a high enough concentration of explosives such that the material presents an explosive hazard.

This section is intended to guide UXO Technicians in the safe and efficient handling, inspection, and proper disposal of MPPEH through the description of procedures, along with guidance for management, inspection, demilitarization, and disposal or recycling of MPPEH items. Because the metal scrap recovered will ultimately be disposed of or recycled off site, it is imperative that explosive hazard items do not become intermingled with other nonhazardous metal scrap. The establishment of a chain of custody and audit trail is mandatory. Ahtna will use an approved, state and/or Resource Conservation and Recovery Act (RCRA) authorized facility for offsite disposal and/or recycling of small arms.

All items recovered in the field are considered MPPEH prior to inspection. Recovered items will initially be inspected by a UXO Technician II. Following the initial inspection a UXO Technician III will complete a 100% reinspection and items will be segregated into one of the following three categories:

- Non-munitions-related material
- Small arms ammunition
- MPPEH

Initial inspections and 100% reinspection of items recovered will be conducted in the grid that the item was recovered prior to transport to the ESL or MD/Scrap Processing Area.

7.4.1 Non-Munitions-Related Material

Non-munitions-related material includes other debris (OD). When discovered, OD items are initially inspected in the field by the UXO Technician II. Following the initial inspection the Team Leader (UXO Technician III) will complete a 100 precent reinspection to verify the items do not contain energetic material or potentially explosive items located within. Once deemed free of explosive hazards, OD items are transported to the MD/Scrap Processing Area where the items then undergo a second inspection by a UXO Technician III and UXO Technician III/II. Once OD items have been inspected a second time and found to be free of explosive hazard , they are placed in a metal bin separate from MD. Items will receive a final inspection prior to being shipped off site for disposal and/or recycling. If OD items cannot be verified as free from explosive hazard, the item will be classified as MPPEH, transported to the ESL, and managed in accordance with the MEC QAPP Addendum Attachment B, UXO SOP 6 (Demolition of MEC and MPPEH).

7.4.2 Small Arms Ammunition

Small arms will be stored at an ESL and subsequently transported to an approved, state and/or RCRA-authorized offsite facility for treatment and/or recycling.

7.4.3 MPPEH Processing

The UXOSO and Unexploded Ordnance Quality Control Specialist (UXOQCS) will ensure that procedures for processing MPPEH are carried out safely and consistent with applicable regulations. Recovered items will initially be inspected by a UXO Technician II to evaluate if the item is a potential MEC item. Following the initial inspection the Team Leader (UXO Technician III) will complete a 100 percent reinspection. Initial inspections and 100 percent reinspection of recovered MPPEH items will be conducted in the grid where the item was recovered. Items that require detonation procedures will be managed in accordance with the MEC QAPP Addendum, Attachment B UXO SOP 6 (Demolition of MEC and MPPEH).

All other recovered items are inspected by the UXO team in the field to verify the items do not contain energetic matter and segregated into MD and RRD. The total weight of recovered MD and RRD are recorded by the UXO Team Leader on a per-grid basis. This data is provided to the SSDM daily. MD and RRD are transported to the MD/Scrap Processing Area and placed in lockable metal bins. MD and RRD items undergo a second inspection by a UXO Technician III and UXO Technician III/II, with oversight being conducted by the SUXOS. This method includes two distinct inspections, which are performed by persons of increasing levels of responsibility. MD found to be MDAS will be placed in secure locked MDAS storage containers awaiting shipping to a qualified receiver for smelting and recycling. RRD found to be MDAS will be placed in a lockable metal bin to be shipped off site for disposal and/or recycling.

The UXO Team Leader responsible for the field operation performs the initial inspection of MPPEH in the grid the item was found. The SUXOS is responsible for overall MEC and MPPEH management; therefore, the SUXOS oversees the final inspection. During this final inspection, the inspected object will be classified as MDAS or remain MPPEH. MPPEH items acceptable to move will be transported to the ESL for detonation to be scheduled at a later date. Items will be managed in accordance with the MEC QAPP Addendum Attachment B, UXO SOP 6 (Demolition of MEC and MPPEH).

If an MPPEH item does not allow for the visual inspection of all cavities and surfaces, or it cannot be verified that an item does not contain an explosive hazard, then it will remain MPPEH, and the item will be vented. This will be accomplished using a jet perforator in an area sufficient to accommodate the Explosive Safety Quantity-Distance (ESQD) arc for the item if it were high-explosive filled. Procedures for venting are described in the MEC QAPP Addendum, Attachment B, UXO SOP 6 (Demolition of MEC and MPPEH).

After detonation/venting, MPPEH items will be inspected again to confirm that all cavities are visually free of explosive residue. The final determination can then be made as to whether the item was MEC or MD. This information is then provided to the SSDM at the end of the day. Debris from the detonation will be collected, classified as MPPEH, and undergo the entire MPPEH processing and inspection process again. If all cavities are still not able to be visually inspected, the item will remain MPPEH and vented again until all cavities can be inspected, and the item can be classified as MDAS.

MPPEH items that are inspected a second time and are classified as MDAS will be processed accordingly as MD or RRD. The UXOQCS will conduct a random sampling of items classified as MDAS to ensure no items with explosive hazards are identified as MD or RRD. The SUXOS will certify that 100 percent of the MDAS items are free of explosive hazards prior to placing the items in secure lockable MDAS storage containers awaiting final disposition.

7.4.4 Certification of MDAS

All MPPEH will be inspected using a systematic approach that is designed to ensure that 100 percent of all items classified as MDAS have been inspected by the UXO Technician in the field, with 100 percent of all MDAS items being re-inspected at the MD/Scrap Processing Area as part of the verification and certification process. All MDAS that has been re-inspected and confirmed to be MDAS will be placed in containers with serialized seals.

An Issue Release/Receipt Document (MEC QAPP Addendum, Attachment C Forms) will be affixed to the side of each container. The form will include the serial of the seal and the signatures of the SUXOS as the "certifier" and a qualified government official as the "verifier." The form will also contain the following statement:

> "The material listed on this form has been inspected, processed by DDESB approved means, or undergone the application of expert knowledge, in compliance with DoD policy, and to the best of my knowledge and belief, does not pose an explosive hazard."

7.4.5 Disposal of MDAS

Sealed containers of MD items certified as MDAS will be released to a qualified receiver facility for smelting and recycling. The facility will then close the chain-of-custody loop by returning a signed copy of the chain-of-custody record stating that the MDAS material has been destroyed by smelting; this ensures that the proper chain of custody has been maintained. .

7.5 Demolition of MEC and MPPEH

Procedures for the demolition of MEC and MPPEH are described in the MEC QAPP Addendum, Attachment B UXO SOP 6 (Demolition of MEC and MPPEH).

7.6 MPPEH Items with Unknown Fillers

7.6.1 Discovery of Unknown Fillers

Based on historical research and previous investigations, chemical warfare materiel (CWM) is not likely to be encountered on the former Fort Ord. However, if an item with an unknown filler is encountered, the following standard procedures will be followed:

- The discoverer will evacuate upwind of the item and immediately notify the UXOSO and SUXOS.
- The initial Exclusion Zone (EZ) for an item with an unknown filler is 450 meters upwind if the unknown filled item is suspected to be leaking.
- The SUXOS will note the location of the unknown filled item using a global positioning system.
- The item will be covered with plastic, surrounded with sandbags, and plywood will be placed over the item.
- The SUXOS will immediately notify the onsite USACE OESS. The USACE OESS will notify the USACE Project Manager Forward, the BRAC Office, and the Contracting Officer's Representative. If the USACE OESS is not present, the SUXOS will make the notifications. The Army representatives will contact Travis Air Force Base EOD flight for response.
- The SUXOS will account for all field personnel and notify the Ahtna Site Project Manager.
- The SUXOS will ensure that the area is secured until properly relieved by EOD personnel; the Chemical, Biological, Radiological, Nuclear and Explosive Command; or local authority. The SUXOS will direct Ahtna field personnel to support such designated authorities as appropriate.
- After securing the site, the SUXOS will submit a report to the BRAC Office and USACE OESS that contains the following information:
    - Date and time of event
    - Location
    - Preliminary identification of suspect item, including quantity and type of munition or container
    - Description of events
    - Description of any property damage, personnel casualties and/or injuries
    - Description of whether medical services or facilities were required
    - List of immediate notification and support requirements identified during initial emergency response assessment
    - Any other pertinent information
- Before work resumes, the site plans will be reviewed for adequacy in consideration of this newly discovered hazard.

7.6.2 Discovery of CWM

Details regarding procedures to be followed in the event of the discovery of an unknown filled item can be found in Engineering Pamphlet 75-1-3, *Recovered Chemical Warfare Materiel (RCWM) Response Process*, (USACE, 2004). In the unlikely event of encountering Chemical Agent Identification Set kits, they will be handled in accordance with the procedures included in *Policy Guidance – Chemical Agent Identification Sets Containing Dilute Agent (Except Dilute Nerve) and Industrial Chemicals* (Army, 2008).

7.7 Addition of MEC Model Information to MMRP Database

Occasionally, a MEC item with a model type that is not included in the MEC model table in the Military Munitions Response Program (MMRP) database may be encountered and recovered in the field. The MEC item will be researched by senior UXO staff and identified using standard UXO references. The USACE OESS will complete a final review and approval of the identification. Once the item is identified, the new model type, associated fields, and a copy of the reference document will be provided to the SSDM and entered into the model table in the Fort Ord MMRP database.

8.0 Documentation

The following information is to be recorded during MEC and MPPEH management operations:

- Motor Vehicle Inspection Form (MEC QAPP Addendum, Attachment C Form M-5)
- Issue Release/Receipt Document (MEC QAPP Addendum, Attachment C Form M-12)
- Data for items originally classified as MPPEH that were found to be explosive after detonation and were then reclassified as MEC
- Data for items originally classified as MPPEH that were found to be inert after detonation and were then reclassified as MD
- Information on new model types

9.0 Quality Control

Quality-control (QC) procedures for MEC and MPPEH management are intrinsic to the operation. Redundant checks and multiple inspections are completed during the MEC and MPPEH management operations.

An inspection checklist specific to this SOP is located in Appendix B, Three-Phase Quality-Control Checklist. Measurement Performance Criteria for MEC and MPPEH management can be found in Worksheet #12 of the MEC QAPP Addendum. Worksheets #31, #32, and #33 of the MEC QAPP Addendum describe who will conduct the QC inspection for this definable feature of work, along with the frequency of the Follow-up-Phase QC inspections.

10.0 Health and Safety

Conducting MEC and MPPEH management operations in areas that potentially contain MEC items will involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items. Safety measures are to be addressed in the Accident Prevention Plan and Site Safety and Health Plan to mitigate these hazards. Procedures for establishing EZs are described in the MEC QAPP Addendum, Attachment B UXO SOP 9 (Exclusion Zones).

11.0 References

United States Department of the Army (Army, 2008). *Policy Guidance – Chemical Agent Identification Sets Containing Dilute Agent (Except Dilute Nerve) and Industrial Chemicals*. December.

Department of Defense Explosive Safety Board (DDESB), 2022. Approval of Final Explosives Safety Submission (ESS), Site Investigation Munitions and Explosives of Concern (MEC), Redial Action at Unit 5, Impact Area Munitions Response Area (MRA), Track 3 Munitions Response Site (MRS), Former Fort Ord, California (File Number M22-0053). September. (OE-0553.53B)

United States Army Corps of Engineers (USACE), 2004. Engineering Pamphlet (EP) 75-1-3. *Recovered Chemical Warfare Materiel (RCWM) Response Process*. November.

USACE, 2013. Engineering Manual (EM) 385-1-97. *Explosives Safety and Health Requirements Manual.* May.

USACE, 2022. *Explosives Safety Submission, Munitions and Explosives of Concern (MEC) Redial Action at Unit 5, Within the Impact Area Munitions Response Area (MRA), Track 3 Munitions Response Site (MRS), Former Fort Ord, California*. Base Realignment and Closure (BRAC). June. (OE-0553.53)

USACE, 2024. Engineering Manual (EM) 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions*. February.

United States Department of Defense (DoD), 2019a. DoD Manual 4160.28, Volume 1. *Defense Demilitarization: Program Administration*. July.

DoD, 2019b. Instruction 4140.62. *Material Potentially Presenting Explosive Hazard*. September.

DoD, 2022. DoD Manual 4160.21, Volume 1. *Defense Materiel Disposition: Disposal Guidance and Procedures*. August.

DoD, 2024. Defense Explosives Safety Regulation 6055.09. *DoD Explosives Safety Standards*. Edition 1, Change 1. February.

Appendix A: SOP Signature Page

Project Information
UXO SOP 5: MEC and MPPEH Management
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	Date:

Appendix B: Three-Phase Quality-Control Checklist

Project Information
UXO SOP 5: MEC and MPPEH Management
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
1	Signature Page	All personnel have signed the SOP Signature Page.				*(P)*
2	5.0	Required equipment is available: • Lockable containers • Locks • Field logbook and/or digital tablet • Shovels or other similar devices for excavation (should it be required) • First-aid kit • Two 10-pound B:C fire extinguishers • Appropriate PPE • Vehicle chocks				*(I), (F)*
3	7.2	Potential MEC items are not moved during initial inspection.				*(I),(F)*
4	7.2	The SUXOS and UXOSO (and OESS if available) have agreed on positive identification of the item and disposition prior to implementing demolition operations.				*(I),(F)*
5	7.2	If arming wires or pop-out pins exist, they have been secured prior to movement.				*(I),(F)*
6	7.2	Item has been identified for a tracer. Rotating bands have been inspected.				*(I),(F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
7	7.2	SUXOS and UXOSO (with OESS input if available) have determined whether the item is safe to move.				*(I),(F)*
8	7.2	If the item is safe to move, the item has been relocated to the MEC Consolidation Point.				*(I),(F)*
9	7.2	If required, a security guard is stationed at the item's location.				*(I),(F)*
11	7.3	If MEC is transported outside the MRA, the vehicle has been inspected, equipped, and placarded prior to loading MEC and/or explosives onto the vehicle. If UXO is transported outside the MRA over public traffic routes the USACE OESS has coordinated EOD approval as required. Motor Vehicle Inspection Form (Form M-5) has been completed.				*(I),(F)*
12	7.3	Transportation of MEC and/or explosives is being conducted in accordance with EM 385-1-97, *Explosives Safety and Health Requirements Manual* (USACE, 2013).				*(I),(F)*
13	7.3.1	The vehicle transporting explosives outside the MRA is placarded when carrying any Class 1 explosives.				*(I),(F)*
14	7.3.1	The transport vehicle contains two 10-pound B:C fire extinguishers.				*(I), (F)*
15	7.3.1	The vehicle used to transport MEC and/or explosives have been inspected. Motor Vehicle Inspection Form (Form M-5) has been completed.				*(I), (F)*
16	7.3.1	The vehicle used to transport MEC and/or explosives has a non-sparking bed liner. All explosive loads are covered and secured prior to departure.				*(I), (F)*
17	7.3.2	No more than two personnel are in the vehicle when transporting MEC and/or explosives.				*(I), (F)*
18	7.3.2	All explosive loads are covered and secured prior to departure.				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
		Individual items are properly secured and/or braced.				
19	7.3.2	Personnel do not have any smoking products or flame-producing devices in the vehicle.				*(I), (F)*
20	7.3.2	If loose pyrotechnic, tracer, flare, or similar mixtures are transported, they are placed in #10 mineral oil or equivalent.				*(I), (F)*
21	7.3.2	Rocket motors are placed in such a manner as to offer maximum protection to personnel.				*(I), (F)*
22	7.3.2	Base-ejection-type projectiles are oriented with their base toward the rear of the vehicle.				*(I), (F)*
23	7.3.2	All MEC items are positively identified regarding the type of munition, filler, and condition of fuzing prior to any movement.				*(I), (F)*
24	7.3.2	If hazardous filler is exposed, the item is placed in an appropriate container (with padding) to prevent migration of filler and protect filler from heat, shock and friction.				*(I), (F)*
25	7.3.2	Offsite, transportation of small arms incorporates applicable manifestation and placarding requirements.				*(I), (F)*
26	7.4	Items are segregated into one of these three categories: • Non-munitions-related material • Small arms ammunition • MPPEH				*(I), (F)*
27	7.4.1	OD has been initially inspected in the field by the UXO Team Leader.				*(I), (F)*
28	7.4.1	OD has been transported to the MD/Scrap Processing Area and inspected a second time by one UXO Technician III and one UXO Technician III/II.				*(I), (F)*
29	7.4.2	Small arms are stored at the ESL.				*(I), (F)*
30	7.4.3	All items recovered in the field have been initially inspected by the UXO team to evaluate if the item is MEC or MPPEH.				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
31	7.4.3	All MPPEH recovered in the field have received initial inspection and re-inspection for final disposition determination.				*(I), (F)*
32	7.4.3	The UXO Team Leader has recorded the total weight of MD and RRD per grid and reported data to the SSDM daily.				*(I), (F)*
33	7.4.3	MD has been transported to the MD/Scrap Processing Area. Transported MD is stored in lockable containers.				*(I), (F)*
34	7.4.3	RRD and OD has been transported to the MD/Scrap Processing Area, has received final inspection, and placed in a roll-off bin for offsite transport.				*(I), (F)*
35	7.4.3	MD stored in lockable bins at the MD/Scrap Processing Area has been inspected a final time, with oversight by the SUXOS.				*(I), (F)*
36	7.4.3	MPPEH that cannot be adequately inspected remains MPPEH, and the item is vented using jet perforators in a sufficient area to accommodate the ESQD arc.				*(I), (F)*
37	7.4.3	After MMPEH items are vented, they are inspected again, and a determination is made whether the item is MEC or MD. This information is provided to the SSDM on a daily basis.				*(I), (F)*
38	7.4.3	All debris from detonations is classified as MPPEH and then inspected again. If all cavities cannot be inspected, then the item will undergo venting again until all cavities can be inspected, and the item can be classified as MDAS.				*(I), (F)*
39	7.4.3	The UXOQCS has conducted a random sampling of items classified as MDAS to ensure no items with explosive hazards are identified as MD or RRD.				*(I), (F)*
40	7.4.3	The SUXOS has certified that 100% of MDAS items are free of explosive hazards before placing items in secure, lockable MDAS storage containers.				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
41	7.4.4	All MDAS being shipped has an Issue Release/Receipt Document (Form M-12) affixed to the side of each container that includes the serial of the seal and signature of the SUXOS.				*(I), (F)*
42	7.4.4	The Issue Release/Receipt Document (Form M-12) contains the following statement: "The material listed on this form has been inspected, processed by DDESB approved means, or undergone the application of expert knowledge, in compliance with DoD policy, and to the best of my knowledge and belief, does not pose an explosive hazard."				*(I), (F)*
43	7.4.5	The receiving facility has closed the chain-of-custody loop by returning a signed copy of chain-of-custody record stating that MDAS has been destroyed.				*(I), (F)*
44	7.6	If an MPPEH item that contains unknown fillers is found, the procedures listed in Section 7.6 of this SOP (UXO SOP 5) have been followed.				*(I), (F)*
45	7.7	If a new MEC model type is found during the project, the UXO team provided information to the SSDM to be included in the MMRP database.				*(I), (F)*

Punch list Items	
No.	

Conducted by: ______________________________ DATE: ______________________________

Approved by: ______________________________ DATE: ______________________________

UXO SOP 6
DEMOLITION OF MEC AND MPPEH

UXO SOP 6:
Demolition of MEC and MPPEH

Document Number	UXO SOP 6: Demolition of MEC and MPPEH
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28, 2025

Approvals

February 28, 2025

Christopher Ohland Date
Southwest Environmental Quality Assurance and Compliance Program Manager

February 28, 2025

Bruce Wilcer Date
Southwest Environmental Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LLC
BEC	Base Realignment and Closure Environmental Coordinator
CEHNC	United States Army Engineering and Support Center, Huntsville
DDESB	Department of Defense Explosives Safety Board
EM	Engineering Manual
EOD	Explosive Ordnance Disposal
EZ	Exclusion Zone
FAA	Federal Aviation Administration
ID	identification
MEC	munitions and explosives of concern
MPPEH	material potentially presenting an explosive hazard
MSD	minimum separation distance
OESS	Ordnance and Explosives Safety Specialist
POMFD	Presidio of Monterey Fire Department
PPE	personal protective equipment
QAPP	Quality Assurance Project Plan
QC	quality control
SOP	standard operating procedure
SUXOS	Senior Unexploded Ordnance Supervisor
USACE	United States Army Corps of Engineers
UXO	unexploded ordnance
UXOSO	Unexploded Ordnance Safety Officer

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this standard operating procedure (SOP) for all work related to the demolition of munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH). This SOP must be distributed to and the signature page included as Appendix A signed by all personnel performing activities related to this SOP. Personnel must adhere to these procedures as field activities are performed.

2.0 Purpose

The purpose of this SOP is to describe the equipment and general methodologies to be used during the demolition of MEC and MPPEH. This SOP does not detail the use of the equipment that is described herein. This SOP assumes that experienced personnel using this SOP are familiar with the equipment and are competent in their use.

3.0 Scope

The information presented in this SOP is generally applicable to all MEC-related project sites.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Equipment

The following equipment is associated with the demolition of MEC and MPPEH:

- First-aid kit
- Two 10-pound B:C fire extinguishers
- Field logbook and/or digital tablet
- Shovels or other similar devices for excavation or filling of sandbags (should it be required)
- Sandbags (if required)
- Demolition material
- Detonation device
- Appropriate personal protective equipment (PPE)
- Vehicle chocks

Depending on the demolition operation being conducted, additional equipment that is not listed in this section may be required, such as heavy machinery or items related to blast reduction/mitigation.

6.0 Personnel

The Senior Unexploded Ordnance Supervisor (SUXOS), Unexploded Ordnance (UXO) Team Leader, and UXO demolition team are responsible for MEC and MPPEH demolition operations. The demolition team will include the following personnel (but may be reduced depending on the size/type of demolition operation being conducted):

- One UXO Technician III Team Leader
- Two (minimum) UXO Technician IIs
- Four (maximum) UXO Technician Is

The two-person rule is always to be followed.

7.0 Procedures

The safest and most expeditious methods of detonation will be used in every case, including blow-in-place and consolidated demolition. Technical procedures will follow:

- DoD Defense Explosives Safety Regulation 6055.09. DoD Explosives Safety Standards. Edition 1, Change 1 (DoD, 2024)
- Engineering Manual (EM) 385-1-1, *Safety and Occupation Health Requirements* (USACE, 2024b)
- EM 385-1-97, *Explosives Safety and Health Requirements Manual (USACE, 2013)*

Verification of the UXO filler shall be required prior to detonation to determine detonation procedures. Demolition procedures will be coordinated with the Base Realignment and Closure Environmental Coordinator (BEC), United States Army Corps of Engineers (USACE) Ordnance and Explosives Safety Specialist (OESS) and Presidio of Monterey Fire Department (POMFD). Demolition procedures require a minimum of five days of advance notification before operations can be conducted unless the BEC approves a shorter timeframe.

If an item cannot be moved to a secure consolidation point, it may be left in place, covered, and the location marked via Global Positioning System for later demolition. Security for the items will be provided as required. The UXO Technician III will present a proposed demolition plan to the SUXOS. If the SUXOS, Unexploded Ordnance Safety Officer (UXOSO), and the USACE OESS approve the plan, the UXO Technician III will then implement the demolition plan. The preferred method of MEC demolition will be detonation. If moving the MEC is not an option, then engineering controls must be designed and implemented to mitigate the effects of a high-order detonation. Coordination with and approval by the USACE OESS is required prior to detonating a MEC item under such circumstances. If the area cannot withstand a high-order detonation, engineering controls cannot be implemented, and the MEC item is not acceptable to be moved. In this case, the SUXOS will contact the USACE OESS to request military Explosive Ordnance Disposal (EOD) assistance.

7.1 Former Fort Ord Detonation Notification Procedure

Prior to any detonation, the appropriate notification and approval procedure will be initiated. The approval procedure includes notification to and approval from the BEC. As soon as it is determined that a detonation will be required, the SUXOS will initiate this procedure. The SUXOS will schedule the demolition to allow sufficient time to complete all notifications and approvals.

The following Contractor Forms are available in the MEC Quality Assurance Project Plan (QAPP) Addendum:

- Form M-1 Explosives Demolition Operations
- Form M-2 Detonation Approval Checklist/Risk Assessment
- Form M-3 Presidio of Monterey Fire Department Munitions Response & Ordnance Removal Fire Risk Assessment
- Form M-4 Misfire Checklist
- Form M-8 Preparatory Phase Demolition Inspection Checklist Form
- Form M-9 Initial Phase Demolition Inspection Checklist
- Form M-10 Final Phase Demolition Inspection Checklist

7.2 Consolidated Shots

Consolidated shots are the preferred method of detonation if it is safe to do so. They will only be performed with authorization from the onsite USACE OESS. Movement of MEC items cannot be performed without the combined approval of the SUXOS and UXOSO, with input from the USACE OESS. Consolidated shots may be performed in the Impact Area at a location designated by the USACE OESS in accordance with USACE *Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (OE) Sites* (USACE, 2000).

7.3 Demolition Procedures

During demolition activities, the SUXOS will have overall control of the site. An Exclusion Zone (EZ) will be established around the demolition site in accordance with the MEC QAPP Addendum, Attachment B UXO SOP 9 (Exclusion Zones). Only the SUXOS, UXOSO, the UXO Team, UXO-qualified personnel, and USACE OESS will be allowed within the EZ once the demolition operations have begun. The UXOSO will ensure that safe work practices are observed and that the UXO Technician III is performing the necessary steps described in this section to dispose of the MEC safely. Road guards will be placed around the work site area outside the EZ to ensure that unauthorized personnel do not enter the EZ.

Notification procedures will be conducted as follows for all detonation operations:

- The appropriate MEC Demolition Checklists and notifications (MEC QAPP Addendum, Attachment C Forms M-1 through M-4, and Forms M-8 through M-10) will be completed for each demolition operation.
- A minimum of three days of advance notification request for POMFD to come to the site and perform a fire risk assessment (MEC QAPP Addendum, Attachment C, Form M-3 [POMFD Munitions Response and Ordnance Removal Fire Risk Assessment]).
- Demolition procedures require a minimum of five days of advance notification before operations can be conducted unless the BEC approves a shorter timeframe. Whenever possible, all requests for risk assessment will require a three-day notification and all demolition shots will require a five-day notification.
- Complete a Detonation Approval Checklist/Risk Assessment (MEC QAPP Addendum, Form M-2) for approval by the BEC.
- Mass detonations require coordination with the Federal Aviation Administration (FAA). If necessary, the UXOSO will contact the FAA at the Monterey Airport Control Tower for air clearance and will hold online with the FAA until the shot is fired.

Technical procedures will be conducted as follows for all detonation operations:

- The SUXOS is responsible for scheduling demolition operations and ensuring that all project personnel are accounted for before demolition operations begin.
- The UXO Team—comprising the UXO Technician III and a UXO Technician II—will inspect the location, condition, and net explosive weight of the MEC to be detonated.
- Dry grass, leaves and other extraneous combustible material in amounts sufficient to spread fires will be removed from a 61-meter (200-foot) radius from the point of destruction.
- The UXO Technician III will ensure that permission to detonate explosives has been obtained from the SUXOS and coordinated with the USACE OESS.
- The UXO Team will be issued enough explosive charges and shock tube initiators to perform the planned detonations. The transportation vehicle will then be loaded with the explosives, shock tubing initiating systems, and other equipment required.
- Initiators will always be transported in a separate container from the main-charge explosives.
- A minimum separation distance (MSD) of 25 feet will be observed for initiators and main-charge explosives while at the demolition site.
- If several MEC items are located in proximity to each other, a mainline/branchline shot may be used to destroy these MEC simultaneously to increase the efficiency of the operation.
- The UXO Technician III will observe as the UXO Technician II positions the explosive charge against the MEC item. The demolition shot may be tamped, except for sensitively fuzed munitions, to minimize the effects of the detonation. However, the initiators (caps) will never be buried.
- All personnel, except, the UXO Technician III and one UXO Technician for priming the shot, will depart the demolition area prior to "capping in" and proceed to the firing point for personnel accountability
- The UXO Technician III will visually inspect the firing system prior to initiation.
- The UXO Technician III will then inspect the demolition shot and return to the safe firing point.
- Prior to initiation, the UXO Technician III will ensure that guards are stationed at the roadblocks, scan the EZ for personnel, and initiate the demolition charge if all is clear.
- All personnel will be accounted for prior to detonation approval.
- In the event of a misfire, there will be a 30-minute wait time for Shock Tube Initiating Systems and a 30-minute wait time for electric misfires (MEC QAPP Addendum, Form M-4, Misfire Checklist).

7.4 Engineering Controls

Engineering controls may be required to mitigate the effects of an intentional detonation. The goals of using engineering controls are to improve personnel safety and/or to reduce the MSD. The most common engineering controls are either soil cover or sandbags. Reducing the EZ with engineering controls is based on tests that follow the guidelines described in the following documents:

- HNC-ED-CS-S-98-7 (United States Army Engineering and Support Center, Huntsville [CEHNC], 2014) provides guidelines for use of sandbags to mitigate blast and fragmentation effects during intentional detonations.

- HNC-ED-CS-S-96-8 (CEHNC, 1997) provides guidelines for use of soil, water tamping, or other forms of barricading during demolition operations to reduce fragmentation and/or blast range.
- HNC-ED-CS-S-00-3 (CEHNC, 2000) provides guidelines for use of water for mitigation of fragmentation and blast effects due to intentional detonation of munitions.
- Department of Defense Explosives Safety Board (DDESB) Technical Paper 15 (DDESB, 2020) authorizes use of these forms of barricading when appropriately used in accordance with established guidelines.

7.5 Post-Detonation Operations

After the successful initiation of the explosive charge, a UXO Technician III and one UXO Technician II acting as safety backup will conduct an inspection of the shot to ensure complete destruction of the MEC. After verification that no more detonations will be required, a “demolition operations are completed” notification will be broadcast to all personnel across the project radio frequency.

The UXO Team will collect all sandbag fragments, large munition fragments, and other debris for disposal and generally clean and restore the site.

8.0 Documentation

The following information is to be recorded during MEC and MPPEH demolition operations:

- Date of discovery
- Date of demolition
- Operation type
- Team identification (ID)
- Team leader
- Found within a burial pit? (Yes or No)
- Demolition required? (Yes or No)
- Demolition performed? (Yes or No)
- Unit ID
- Grid ID
- Unique demolition ID
- Discovery easting
- Discovery northing
- Demolition easting
- Demolition northing
- Quantity
- Weight
- Demolition type
- Initial description
- Final description
- Model ID
- Initial condition

- Final condition
- Initial disposition
- Final disposition
- Final category

All demolition-related data are to be provided to the Site-Specific Data Manager at the end of each demolition operation.

9.0 Quality Control

Inspection checklists specific to this SOP are located in Appendix B. Measurement performance criteria for the demolition of MEC and MPPEH can be found in Worksheet #12 of the MEC QAPP Addendum. Worksheets #31, #32, and #33 of the MEC QAPP Addendum describe who will conduct the quality control (QC) inspection for this definable feature of work, along with the frequency of the Follow-up-Phase QC inspections.

10.0 Health and Safety

Conducting MEC and MPPEH demolition operations in areas that potentially contain MEC items will involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items. Safety measures will be addressed in the Accident Prevention Plan and Site Safety and Health Plan to mitigate these hazards. Procedures for establishing EZs are described in the MEC QAPP Addendum, Attachment B UXO SOP 9 (Exclusion Zones).

11.0 References

Department of Defense Explosives Safety Board (DDESB), 2020. *Approved Protective Construction.* Technical Paper 15. Revision 4. July.

United States Department of Defense (DoD), 2019a. DoD Manual 4160.28, Volume 1. *Defense Demilitarization: Program Administration*. July.

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United States Army Engineering and Support Center, Huntsville (CEHNC), 1997. HNC-ED-CS-S-96-8. *Guide for Selection and Siting of Barricades for Selected Unexploded Ordnance, Revision 1*. September.

CEHNC, 2000. HNC-ED-CS-S-00-3. *Use of Water for Mitigation of Fragmentation and Blast Effects due to Intentional Detonation of Munitions*.

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USACE, 2024a. Engineering Manual (EM) 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions*. March.

USACE, 2024b. Engineering Manul 385-1-1. *Safety and Occupation Health Requirements*. March.

Appendix A: SOP Signature Page

Project Information
UXO SOP 6: Demolition of MEC and MPPEH
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	Date:

Appendix B: Three-Phase Quality-Control Checklist

Project Information
UXO SOP 6: Demolition of MEC and MPPEH
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	**Section**	**Inspection Point**	**Yes**	**No**	**NA**	**Comments**
		Verify the following				
1	Signature Page	All personnel have signed the SOP Signature Page.				*(P)*
2	5.0	The required equipment is available: • First-aid kit • Two 10-pound B:C fire extinguishers • Field logbook and/or digital tablet • Shovels or other similar devices for excavation or filling of sandbags (should it be required) • Sandbags (if required) • Demolition material • Detonation device • Appropriate PPE				*(I), (F)*
3	7.0	Demolition procedures follow EM 385-1-1, EM 385-1-97 and DDESB 6055.09				*(I),(F)*
4	7.0	UXO filler has been determined prior to demolition.				*(I),(F)*
5	7.0	Demolition procedures are coordinated with the BEC, USACE, OESS, and local fire departments. Proper (three-day or five-day) notification has been given prior to demolition operations.				*(I),(F)*

Checklist						
Item	**Section**	**Inspection Point**	**Yes**	**No**	**NA**	**Comments**
6	7.0	Demolition plans have been approved by the SUXOS, UXOSO, and OESS.				*(I),(F)*
7	7.0	Engineering controls have been implemented if required. The OESS has approved the engineering controls.				*(I),(F)*
8	7.1	The SUXOS has initiated approval procedures. Proper forms have been completed.				*(I),(F)*
9	7.2	The OESS has authorized consolidated shots and a designated consolidation shot location (USACE, 2000).				*(I),(F)*
10	7.3	An EZ has been established during demolition operations in accordance with UXO SOP 9.				*(I),(F)*
11	7.3	Only SUXOS, UXOSO, UXO Team, UXO-qualified personnel and OESS are allowed in the EZ once demolition operations have begun.				*(I),(F)*
12	7.3	Road guards are placed around the worksite area outside the EZ to ensure unauthorized personnel do not enter the EZ.				*(I),(F)*
13	7.3	Appropriate MEC demolition checklists and notifications have been completed (Forms M-1, M-2, and M-3).				*(I),(F)*
14	7.3	The local fire department has performed a fire risk assessment (Munitions Response & Ordnance Removal Fire Risk Assessment Form).				*(I),(F)*
15	7.3	Appropriate notifications have been given.				*(I), (F)*
16	7.3	Form M-2 been filled out for approval by the BEC.				*(I), (F)*
17	7.3	The UXOSO has contacted the FAA at the Monterey Airport Control Tower for air clearance and will hold on the line with the FAA until the shot is fired.				*(I), (F)*
18	7.3	Location, condition, and net explosive weight have been determined for the MEC items.				*(I), (F)*
19	7.3	The demolition team has received permission from the SUXOS (and coordinated with the OESS) prior to detonation.				*(I), (F)*
20	7.3	All personnel are accounted for prior to the demolition operation.				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point**	**Yes**	**No**	**NA**	**Comments**
21	7.3	The demolition team has been issued sufficient charges and shock tube initiators to perform the detonation.				*(I), (F)*
22	7.3	Initiators are transported in a separate container from the main-charge explosives.				*(I), (F)*
23	7.3	The MSD of 25 feet is observed for initiators and main-charge explosives while at the demolition site.				*(I), (F)*
24	7.3	Sensitively fuzed munitions are not tamped. Initiators (caps) are not buried.				*(I), (F)*
25	7.3	Road guards are stationed, and the EZ is scanned for personnel prior to initiating demolition operations.				*(I), (F)*
26	7.3	In the event of a misfire, there is a 30-minute wait time for Shock Tube Initiating Systems and a 30-minute wait time for electric misfires. The General Demolition Misfire Checklist Form is completed and Form M-4 is filled out.				*(I), (F)*
27	7.4	After a demolition shot, the UXO Technician III with one UXO Technician II acting as safety backup has inspected the shot to ensure complete destruction.				*(I), (F)*
28	7.4	After verification that no more shots are required, a “demolition operations are completed” notification has been broadcast to all personnel across the project radio frequency.				*(I), (F)*
29	7.4	After demolition operations have been completed, the UXO Team has collected all sandbag fragments, large munition fragments, and other debris and has generally cleaned and restored the site.				*(I), (F)*
30	7.5	Engineering controls that are used (if required) follow HNC-ED-CS- S-98-7 (CEHNC, 2000) and HNC-ED-CS-S-96-8 (CEHNC, 1997).				*(I), (F)*
31	8.0	Required demolition-related documentation/data have been recorded and provided to the Site-Specific Data Manager at the end of each demolition operation.				*(I), (F)*

Punch list Items	
No.	

Conducted by: ____________________________ DATE: ____________________________

Approved by: ____________________________ DATE: ____________________________

UXO SOP 7
EXPLOSIVES MANAGEMENT

UXO SOP 7:
Explosives Management

Document Number	UXO SOP 7: Explosives Management
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28, 2025

Approvals

February 28, 2025

Christopher Ohland — Date

Southwest Environmental Quality Assurance and Compliance Program Manager

February 28, 2025

Bruce Wilcer — Date

Southwest Environmental Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LLC
ba	blasting agents
BATFE	Bureau of Alcohol, Tobacco, Firearms and Explosives
CFR	Code of Federal Regulations
det	detonators
DoD	United States Department of Defense
dyn	dynamite
MEC	munitions and explosives of concern
MPPEH	material potentially presenting an explosive hazard
OESS	Ordnance and Explosives Safety Specialist
PPE	personal protective equipment
QAPP	Quality Assurance Project Plan
QC	quality control
SOP	standard operating procedure
SUXOS	Senior Unexploded Ordnance Supervisor
USACE	United States Army Corps of Engineers
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this standard operating procedure (SOP) for all work related to explosives management. This SOP must be distributed to and the signature page included as Appendix A signed by all personnel performing activities related to this SOP. Personnel must adhere to these procedures as field activities are performed.

2.0 Purpose

The purpose of this SOP is to describe the equipment and general methodologies that are to be used during explosives management operations. This SOP does not detail the use of the equipment that is described herein. This SOP assumes that experienced personnel using this SOP are familiar with the equipment and are competent in their use.

3.0 Scope

The information presented in this SOP is generally applicable to all munitions and explosives of concern (MEC)-related project sites.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Equipment

The following equipment is associated with explosives management:

- First-aid kit
- A minimum of two 10-pound B:C fire extinguishers
- Field logbook and/or digital tablet
- Appropriate personal protective equipment (PPE)
- Vehicle chocks

6.0 Personnel

The Senior Unexploded Ordnance Supervisor (SUXOS), Unexploded Ordnance (UXO) Team Leader, and the UXO Team are responsible for explosives management. The explosives management team will include the following personnel (but may be reduced depending on the operation being performed):

- One UXO Technician III Team Leader
- Two (minimum) UXO Technician IIs
- Four (maximum) UXO Technician Is

The two-person rule is always to be followed.

7.0 Procedures

This section provides details on the management of explosives that can be employed, if necessary, at the Munitions Response Site within the Habitat Areas. These procedures were developed in accordance with the following:

- Defense Explosives Safety Regulation 6055.09, *DoD Explosives Safety Standards* (United States Department of Defense [DoD], 2024)
- Army Regulation (AR) 190-11. *Physical Security of Arms, Ammunition, and Explosives* (United States Department of the Army [Army], 2019)
- DA PAM 385-64. *Ammunition and Explosives Safety Standards*. 24 July 2023 (Army, 2023)
- Federal Acquisition Regulation 945.5. *Management of Government Property in the Possession of Contractors*
- Local and state laws and regulations
- United States Department of Transportation regulations

Required forms are available in the MEC Quality Assurance Project Plan (QAPP) Addendum.

7.1 Acquisition

The Contractor (Ahtna) will order explosives from a Bureau of Alcohol, Tobacco, Firearms and Explosives (BATFE)-licensed explosives vendor. The Contractor must maintain a valid BATFE Explosive User Permit. A copy of the BATFE dealer license and the Contractor's Explosive User Permit will be maintained at the project site. They will be made available to any local, state, or federal authority upon request.

The SUXOS is designated as the primary individual authorized to receive explosives. The Unexploded Ordnance Safety Officer (UXOSO), and Unexploded Ordnance Quality Control Specialist (UXOQCS) are designated as alternates, in the event the SUXOS is not on site. If the SUXOS, UXOSO and the UXOQCS are absent, approval for an alternate must be obtained from the Contracting Officer's Representative. Approval and letter of clearance from BATFE is required for all personnel authorized to receive explosives. All explosives received will be stored on site at the onsite explosives storage location.

Ahtna personnel will transport explosives from the explosives storage location to the work site. Types of explosives and their intended use are specified below. Typically, the following explosives will be used for the disposal of MEC or venting of inert munitions:

- Perforators will be used to detonate MEC and vent material potentially presenting an explosive hazard (MPPEH) items.
- Detonating cord will be used to construct mainline/branchline shots, to link multiple shots together, or to transmit the explosive train to the main-charge explosive when the main charge is tamped or otherwise inaccessible.
- Nonelectric initiators will be used to initiate the explosive train. Nonelectric tubing will be used to transmit the explosive train from the igniter to the demolition devices. Shock tube priming of explosives offers the instantaneous action of electric detonation without the risk of accidental initiation of the blasting cap (and the charge) by radio transmitters in the area or by static

electricity discharge. The explosion of the shock tube is entirely contained within the plastic tubing.

7.2 Initial Receipt

Explosives will be transported to the project site on an as-required basis. An initial explosives receipt inventory will be conducted by the SUXOS with one other qualified person before the explosives are transferred from the explosives vendor to the Contractor.

The quantities received by the SUXOS will be stored at the explosives storage location. During storage, the SUXOS is to be accompanied by one or more UXO Team members. Copies of the receipt documentation will be filed at the onsite Ahtna office and placed in the project's permanent archive.

7.3 Storage

Explosives will only be stored in the Department of Defense Explosives Safety Board sited and approved explosives storage magazines, which are inspected weekly. They will be stored in accordance with the requirements contained in the following:

- Title 27 Code of Federal Regulations (CFR) Parts 555.201–555.224 (27 CFR 555), Commerce in Explosives
- Defense Explosives Safety Regulation 6055.09, *DoD Explosives Safety Standards* (DoD, 2024)
- Local laws and regulations

7.4 Transportation

This section presents the vehicle requirements and onsite transportation procedures for explosives at the Munitions Response project area.

7.4.1 Onsite Transportation Procedures

Explosives will be received from the vendor and transported to the project site by Ahtna personnel. When demolition activities are planned, explosives will be transported to the designated area in an appropriately placarded vehicle following the procedures stated in this section.

Recovered MEC will not be moved unless it is acceptable to do so and only with the specific concurrence of the SUXOS, UXOSO, and United States Army Corps of Engineers (USACE) Ordnance and Explosives Safety Specialist (OESS) on site. The USACE OESS may require additional measures and inspection before the movement and preparation of MEC items for transportation.

Onsite transportation procedures will include the following safeguards:

- The driver of any vehicle carrying explosives or MEC will ensure that the load is properly braced and secured for transport (i.e., tie-downs).
- Initiators will be carried separately from main-charge explosives.
- The driver and any passengers transporting explosives or MEC will not carry any smoking products or flame-producing devices. Smoking will be strictly forbidden among all personnel involved in the handling or transportation of explosives and MEC.

- 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 fire and explosion hazards.
- If an unfired rocket motor must be transported, it shall be positioned in such a manner as to offer maximum protection to personnel in the event of an accident.
- If base-ejection-type projectiles must be transported to a demolition area or collection point, the base will be oriented to the rear of the vehicle, and the projectile will be secured in the event the ejection charge detonates in route.
- All MEC items will be positively identified as to the type of munition, filler, and condition of the fuzing prior to any movement.
- If MEC with exposed hazardous filler has to be moved to a demolition area, the item will be placed in an appropriate container with packing materials to prevent migration of the hazardous filler. Padding will also be added to protect the exposed filler from heat, shock, and friction.

7.4.2 Vehicle Requirements

Vehicles transporting explosives on the project site will comply with the following requirements:

- Vehicle engine will be turned off and vehicle chocked when loading and unloading explosives.
- Vehicles transporting explosives will be placarded when carrying any Class 1 explosives.
- All vehicles transporting explosives will be equipped with reliable communications, a first-aid kit, and two 10-pound B:C fire extinguishers. One extinguisher will be located in the driver's compartment, and the other will be located in the cargo compartment.
- Vehicles transporting explosives will be inspected daily when in use, and the inspections will be documented on a Motor Vehicle Inspection Form (MEC QAPP Addendum, Attachment C Forms).
- The vehicle used to transport the explosives will have a non-sparking bed liner, and all explosive loads will be covered and secured prior to departure.
- The SUXOS and UXOSO (and USACE OESS if available) will evaluate the appropriate transportation requirements for the item being transferred.

7.5 Receipt Procedures

This section describes the procedures that will be used to maintain records of explosives inventories and usage.

Upon the receipt of the explosives delivery at the project site, the SUXOS, in conjunction with another individual (UXOSO or UXOQCS), shall do the following:

- If the decision is made to escort the vendor to the magazine area a responsible person listed on the ATF license and at least one additional person identified as a possessor/user will be required to receive the shipment and follow the receipt procedures.
- Unload the shipment and physically verify quantities and types of materials received against the bill of lading and the order.
- Document any discrepancies and materials not yet shipped (i.e., not received). Attempt to resolve with the vendor. If discrepancies remain, notify the Ahtna MMRP Project Manager, who shall work with procurement and the vendors to resolve the issues.

- Sign the vendor's receipt documentation and annotate discrepancies (if unable to resolve).
- Place the explosives materials into the magazines (paying attention to storage compatibility and magazine quantities).
- Update the magazine data cards.
- Update the project explosives inventory (explosives received, used, and/or returned).

7.5.1 Inventory Control and Records Management

An accurate running inventory of all explosives received, used, and/or returned will be maintained. Copies of all paperwork pertaining to explosives received, used, and/or returned will be maintained by the SUXOS in the field office.

7.5.2 Authorized Individuals

The SUXOS and/or the UXOQCS/UXOSO will be responsible for the proper receipt and use of explosives for detonation purposes. They cannot delegate the responsibility for ensuring that the inventory, receipt, usage returns, and handling of the explosives is performed in accordance with the requirements of this plan.

7.5.3 End User Certification

The SUXOS, as the end user of explosives, will certify in writing that the explosives were used for their intended purpose. This information is tracked on the Explosives Usage Record (MEC QAPP Addendum, Attachment C Forms) and is included in daily reporting.

7.5.4 Reconciling Discrepancies

In the event that there is a discrepancy with any aspect of the management of explosives, the SUXOS will be immediately notified. The SUXOS, together with the UXOSO and UXOQCS, will review documentation to determine whether the discrepancy is a paperwork error or whether explosives have been lost or stolen. If it is concluded that explosives have been lost or stolen, the USACE OESS will be notified, and the procedures specified in Section 7.7 of this SOP will be implemented.

7.6 Inventory

At a minimum, the following inventories will be maintained.

7.6.1 Special Inventories

The SUXOS will take a true and accurate physical inventory that will include all explosive materials on hand required to be accounted for in the records kept. The SUXOS must take a special inventory at the following times:

- At the time of commencing business (project start-up)
- At the time of changing the location of their premises (change in project location)
- At the time of discontinuing business (project completion)
- At any other time the BATFE may require

Each special inventory is to be prepared in duplicate; the original is submitted to the BATFE, and the duplicate is retained by the permittee.

7.6.2 Minimum Inventory Requirement

The SUXOS will take and record a true and accurate physical inventory, at least monthly, that will include all explosive materials on hand required to be accounted for. In addition, an inventory will be completed following demolition operations to ensure accurate quantities of explosives are maintained.

7.6.3 Receipt Inventory

The SUXOS will, not later than the close of the next business day following the date of acquisition of explosive materials, enter the following information in a separate memorandum retained in the SUXOS field office:

- Date of acquisition
- Name or brand name of manufacturer
- Manufacturer's marks of identification
- Quantity (applicable quantity units, such as pounds of explosives, number of detonators, etc.)
- Description: dynamite (dyn), blasting agents (ba), detonators (det), etc.
- Name, address, and license number of the persons from whom the explosive materials are received

7.6.4 Magazine Data Cards

Each magazine will have a Magazine Data Card (MEC QAPP Addendum, Attachment C Forms) placed inside the magazine with a true and accurate inventory of the materials contained in the magazine. The Magazine Data Card shall be updated each time materials are added or subtracted from the magazine. One data card shall be kept for each type of material stored in the magazine. A MEC / UXO tracking form, to include MPPEH items and incidental items from activities/location unrelated to the remedial action, shall be maintained in case the Magazine Data Card is rendered unusable due to weather or other unforeseen issues. The MEC / UXO tracking form will include descriptions of the item type, source location (e.g., unit), date recovered, and identification of UXO Technician that recovered the item.

7.7 Lost, Stolen, or Unauthorized Use of Explosives

If explosives are discovered to be lost, stolen, or used without authorization, the incident will be immediately reported to the SUXOS, who will inform the USACE OESS and Ahtna MMRP Project Manager.

As the federal licensee, Ahtna is required by law (27 CFR 55.30) to report the theft or loss of explosives to the BATFE within 24 hours. In the event of such an occurrence, the following procedures will be followed:

- The SUXOS will make the appropriate notifications in accordance with 27 CFR 55.30. These include calling BATFE (866-927-4570) and the local law enforcement authorities.
- The SUXOS will complete and forward BATFE Form 5400.5 (MEC QAPP Addendum, Attachment C Forms). A copy will be provided to the USACE OESS.
- The SUXOS will provide a copy of the police report to USACE if requested.

8.0 Documentation

The following information is to be recorded during demolition operations:

- Explosives receipt inventory
- Document any discrepancies and materials not yet shipped (i.e., not received)
- Explosives inventory (explosives received, used, and/or returned)
- Magazine Data Cards (MEC QAPP Addendum, Attachment C Form M-11)
- Explosives Usage Record MEC QAPP Addendum, Attachment C Form M-6)
- Motor Vehicle Inspection (MEC QAPP Addendum, Attachment C Form M-5)
- BATFE Form 5400.5 MEC QAPP Addendum, Attachment C Form M-7) (if lost, stolen, or unauthorized use of explosives)

9.0 Quality Control

Inspection checklists specific to this SOP are located in Appendix B, Three-Phase Quality-Control Checklist). Measurement performance criteria for explosives management operations can be found in Worksheet #12 of the MEC QAPP Addendum. Worksheets #31, #3, and #33 of the MEC QAPP Addendum describe who will conduct the quality control (QC) inspection for this definable feature of work, along with the frequency of the Follow-up-Phase QC inspections.

10.0 Health and Safety

Conducting explosives management operations in areas that potentially contain MEC items will involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items. Safety measures will be addressed in the Accident Prevention Plan and Site Safety and Health Plan to mitigate these hazards. Procedures for establishing Exclusion Zones are described in the MEC QAPP Addendum, Attachment B UXO SOP 9 (Exclusion Zones).

11.0 References

United States Department of the Army (Army), 2019. Army Regulation (AR) 190-11. *Physical Security of Arms, Ammunition, and Explosives*. January.

Army, 2023. DA PAM 385–64. *Ammunition and Explosives Safety Standards*. July.

United States Department of Defense (DoD), 2024. Defense Explosives Safety Regulation 6055.09. *DoD Explosives Safety Standards*. Edition 1, Change 1. February.

Appendix A: SOP Signature Page

Project Information
UXO SOP 7: Explosives Management
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	Date:

Appendix B: Three-Phase Quality-Control Checklist

Project Information
UXO SOP 7: Explosives Management
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
1	Signature Page	All personnel have signed the SOP Signature Page.				*(P)*
2	5.0	Required equipment is available: • First-aid kit • A minimum of two 10-pound B:C fire extinguishers • Field logbook and/or digital tablet • Appropriate PPE • Vehicle chocks				*(I), (F)*
3	7.1	Explosives are ordered through a BATFE-licensed explosives vendor with a valid BATFE Explosives User Permit. The Contractor's Explosives User Permit is maintained at the project site.				*(I), (F)*
4	7.1	SUXOS receives explosives, with UXOSO or UXOQCS as the alternate.				*(I), (F)*
5	7.1	All explosives received are stored on site at the explosives storage location.				*(I), (F)*
6	7.1	Perforations are used to detonate MEC and vent MPPEH.				*(I), (F)*
7	7.1	Detonation cord is used to construct mainline/branchline shots.				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
8	7.1	Nonelectric initiators are used to initiate the explosive train.				*(I), (F)*
9	7.2	An initial explosives receipt inventory has been conducted before explosives are transferred from the previous Contractor.				*(I), (F)*
10	7.2	Explosives are received by the SUXOS and are stored at the explosives storage location. During storage, the SUXOS is accompanied by one or more UXO Team members. Copies of receipt documentation are filed at the onsite Ahtna office and placed in the project's permanent archive.				*(I), (F)*
11	7.3	Explosives are stored in the approved explosives storage magazines, which are inspected weekly and are stored in accordance with: • 27 CFR 555, Commerce in Explosives • Defense Explosives Safety Regulation 6055.09, *DoD Explosives Safety Standards* (DoD, 2024) • Local laws and regulations				*(I), (F)*
12	7.4.1	Items are properly secured/braced.				*(I), (F)*
13	7.4.1	Initiators are carried separately from main-charge explosives.				*(I), (F)*
14	7.4.1	Personnel do not have any smoking products or flame-producing devices.				*(I), (F)*
15	7.4.1	If loose pyrotechnic, tracer, flare, or similar mixtures are transported, they are placed in #10 mineral oil or equivalent.				*(I), (F)*
16	7.4.1	Rocket motors are placed in such a manner as to offer maximum protection to personnel.				*(I), (F)*
17	7.4.1	Base-ejection-type projectiles are oriented with their base toward the rear of the vehicle.				*(I), (F)*
18	7.4.1	All MEC items are positively identified as to type of munition, filler and condition of fuzing prior to any movement.				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
19	7.4.1	If hazardous filler is exposed, the item is placed in an appropriate container (with padding) to prevent migration of filler and protect filler from heat, shock, friction.				*(I), (F)*
20	7.4.2	Vehicle engine will be turned off and vehicle chocked when loading and unloading explosives				*(I), (F)*
21	7.4.2	Vehicles transporting explosives are placarded when carrying any Class 1 explosives.				*(I), (F)*
22	7.4.2	Vehicles transporting explosives have reliable communication, a first-aid kit, and a minimum of two 10-pound B:C fire extinguishers.				*(I), (F)*
23	7.4.2	Vehicles transporting explosives are inspected daily. Motor Vehicle Inspection Form (Form M-5) is filled out for each vehicle.				*(I), (F)*
24	7.4.2	Vehicles used to transport explosives have a non-sparking bed liner. All explosive loads are covered and secured prior to departure.				*(I), (F)*
25	7.5	The SUXOS (with UXOSO or UXOQCS) has completed the following: 1. If the decision is made to escort the vendor to the magazine area a responsible person listed on the ATF license and at least one additional person identified as a possessor/user will be required to receive the shipment and follow the receipt procedures. 2. Physically verify the quantities and types of materials received against the bill of lading and the order. 3. Document discrepancies. Notify the Ahtna MMRP Project Manager of discrepancies. 4. Sign the vendor's receipt documentation and annotate discrepancies.				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
		5. Place explosives materials into magazines, paying attention to storage compatibility and magazine quantities. 6. Update the Magazine Data Cards. 7. Update the project explosives inventory (explosives received, used, and/or returned).				
26	7.5.1	The SUXOS maintains an accurate running inventory of all explosives received, used, and/or returned. The SUXOS maintains copies of all paperwork.				*(I), (F)*
27	7.5.2	The SUXOS and/or the UXOQCS/UXOSO are responsible for the proper receipt and use of explosives; this responsibility has not been delegated.				*(I), (F)*
28	7.5.3	The SUXOS has certified in writing that explosives were used for their intended purpose (Explosives Usage Record, Form M-6). Certification is included with daily reporting.				*(I), (F)*
29	7.5.4	If discrepancies exist, the SUXOS has been notified immediately. The SUXOS, UXOSO, and UXOQCS have determined whether it is a paperwork error or if explosives have been lost or stolen. If explosives have been lost or stolen, the OESS has been notified.				*(I), (F)*
30	7.6.1	The SUXOS has taken special inventory when the following occurs: • At the time of commencing business (project start-up) • At the time of changing the location of their premises (change in project location) • At the time of discontinuing business (project completion) • At any other time, the BATFE may require it Each special inventory has been prepared in duplicate. The original has been submitted to the				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
		BATFE, and the duplicate has been retained by the permittee.				
31	7.6.2	The SUXOS takes a true and accurate physical inventory at least monthly and following demolition operations.				*(I), (F)*
32	7.6.3	The SUXOS has entered the following information in a separate memorandum retained in the SUXOS office (not later than the close of the next business day following the date of acquisition of explosive materials): • Date of acquisition • Name or brand name of manufacturer • Manufacturer's marks of identification • Quantity (applicable quantity units, such as pounds of explosives and number of detonators) • Description dynamite (dyn), blasting agents (ba), detonators (det) • Name, address, and license number of the persons from whom the explosive materials are received				*(I), (F)*
33	7.6.4	Each magazine has a Magazine Data Card (Form M-11) attached to the door of the magazine that has a true and accurate inventory of the materials contained in the magazine.				*(I), (F)*
34	7.6.4	Magazine Data Cards are updated each time materials are added or subtracted from the magazine. One Magazine Data Card is kept for each type of material stored in the magazine. Duplicate records are maintained at the onsite office.				*(I), (F)*
35	7.7	Lost, stolen, or unauthorized use of explosives is reported immediately to the SUXOS, who notifies the OESS and Ahtna MMRP Project Manager.				*(I), (F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
36	7.7	The SUXOS reports lost, stolen, or unauthorized use of explosives to BATFE within 24 hours in accordance with 27 CFR 55.30, including calling BATFE and local law enforcement authorities.				*(I), (F)*
37	7.7	If lost, stolen or unauthorized use of explosives occurs, the SUXOS completes and forwards BATFE Form 5400.5 (Form M-7). A copy of the form is provided to the OESS.				*(I), (F)*
38	8.0	The following documentation has been completed: • Explosives Receipt Inventory • Any discrepancies and materials not yet shipped (i.e., not received) • Explosives inventory (explosives received, used, and/or returned) • Magazine Data Card(s) (Form M-11) • Explosives Usage Record (Form M-6) • Motor Vehicle Inspection (Form M-5) • BATFE Form 5400.5 (Form M-7) (if lost, stolen, or unauthorized use of explosives)				*(I), (F)*

Punch list Items	
No.	

Conducted by: ______________________________ DATE: ______________________________

Approved by: ______________________________ DATE: ______________________________

UXO SOP 8
EXPLOSIVES SITING

UXO SOP 8:
Explosives Siting

Document Number	UXO SOP 8: Explosives Siting
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28, 2025

Approvals

Christopher Ohland — February 28, 2025

Christopher Ohland | Date

Southwest Environmental Quality Assurance and Compliance Program Manager

Bruce Wilcer — February 28, 2025

Bruce Wilcer | Date

Southwest Environmental Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LLC
CEHNC	United States Army Engineering and Support Center, Huntsville
DDESB	Department of Defense Explosives Safety Board
ESS	Explosives Safety Submission
EZ	Exclusion Zone
GIS	geographic information system
MEC	munitions and explosives of concern
MFD	maximum fragmentation distance
MGFD	munition with the greatest fragmentation distance
MMRP	Military Munitions Response Program
MSD	minimum separation distance
OESS	Ordnance and Explosives Safety Specialist
QAPP	Quality Assurance Project Plan
QC	quality control
SOP	standard operating procedure
SSWP	Site-Specific Work Plan
SUXOS	Senior Unexploded Ordnance Supervisor
TP	Technical Paper
USACE	United States Army Corps of Engineers
UXO	unexploded ordnance
UXOSO	Unexploded Ordnance Safety Officer

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this standard operating procedure (SOP) for all work related to explosives management. This SOP must be distributed to and the signature page (Appendix A) signed by all personnel performing activities related to this SOP. Personnel must adhere to these procedures as field activities are performed.

2.0 Purpose

The purpose of this SOP is to describe the equipment and general methodologies to be used during explosives siting operations. This SOP does not detail the use of the equipment that is described herein. This SOP assumes that experienced personnel using this SOP are familiar with the equipment and are competent in their use.

3.0 Scope

The information presented in this SOP is generally applicable to all munitions and explosives of concern (MEC)-related project sites.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Equipment

No specific equipment is required for explosives siting activities.

6.0 Personnel

6.1 Explosives Siting Team

The Senior Unexploded Ordnance Supervisor (SUXOS), Unexploded Ordnance Safety Officer (UXOSO), and Military Munitions Response Program (MMRP) Project Manager are responsible for explosives siting. The explosives siting team will include the following personnel:

- SUXOS
- UXOSO
- MMRP Project Manager
- Geographic Information System (GIS) Manager (for map generation)

7.0 Procedures

The procedures described in this section for siting explosives are intended to ensure the safety and security of explosive-related operations during removal activities. If an Explosives Safety Submission (ESS) is required for a specific site, the ESS will be approved prior to the commencement of work at the site.

7.1 Exclusion Zones and Minimum Separation Distances

The munition with the greatest fragmentation distance (MGFD) will be computed for each unit and will be discussed in the Site-Specific Work Plan (SSWP). The Exclusion Zone (EZ) will be established based on the minimum separation distance (MSD) for the MGFD, which will be determined for each unit. This distance will be computed in accordance with the current version of Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 16, *Methodologies for Calculating Primary Fragment Characteristics* and the fragmentation data sheet.

Engineering controls can be used to reduce the MSD when evacuation perimeters around the work sites do not permit the establishment of the needed 360-degree EZ. Engineering controls can serve as an alternative to evacuation to the full MSD for the MGFD but decrease work production rates, require additional equipment and materials, and require site approval for use. Reducing the EZ with engineering controls is based on tests that follow the guidelines described in the following documents:

- HNC-ED-CS-S-98-8 provides guidelines for the use of the Miniature Open Front Barricade (commonly referred to as the “Bud-Lite”) for use during intrusive operations such as MEC investigation and anomaly excavations (United States Army Engineering and Support Center, Huntsville [CEHNC], 2018). This equipment—authorized for use by TP-15, Approved Protective Construction (DDESB, 2020)—mitigates fragmentation range in three directions (sides and front) in the event of unintentional detonations but offers no blast mitigation capability.
- HNC-ED-CS-S-98-7 provides guidelines for use of sandbags to mitigate blast and fragmentation effects during intentional detonations (CEHNC, 2014). TP 15 authorizes use of this equipment during removal actions when appropriately used in accordance with established guidelines.
- HNC-ED-CS-S-96-8 provides guidelines for use of soil, water tamping, or other forms of barricading during demolition operations to reduce fragmentation and/or blast range (CEHNC, 1997). TP 15 authorizes use of these forms of barricading when appropriately used in accordance with established guidelines.
- HNC-ED-CS-S-00-3, Use of Water for Mitigation of Fragmentation and Blast Effects due to Intentional Detonation of Munitions (CEHNC, 2000).
- DDESB Buried Explosion Module, Version 6.3.2 (DDESB, 2023 or most current version).

Only personnel essential to the project and authorized visitors will be permitted access to the EZ. Essential personnel are defined as United States Army Corps of Engineers (USACE) and Contractor project personnel necessary for the safe and efficient completion of field operations conducted in an EZ. This is limited to the USACE Ordnance and Explosives Safety Specialist (OESS) along with Contractor work team members, including the UXOSO, Unexploded Ordnance Quality Control Specialist, and SUXOS. Personnel may include others designated by the SUXOS. A daily sign-in/out log will be maintained for essential personnel conduction work in the EZ. Essential personnel will sign-in at the daily safety brief and sign-out following completion of daily field operations. All nonessential personnel (authorized visitors) who require entry into the EZ will require an Unexploded Ordnance (UXO) Technician escort, and all MEC operations will cease until nonessential personnel leave the EZ. Nonessential personnel must receive a safety brief and sign the visitor sign-in/out log prior to entering the exclusion zone. The UXOSO or SUXOS will brief the visitor on the measures to be taken in the event of an accident and the location and route to the nearest hospital; the hazards associated with the site; and authorized areas to eat, drink, or smoke. Visitors must sign-out when leaving the site. Regulatory agency representatives may be deemed essential personnel on a case-by-case basis following coordination between the SUXOS and USACE OESS.

If MEC with a larger maximum fragmentation distance (MFD) than that of the MGFD is discovered, or if warranted by the quantity of MEC discovered, all work will be halted, and a new MGFD and associated EZ will be designated based on the items found. The applicable ESS will then be amended to address the larger MGFD. Work will not continue until United States Army Technical Center for Explosives Safety interim approval or DDESB approval is granted. If demolition operations are to be performed, the SUXOS will calculate an EZ based on the type of MEC involved and the quantity of explosives required to destroy the MEC items. The USACE OESS will approve this computation before demolition activities are performed.

The EZ will be established based on the larger of the MGFD and K328 distances for the quantity of the explosives used, obtained from either the fragmentation data sheet or Defense Explosives Safety Regulation 6055.9 (DDESB, 2024).

7.2 Explosives Storage and Planned Demolition

Explosives will be stored at the explosives storage location. The SUXOS will issue the explosives needed for demolition operations to the demolition crew. The crew will transport the explosives to the required location. All explosives will be managed in accordance with the MEC Quality Assurance Project Plan (QAPP) Addendum, Attachment B UXO SOP 7 (Explosives Management).

The SUXOS will direct the demolition crew to commence with the demolition operations, which will be directly supervised by a UXO Technician III and conducted in accordance with MEC QAPP Addendum, Attachment B UXO SOP 6 (Demolition of MEC and Material Potentially Presenting an Explosive Hazard). An EZ will be established for all personnel, which will be the greater of the overpressure distance or the appropriate fragment range as determined by the maximum fragment range or the mitigated fragment range used during the demolition activities. This distance will be computed as the greater of the MFD or the K328 distance for the maximum quantity of explosives to be used.

8.0 Documentation

A map of the EZ (to include MGFD and/or K328 distances) shall be recorded as part of ESS.

Essential personnel visitor sign-in/out logs shall be maintained at the Project Site Office.

9.0 Quality Control

Inspection checklists specific to this SOP are located in Appendix B, Three-Phase Quality-Control Checklist. Measurement Performance criteria for explosives siting can be found in Worksheet #12 of the MEC QAPP Addendum. Worksheets #31, #32, and #33 of the MEC QAPP Addendum describe who will conduct the quality control (QC) inspection for this definable feature of work, along with the frequency of the Follow-up-Phase QC inspections.

10.0 Health and Safety

Conducting explosives siting operations in areas that potentially contain MEC items will involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items. Safety measures are to be addressed in the Accident Prevention Plan and Site Safety and Health Plan to mitigate these hazards. Procedures for establishing EZs are described in the MEC QAPP Addendum, Attachment B UXO SOP 9 (Exclusion Zones).

11.0 References

Department of Defense Explosives Safety Board (DDESB), 2020. Technical Paper (TP) 15. *Approved Protective Construction.* Revision 4. July.

DDESB, 2023 (or current version). Technical Paper (TP) 16. *Methodologies for Calculating Primary Fragment Characteristics*.

DDESB, 2024. Regulation 6055.09. *Department of Defense Explosives Safety Standards*. Edition 1, Change 1. February 2024.

United States Army Engineering and Support Center, Huntsville (CEHNC), 1997. HNC-ED-CS-S-96-8. *Guide for Selection and Siting of Barricades for Selected Unexploded Ordnanc*e, *Revision 1*. September.

CEHNC, 1998. HNC-ED-CS-S-98-8. *Miniature Open Front Barricade*. Revision 2.

CEHNC, 2000. HNC-ED-CS-S-00-3. *Use of Water for Mitigation of Fragmentation and Blast Effects due to Intentional Detonation of Munitions*.

CEHNC, 2014. HNC-ED-CS-S-98-7. *Use of Sandbags for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions*. November.

Appendix A: SOP Signature Page

Project Information
UXO SOP 8: Explosives Siting
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	Date:

Appendix B: Three-Phase Quality-Control Checklist

Project Information
UXO SOP 8: Explosives Siting
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
1	Signature Page	All personnel have signed the SOP Signature Page (Appendix A).				*(P)*
2	7.1	MGFD has been computed for the unit and is discussed in the SSWP.				*(I),(F)*
3	7.1	The EZ has been established based on the MSD for the MGFD that has been computed in accordance with the current version of TP 16.				*(I),(F)*
4	7.1	If engineering controls are to be used, verify that they are in compliance with the five bullets listed in Section 7.1 of this SOP.				*(I),(F)*
5	7.1	Only essential personnel and authorized visitors are permitted access to the EZ when Munitions Response operations are being conducted.				*(I),(F)*
6	7.1	A daily sign-in/out log is maintained for essential personnel working in the EZ.				*(I),(F)*
7	7.1	All nonessential personnel who require entry into the EZ have a UXO escort. All MEC operations cease until nonessential personnel leave the EZ.				*(I),(F)*
8	7.1	A visitors sign-in/out log is maintained for nonessential personnel entering the EZ.				*(I),(F)*
9	7.1	Visitors are briefed on the measures to be taken in the event of an accident and the location and route to the nearest hospital; the hazards				*(I),(F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**NA**	**Comments**
		associated with the site; and authorized areas to eat, drink, or smoke by the UXOSO or SUXOS prior to entering the EZ.				
10	7.1	If MEC with larger MFD than the MGFD is discovered, or if warranted by the quantity of MEC discovered, verify that all work is halted. A new EZ is then designated based on the items found, and the ESS is amended to address the larger MGFD.				*(I),(F)*
11	7.1	For demolition operations, the SUXOS calculates an EZ based on the type and quantity of MEC involved and the quantity of explosives required to destroy the MEC items.				*(I),(F)*
12	7.1	The OESS has approved this computation before demolition activities are performed.				*(I),(F)*
13	7.1	The EZ is based on the larger of the MGFD and K328 distances for the quantity of the explosives used.				*(I),(F)*
14	7.2	Explosives are stored at the explosives storage location.				*(I),(F)*
15	7.2	The SUXOS issues the explosives needed for demolition operations to the demolition crew.				*(I),(F)*
16	7.2	All explosives are managed in accordance with UXO SOP 7 (Explosives Management).				*(I),(F)*
17	7.2	An EZ has been established for all personnel, which will be the greater of the overpressure distance or the appropriate fragmentation range as determined by the maximum fragmentation range or the mitigated fragmentation range used during demolition operations, calculated as the greater of the MFD or the K328 distance for the maximum quantity of explosives used.				*(I),(F)*
18	8.0	The GIS Manager has generated a map of the EZ.				*(I),(F)*
19	8.0	Essential personnel sign-in/out logs and visitor sign-in/out logs are maintained at the Project Site Office.				*(I),(F)*

Punch list Items	
No.	

Conducted by: ____________________________ DATE: ___________________________

Approved by: _____________________________ DATE: ___________________________

UXO SOP 9
EXCLUSION ZONES

UXO SOP 9:
Exclusion Zones

Document Number	UXO SOP 9: Exclusion Zones
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28, 2025

Approvals

February 28, 2025

Christopher Ohland — Date

Southwest Environmental Quality Assurance and Compliance Program Manager

February 28, 2025

Bruce Wilcer — Date

Southwest Environmental Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LCC
CEHNC	United States Army Engineering and Support Center, Huntsville
DDESB	Department of Defense Explosives Safety Board
ESS	Explosive Safety Submission
EZ	Exclusion Zone
GIS	Geographic Information System
MEC	munitions and explosives of concern
MFD	maximum fragmentation distance
MGFD	munition with the greatest fragmentation distance
MSD	minimum separation distance
OESS	Ordnance and Explosives Safety Specialist
QAPP	Quality Assurance Project Plan
QC	quality control
SOP	standard operating procedure
SSWP	Site-Specific Work Plan
SUXOS	Senior Unexploded Ordnance Supervisor
USACE	United States Army Corps of Engineers
UXO	unexploded ordnance
UXOSO	Unexploded Ordnance Safety Officer

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this standard operating procedure (SOP) for all work related to the generation and use of Exclusion Zones (EZs). This SOP must be distributed to and signed by all personnel performing activities related to this SOP. Personnel must adhere to these procedures as field activities are performed.

2.0 Purpose

The purpose of this SOP is to describe the equipment and general methodologies that are to be used during the generation and use of EZs. This SOP does not detail the use of the equipment that is described herein. This SOP assumes that experienced personnel that will be using this SOP are familiar with the equipment and are competent in their use.

3.0 Scope

The information presented in this SOP is generally applicable to all munitions and explosives of concern (MEC)-related project sites.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Equipment

There is no specific equipment associated with the generation and use of EZs,

6.0 Personnel

The Senior Unexploded Ordnance Supervisor (SUXOS) and Unexploded Ordnance Safety Officer (UXOSO) are responsible for the generation and use of EZs. The following personnel will be involved with the generation and use of EZs:

- SUXOS
- UXOSO
- Geographic Information System (GIS) Manager (for map generation)

7.0 Procedures

The procedures described in this section are for the generation and use of EZs intended to ensure the safety of project personnel and the public. EZs also ensure the security of explosive-related operations during removal activities. If an Explosive Safety Submission (ESS) is required for a specific site, the ESS will be approved prior to the commencement of work at the site.

7.1 Exclusion Zones and Minimum Separation Distance

The munition with the greatest fragmentation distance (MGFD) will be computed for each unit and will be discussed in the Site-Specific Work Plan (SSWP). The EZ will be established based on the minimum separation distance (MSD) for the MGFD, which will be determined for each unit. This distance will be computed in accordance with the most current version of Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 16, *Methodologies for Calculating Primary Fragment Characteristics* and the fragmentation data sheet. Engineering controls can be used to reduce the MSD when exclusion perimeters around the work sites do not permit the establishment of the needed 360-degree EZ.

Engineering controls can serve as an alternative to the full MSD for the MGFD but decrease work production rates, require additional equipment and materials, and require site approval for use. Reducing the EZ with engineering controls is based on tests that follow the guidelines described in the following items:

- HNC-ED-CS-S-98-8 provides guidelines for the use of the Miniature Open Front Barricade (commonly referred to as the "Bud-Lite") for use during intrusive operations such as MEC investigation and anomaly excavations (United States Army Engineering and Support Center, Huntsville [CEHNC], 1998). This equipment—authorized for use by TP-15, Approved Protective Construction (DDESB, 2020)—mitigates fragmentation range in three directions (sides and front) in the event of unintentional detonations but offers no blast mitigation capability.
- HNC-ED-CS-S-98-7 provides guidelines for use of sandbags to mitigate blast and fragmentation effects during intentional detonations (CEHNC, 2014). TP 15 authorizes use of this equipment during removal actions when appropriately used in accordance with established guidelines.
- HNC-ED-CS-S-96-8 provides guidelines for use of soil, water tamping, or other forms of barricading during demolition operations to reduce fragmentation and/or blast range (CEHNC, 1997). TP 15 authorizes use of these forms of barricading when appropriately used in accordance with established guidelines.
- HNC-ED-CS-S-00-3, Use of Water for Mitigation of Fragmentation and Blast Effects due to Intentional Detonation of Munitions (CEHNC, 2000)
- DDESB Buried Explosion Module, Version 6.3.2 (DDESB, 2023 or most current version)

Only personnel essential to the project and authorized visitors will be permitted access to the EZ. Essential personnel are defined as USACE and Contractor project personnel necessary for the safe and efficient completion of field operations conducted in an EZ. This is limited to the United States Army Corps of Engineers (USACE) Ordnance and Explosives Safety Specialist (OESS) along with Contractor work team members, including the UXOSO, Unexploded Ordnance Quality Control Specialist, and SUXOS. Essential personnel may include others designated by the SUXOS. A daily sign-in/out log will be maintained for essential personnel conduction work in the EZ. Essential personnel will sign-in at the daily safety brief and sign-out following completion of daily field operations. All nonessential personnel (authorized visitors) who require entry into the EZ will require an Unexploded Ordnance (UXO) Technician escort, and all MEC operations will cease until nonessential personnel leave the EZ. Nonessential personnel must receive a safety brief and sign the visitor sign-in/out log prior to entering the exclusion zone. The UXOSO or SUXOS will brief the visitor on the measures to be taken in the event of an accident and the location and route to the nearest hospital; the hazards associated with the site; and authorized areas to eat, drink, or smoke. Visitors must sign-out when leaving the site. Regulatory agency representatives may be deemed essential personnel on a case-by-case basis following coordination between the SUXOS and USACE OESS.

If MEC with a larger maximum fragmentation distance (MFD) than that of the MGFD are discovered, or if warranted by the quantity of MEC discovered, all work will be halted and a new MGFD and associated EZ will be designated based on the items found. The applicable ESS will then be amended to address the larger MGFD. Work will not continue until United States Army Technical Center for Explosives Safety interim approval or DDESB approval is granted. If demolition operations are to be performed, the SUXOS will calculate an EZ based on the type of MEC involved and the quantity of explosives required to destroy the MEC items. The USACE OESS will approve this computation before demolition activities can be performed.

The EZ will be established based on the larger of the MGFD and K328 distances for the quantity of the explosives used, obtained from either the fragmentation data sheet or Defense Explosives Safety Regulation 6055.9 (DDESB, 2024).

8.0 Documentation

A map of the EZ (to include MGFD and/or K328 distances) shall be recorded as part of EZ operations.

Essential personnel and visitor sign-in/out logs shall be maintained at the Project Site Office.

9.0 Quality Control

Inspection checklists specific to this SOP are located in Appendix B, Three-Phase Quality-Control Checklist. Measurement performance criteria for establishing EZs can be found in Worksheet #12 of the MEC Quality Assurance Project Plan QAPP Addendum. Worksheets #31, #32, and #33 of the MEC QAPP Addendum describe who will conduct the quality control (QC) inspection for this definable feature of work, along with the frequency of the Follow-up-Phase QC inspections.

10.0 Health and Safety

Conducting explosives siting operations in areas that potentially contain MEC items will involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items. Safety measures are to be addressed in the Accident Prevention Plan and Site Safety and Health Plan to mitigate these hazards.

11.0 References

Department of Defense Explosives Safety Board (DDESB), 2020. Technical Paper (TP) 15. *Approved Protective Construction.* Revision 4. July.

DDESB, 2023 (or most current version). Technical Paper (TP) 16. *Methodologies for Calculating Primary Fragment Characteristics*.

DDESB, 2024. Regulation 6055.09. *Department of Defense Explosives Safety Standards*. Edition 1, Change 1. February 2024.

United States Army Engineering and Support Center, Huntsville (CEHNC), 1997. HNC-ED-CS-S-96-8. *Guide for Selection and Siting of Barricades for Selected Unexploded Ordnanc*e, *Revision 1*. September.

CEHNC, 1998. HNC-ED-CS-S-98-8. *Miniature Open Front Barricade*. Revision 2.

CEHNC, 2000. HNC-ED-CS-S-00-3. *Use of Water for Mitigation of Fragmentation and Blast Effects due to Intentional Detonation of Munitions*.

CEHNC, 2014. HNC-ED-CS-S-98-7. *Use of Sandbags for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions*. November.

Appendix A: SOP Signature Page

Project Information
UXO SOP 9: Exclusion Zones
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	**Date:**

Appendix B: Three-Phase Quality-Control Checklist

Project Information
UXO SOP 9: Exclusion Zones
Contract and Task Order:
Site:

Team Information		
TEAM:	Location:	Date:
Personnel Present:		
Phase of Inspection (Circle): *PREPARATORY (P); INITIAL (I); FOLLOW-UP (F)*		

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
1	Signature Page	All personnel have signed the SOP Signature Page (Appendix A).				*(P)*
2	7.1	The MGFD has been computed for the unit and is discussed in the SSWP.				*(I),(F)*
3	7.1	The EZ has been established based on the MSD for the MGFD that has been computed in accordance with the current version of TP 16.				*(I),(F)*
4	7.1	If engineering controls are to be used, verify that they are in compliance with the five bullets listed in Section 7.1 of this SOP.				*(I),(F)*
5	7.1	Only essential personnel and authorized visitors are permitted access into the EZ when Munitions Response operations are being conducted.				*(I),(F)*
6	7.1	A daily sign-in/out log is maintained for essential personnel working in the EZ.				*(I),(F)*
7	7.1	All nonessential personnel who require entry into the EZ have a UXO escort. All MEC operations cease until nonessential personnel leave the EZ.				*(I),(F)*
8	7.1	A visitors sign-in/out log is maintained for nonessential personnel entering the EZ.				*(I),(F)*
9	7.1	Visitors are briefed on the measures to be taken in the event of an accident and the location and route to the nearest hospital; the hazards				*(I),(F)*

Checklist						
Item	**Section**	**Inspection Point** **Verify the Following:**	**Yes**	**No**	**N/A**	**Comments**
		associated with the site; and authorized areas to eat, drink, or smoke by the UXOSO or SUXOS prior to entering the EZ				
10	7.1	If MEC with larger MFD than the MGFD is discovered, or if warranted by the quantity of MEC discovered, verify that all work is halted. A new EZ is then designated based on the items found, and the ESS is amended to address the larger MGFD.				*(I),(F)*
11	7.1	For demolition operations, the SUXOS will calculate an EZ based on the type and quantity of MEC involved and the quantity of explosives required to destroy the MEC items.				*(I),(F)*
12	7.1	The OESS has approved this computation before demolition activities are performed.				*(I),(F)*
13	7.1	The EZ is based on the larger of the MGFD and K328 distances for the quantity of the explosives used.				*(I),(F)*
14	8.0	The GIS Manager has generated a map of the EZ.				*(I), (F)*
15	8.0	Essential personnel sign-in/out logs and visitor sign-in/out logs are maintained at the Project Site Office.				*(I),(F)*

Punch list Items	
No.	

Conducted by: ______________________________ DATE: ______________________________

Approved by: ______________________________ DATE: ______________________________

UXO SOP 10
QC OF TASKS RELATED TO THE INVESTIGATION AND MANAGEMENT OF MEC, AND OTHER EXPLOSIVES-RELATED OPERATIONS

UXO SOP 10: QC of Tasks Related to the Investigation and Management of MEC, and Other Explosives-Related Operations

Document Number	UXO SOP 10: QC of Tasks Related to the Investigation and Management of MEC and other Explosives-Related Operations
Revision	1
Department	Southwest Operations
Previous Document Number	Original Document
Originally Released	May 1, 2024
Effective Date	February 28, 2025

Approvals

Christopher Ohland — February 28, 2025
Christopher Ohland — Date
Southwest Environmental Quality Assurance and Compliance Program Manager

Bruce Wilcer — February 28, 2025
Bruce Wilcer — Date
Southwest Environmental Field Contractor Quality Control Supervisor

Revision History

Table of Contents

Acronyms and Abbreviations

Ahtna	Ahtna Global, LLC
APP	Accident Prevention Plan
BSI	blind seed item
CAP	Corrective Action Plan
CAR	Corrective Action Request
CQCS	Contractor Quality Control Specialist
COR	Contracting Officer's Representative
DDESB	Department of Defense Explosives Safety Board
DFW	definable feature of work
DGM	digital geophysical mapping
EM	Engineering Manual
ER	Engineering Regulation
EZ	Exclusion Zone
FCA	Function Check Area
GPS	Global Positioning System
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MPPEH	Material Potentially Possessing an Explosive Hazard
OESS	Ordnance and Explosives Safety Specialist
QAPP	Quality Assurance Project Plan
QC	quality control
RCA	root-cause analysis
SOP	standard operating procedure
SSDM	Site-Specific Data Manager
SSWP	Site-Specific Work Plan
SUXOS	Senior Unexploded Ordnance Supervisor
USACE	United States Army Corps of Engineers
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer

1.0 Policy

Ahtna Global, LLC (Ahtna) and subcontractor personnel will follow procedures established in this standard operating procedure (SOP) for the quality control (QC) of operations related to the investigation and management of munitions and explosives of concern (MEC) and other explosives-related operations. Although this SOP does discuss some geophysical-related topics, QC procedures for geophysical operations are discussed in detail in the MEC Quality Assurance Project Plan (QAPP) Addendum, Attachment B GEO SOP 8 (Geophysical QC). This SOP must be distributed to and the signature page (Appendix A) signed by all personnel performing activities related to this SOP. Personnel must adhere to these procedures as field activities are performed.

2.0 Purpose

The purpose of this SOP is to describe the equipment and general methodologies to be used. It details the general policies, operational procedures, and guidance to be employed during the performance of QC tasks related to the investigation and management of MEC and other explosives-related operations. This SOP does not detail the use of the equipment described herein. This SOP assumes that experienced personnel using this SOP are familiar with the equipment and are competent in their use.

Where applicable, this SOP was developed in accordance with the following:

- Engineering Manual (EM) 200-1-15, *Environmental Quality Technical Guidance in Military Munitions Response Actions* (United States Army Corps of Engineers [USACE], 2024)
- Engineering Regulation (ER) 1180-1-6, *Construction Quality Management* (USACE, 1995)
- ER 1110-3-12, *Military Engineering and Desing Quality Management* (USACE, 2021)

3.0 Scope

This SOP provides technical guidance on the performance of QC activities related to investigating and managing MEC and other explosives-related operations.

3.1 Topics

The topics covered in this SOP include, but are not limited to, the following:

- Blind seed items (BSIs) (installation and recovery)
- Instrument daily function tests
- Technology-aided surface MEC removal
- Intrusive investigation (analog methodology)
- Intrusive investigation of digital geophysical mapping targets
- Hole clearance using an EM61MK2
- Sifting operations
- MEC and material potentially possessing an explosive hazard (MPPEH) management
- Demolition of MEC and MPPEH
- Explosives management

- Explosives siting
- Exclusion Zones (EZs)

This document is not intended to contain all requirements and procedures necessary for QC activities. This document should be used in conjunction with the documents listed in Section 10.0 (Associated SOPs) and Section 11.0 (Documentation), along with the QC metrics described in Worksheet #12 of the MEC QAPP Addendum. The information presented in this SOP is generally applicable to all MEC-related project sites.

4.0 Maintenance

Ahtna personnel are responsible for maintaining this SOP.

5.0 Equipment

The following equipment is associated with QC activities related to investigating and managing MEC and other explosives-related operations.

- Logbook
- Digital tablet with Global Positioning System (GPS) capability (if used)
- QC inspection forms
- Real-time kinematic-GPS rover unit (if used)

6.0 QC Personnel Organization, Qualifications and Responsibilities

The overall project organization and reporting structure are presented in Worksheet #3 of the MEC QAPP Addendum. The QC personnel, organization, qualifications, and responsibilities are addressed in more detail in this SOP.

6.1 Project QC Personnel

The MEC and Explosives QC Team will include the following personnel:

- Contractor Quality Control Supervisor (CQCS)
- Unexploded Ordnance Quality Control Supervisor (UXOQCS)
- QC Geophysicist (for DGM-related BSIs)

6.1.1 Contractor Quality Control Supervisor

The CQCS is responsible for developing, maintaining, and ensuring implantation of the quality program. This responsibility includes oversight of activities, periodic reviews of the processes being implemented, evaluation of any recommendations made by the project team over the course of the project regarding use of these processes, and continuous improvement evaluations of the quality program. The CQCS is also responsible for providing support to the project team in ensuring the quality of products and services is provided to the government. The CQCS will have the authority to act in all Contractor QC matters for Ahtna, including stopping work for any item, feature, or practice not meeting quality standards. The CQCS will communicate Contractor QC nonconformances with the Ahtna Military Munitions Response Program

(MMRP) Project Manager, Site Project Manager, Senior Unexploded Ordnance Supervisor (SUXOS) and UXOQCS.

6.1.2 Unexploded Ordnance Quality Control Specialist

The UXOQCS is responsible for the implementation and operation of the field quality management program for MEC and explosives-related operations. The qualifications of the UXOQCS will be submitted to the USACE Contracting Officer's Representative (COR) for approval. Replacement of the UXOQCS can only be made with the prior written consent of the USACE COR.

The UXOQCS will communicate with the Site Project Manager, SUXOS and field teams and will report to the CQCS. The UXOQCS has the authority to enforce the procedures defined in this SOP. The UXOQCS has the authority to stop work in order to ensure that project activities comply with the specifications of this SOP, MEC QAPP Addendum, Site-Specific Work Plan (SSWP), the contract, and the task order. This authority applies equally to all project activities, whether performed by the contractor or its subcontractors and suppliers.

The UXOQCS is responsible for planning and executing QC oversight of field project operations and ensuring compliance with specified field QC requirements. Specifically, the UXOQCS is responsible for the following:

- Developing, assessing the effectiveness of, and maintaining this SOP and related procedures
- Ensuring QC activities are performed in accordance with the MEC QAPP Addendum, and SSWP
- Verifying that all BSIs have been located by the surface removal and analog intrusive investigation teams
- Identifying quality problems and verifying that appropriate corrective actions are implemented

The UXOQCS is to be physically on site whenever project-related fieldwork is in progress. If the UXOQCS is to be absent from the site, with COR approval, a qualified alternative UXOQCS (with COR approval) will be designated and given equivalent responsibilities and authority.

6.1.3 Quality Control Geophysicist

The QC Geophysicist is responsible for the implementation and the operation, and the field quality management program for geophysics-related operations. The QC Geophysicist conducts QC operations on the geophysical data to document that measurement performance criteria are met and that the data are of high quality. The QC Geophysicist is responsible for the placement of BSIs for DGM operations. The project QC Geophysicist ensures that field procedures, system calibration and daily testing, DGM data collection, data processing, and other DGM-related activities that potentially impact DGM data quality follow the approved plans. This is to be completed through regularly scheduled (and unscheduled) QC inspections, which include the use of QC Inspection checklists (provided in the relevant SOPs included in Appendix B the MEC QAPP Addendum relevant SOP) and surveillances to verify that the DGM operation is functioning in accordance with the approved plans.

For MEC and explosives-related operations, the QC Geophysicist reviews excavation data to verify that BSI items were located and accurately recorded. The QC Geophysicist also reviews excavation data to ensure that items found are representative of the DGM anomaly that was targeted. The QC Geophysicist is required to report QC Inspection results to the USACE QA Geophysicist regularly. The QC Geophysicist reports to the Senior Geophysicist and Ahtna Site Project Manager.

6.2 Personnel Qualifications and Training

Project personnel will possess the necessary qualifications to perform their assigned jobs and tasks. The UXOQCS will validate that each UXO Technician conforms to the Department of Defense Explosives Safety Board (DDESB) Technical Paper 18 (DDESB, 2020).

6.3 Documentation of Qualifications and Training

The Unexploded Ordnance Safety Officer (UXOSO) will maintain records documenting that each worker (including subcontractor personnel) has the required qualifications and training, including Site Specific and routine training for personnel and visitors. The UXOSO will monitor certification expiration dates and notify the Ahtna Site Project Manager when employees will require refresher training or other requirements. These records will be maintained on site for audit purposes.

6.4 Standard Quality Management Program

The project will be conducted following these standard quality management procedures:

- Any revisions or changes to this SOP must be approved by the COR prior to being implemented.
- Site Specific QC testing and inspection requirements, data objectives, and control measures will be detailed in the MEC QAPP Addendum and SSWPs.
- The UXOQCS, or designee, will establish and maintain an onsite project file in accordance with contract requirements and Contractor policies for document control.
- The UXOQCS, or designee, is responsible for verifying compliance with this SOP through implementation of the Three-Phase QC Inspection Process on all field-related definable features of work (DFWs). SOPs have been generated for each DFW that include SOP-specific QC checklists at the end of each SOP (Attachment B of the MEC QAPP Addendum).
- Prior to client delivery or use, project submittals are to be reviewed and approved by Ahtna.
- Prior to submittal, technical documents (e.g., reports, plans, and engineering drawings) are to be reviewed by qualified personnel.
- The UXOQCS, or designee, will notify the USACE Ordnance and Explosives Safety Specialist (OESS) and Base Realignment and Closure Office two business days prior to the commencement of any Preparatory-Phase QC Inspection.
- The UXOQCS, or designee, will perform a Preparatory-Phase QC Inspection prior to beginning each field-related DFW. SOPs have been generated for each DFW and include SOP-specific QC checklists. These checklists are located at the end of each SOP. The purpose of this Preparatory-Phase QC Inspection is to review applicable specifications and verify that the necessary resources, conditions, and controls are in place and compliant before the start of work activities.
- To conduct and document the Preparatory-Phase QC Inspection, the UXOQCS, or designee, is to use the Preparatory-Phase QC Inspection Checklist that is specific to each SOP. The Preparatory-Phase QC Inspection Checklist generic form and the Preparatory-Phase Demolition Inspection Checklist form are located in the MEC QAPP Addendum, Attachment C Forms. During the

Preparatory-Phase QC Inspection, the UXOQCS or designee is responsible for reviewing the specifications and requesting clarification from USACE, where necessary.

- The UXOQCS, or designee, is to perform an Initial-Phase QC Inspection the first time a field-related DFW is performed. To conduct and document the initial inspection, the UXOQCS or designee will use the Initial-Phase QC Checklist that is specific to each SOP.
- The Initial-Phase QC Inspection generic form and the Initial-Phase Demolition Inspection Checklist are located in the MEC QAPP Addendum, Attachment C Forms.
- The UXOQCS, or designee, may perform periodic Follow-up-Phase QC Inspections for work in progress or each time a DFW has a significant change in location, equipment, and/or personnel. If the change is substantial, the UXOQCS, or designee, may conduct an additional preparatory meeting. The purpose of this additional preparatory meeting is to ensure continuous compliance and that an acceptable level of workmanship is achieved.
- To conduct and document the Follow-Up-Phase QC Inspections, the UXOQCS, or designee, is to use the Follow-up-Phase Inspection Checklist that is specific to each SOP. The Follow-up-Phase QC Inspection generic form and Final Phase Demolition Inspection Checklist are located in the MEC QAPP Addendum, Attachment C Forms.
- The final inspection is performed upon conclusion of the DFW and/or prior to closeout to verify that project requirements relevant to the particular feature of work have been met. Outstanding and nonconforming items are to be identified and documented on the Final Inspection Outline (MEC QAPP Addendum, Attachment C Forms).
- The UXOQCS, or designee, is responsible for tracking all inspections using the Inspection Schedule and Tracking Form and report QC field surveillance activities using the Quality Control Surveillance Report located in the MEC QAPP Addendum, Attachment C Forms.
- Tasks that require specific training, calibration, maintenance, and certifications will be documented by the task leader performing the activity with copies of applicable documentation provided to the UXOQCS, or designee, for retention in the project QC file.
- The UXOQCS will encourage project personnel at all levels to provide recommendations for improvements in established work processes and techniques.
- The UXOQCS will respond to any member of the project personnel, including Ahtna and subcontractor employees, that submit a Corrective Action Request (CAR) (MEC QAPP Addendum, Attachment C Forms).
- The UXOQCS, or designee, will determine whether a written Corrective Action Plan (CAP) (MEC QAPP Addendum, Attachment C Forms) is necessary based on whether any of the following criteria are met:
  - The CAR priority is high.
  - The deficiency requires a rigorous corrective action planning process to identify similar work products or activities affected by the deficiency.
  - The deficiency requires extensive resources and planning to correct the deficiency and prevent recurrence.

- The UXOQCS, or designee, is responsible for preparing and submitting the Daily QC Report (MEC QAPP Addendum, Attachment C Forms) to the USACE OESS, the project file, and providing concurrent courtesy copies to the COR as requested.

6.5 Field Quality Management Program for MEC and Explosives-Related Operations

The UXOQCS reports directly to the CQCS. Although the UXOQCS communicates directly with the Ahtna MMRP Project Manager and Site Project Manager, the UXOQCS has the authority to act independently of the MMRP and Site Project Managers in all MEC and explosives-related QC matters. The UXOQCS has the authority to stop work if operations are found to be out of compliance with the MEC QAPP Addendum, SSWP, or if any operations are deemed unsafe. The UXOQCS is on site full-time and is responsible for the activities described in the following subsections.

6.5.1 Technology-Aided Surface MEC Removal

- Ensure that the equipment used by UXO teams is in good working condition and that team members are familiar and comfortable with the equipment.
- Verify that an equipment checkout for each new team member has been performed at the equipment test strip located adjacent to the field office.
- Verify that unit/area grid stakes are correctly placed and that grid lanes are installed correctly.
- Place BSIs at the rate/density specified in the MEC QAPP addendum and SSWP. If production rates change, modify the BSI rate/density accordingly. Document the BSI resolution.
- Conduct periodic surveillance of UXO team members to ensure environmental protections are followed during fieldwork.
- Conduct periodic surveillance of UXO team members to ensure compliance with SOPs, the MEC QAPP Addendum, and SSWP requirements.
- Using QC metrics described in Worksheet #12 of the MEC QAPP Addendum, conduct a technology-aided QC inspection where technology-aided surface MEC removal operations have been completed.
- Ensure that the entire surface has been addressed by the technology-aided surface MEC removal team, or appropriate action has been taken to record that a specific area could not be addressed.
- Conduct periodic inspections of UXO Team documentation.
- Conduct periodic inspections of UXO Team MEC data submissions.

6.5.2 Subsurface MEC Removal (Analog and DGM Related)

- Ensure equipment used by UXO teams is in good working condition and that team members are familiar and comfortable with equipment.
- Verify that an equipment checkout for each new team member has been performed at the equipment test strip located adjacent to the field office. If an EM61MK2 is to be used, verify that the daily EM61MK2 QC function tests have been completed, and are at the frequency identified in the MEC QAPP Addendum.
- Verify unit/area grid stakes are correctly placed and grid lanes are correctly installed.
- Place BSIs at the rate/density specified in the MEC QAPP Addendum and SSWP. If production rates change, modify the BSI rate/density accordingly. Document the BSI resolution.

- Conduct periodic surveillance of UXO team members to ensure environmental protections are followed during fieldwork.
- Conduct periodic surveillance of UXO team members to ensure compliance with SOPs, MEC QAPP Addendum, and SSWP requirements.
- Using QC metrics described in Worksheet #12 of the MEC QAPP Addendum, conduct a QC inspection of each grid where analog intrusive MEC removal has been completed.
- Using QC metrics described in Worksheet #12 of the MEC QAPP Addendum, conduct a QC inspection of the DGM target locations that have been intrusively investigated.
- Ensure that the entire subsurface has been addressed by the DGM and intrusive investigation team, or appropriate action has been taken to record that a specific area could not be addressed.
- Conduct periodic inspections of UXO team documentation.
- Conduct periodic inspections of UXO team MEC data submissions.

QC completion status of intrusive investigations will be recorded by the UXOQCS on a grid-by grid basis. This data is provided to the Site-Specific Data Manager (SSDM) daily.

6.5.3 Inspection of the Ahtna Database

The UXOQCS will inspect the Ahtna database a minimum of once a week. This inspection is to review the ordnance-related data for that week that have been uploaded to the Ahtna database. Any required changes are made in real time, or discrepancies are relayed to the appropriate UXO Team Leader, clarification is then gained, and the required changes (if necessary) are then made.

6.6 Standard Field Quality Management Program for Geophysics-Related Operations

For the investigation and management of MEC and other explosives-related operations, the QC Geophysicist is responsible for the installation of BSIs in areas that are to have DGM operations conducted over them. The QC Geophysicist is also responsible for assisting the UXOQCS in verifying that all DGM-related BSIs in select areas where intrusive investigation of DGM targets is conducted have been excavated and have been properly identified and reported by the intrusive investigation team. The QC Geophysicist will work with the UXOQCS with the generation of any CARs, root-cause analysis (RCA), and CAPs that relate to DGM operations. The QC Geophysicist is not required to be on site full-time. A complete list of the QC Geophysicist's duties as they relate to DGM operations are described in the MEC QAPP Addendum, Attachment B GEO SOP 8 (Geophysical QC).

7.0 Blind Seeding

In accordance with the Geophysical System Verification process (Environmental Security Technology Certification Program, 2009), the UXOQCS will be responsible for emplacing BSIs in areas where technology-aided surface MEC removal and analog intrusive operations are to be conducted. The QC Geophysicist will be responsible for placing BSIs in areas where DGM is to be conducted (see MEC QAPP Addendum, Attachment B GEO SOP 8 [Geophysical QC]). BSI installation is discussed in the MEC QAPP Addendum, Attachment B GEO SOP 2 (Blind Seed Item Installation). The integrity of the blind seeds will be maintained in accordance with the Blind Seed Firewall Plan (MEC QAPP Addendum).

Once an area has been investigated, the UXOQCS will verify that all BSIs have been located and have been accurately identified. Once it has been verified that the BSIs have been successfully detected, their location and other associated information will be supplied to the SSDM for inclusion in the Ahtna database. Upon finding a failure (i.e., missed BSI), the UXOQCS (and QC Geophysicist if the BSI is related to DGM operations) will use procedures described in Section 9.0 (Deficiency Identification and Resolution) to determine the extent of the failure, why it occurred, and if corrective actions are warranted.

8.0 Three-Phase QC Process

Ahtna is responsible for verifying compliance with approved project documents through the implementation of the Three Phase QC Process, which ensures that project activities comply with the approved plans and procedures. The QC monitoring requirements for each field DFW related to the investigation and management of MEC, as well as other explosives-related operations, are discussed in general in this section. A list of project-specific DFWs can be found in Worksheet #12 of the MEC QAPP Addendum. The UXOQCS, or designee, will ensure that the Three-Phase QC Process is implemented for each field-related DFW. SOPs have been generated for each DFW that include SOP-specific QC checklists. This section specifies the minimum inspection requirements that must be met and to what extent QC monitoring must be conducted and documented by the UXOQCS, or designee.

Each QC inspection phase is considered relevant for obtaining the required product quality. However, the preparatory and initial inspections are particularly invaluable in preventing problems. Work will not be performed on a DFW until the Preparatory-Phase QC Inspections have been completed, and any non-conformance issues have been resolved.

8.1 Preparatory-Phase QC Inspection

Prior to performing the Preparatory-Phase QC Inspection, the UXOQCS, or designee, will review the appropriate sections of the MEC QAPP Addendum, SOPs, and SSWP. The Preparatory-Phase QC Inspection is completed by the UXOQCS, or designee, through the verification that the following has been completed prior to the commencement of field activities associated with a field DFW (related to the investigation and management of MEC and other explosives-related operations):

- Authorization to proceed has been obtained.
- Required permits and notifications have been obtained or given.
- Required submittals have been approved.
- Plans, procedures, specifications, and required documentation have been approved and are available to the workers.
- Required materials and equipment are on site.
- Field equipment is appropriate, available, functional, and properly tested for its intended/stated use.
- Workers needed to perform the work have been designated and are available.
- Staff responsibilities have been assigned and communicated.
- Staff members have the necessary knowledge, expertise, and information to perform their jobs.

- Arrangements for support services have been made (if required)
- All necessary procurements are in place
- Training in accordance with the requirements of the MEC QAPP Addendum, and SOPs has occurred.

The UXOQCS, or designee, will coordinate and perform a Preparatory-Phase QC Inspection meeting before beginning each field-related DFW. The purpose of this meeting is to ensure that all critical personnel involved in the work are familiar with applicable specifications and plans and to verify that the necessary resources, conditions, and controls are in place and compliant before work activities start. Upon completion of the inspection, the UXOQCS, or designee, will complete a Preparatory-Phase QC Inspection Checklist that is specific to each SOP. Generic Preparatory-Phase QC Inspection Checklists can be found in the MEC QAPP Addendum, Attachment C Forms.

Project personnel must correct or resolve discrepancies between existing conditions and the approved MEC QAPP Addendum that are identified by the UXOQCS, or designee, during the Preparatory-Phase QC Inspection. The inspection results will be documented by the UXOQCS, or designee, in the form of QC checklists and daily reports. Should the results of the inspection be unsatisfactory, work will be stopped, corrective actions will be initiated, and deficiencies corrected. The UXOQCS, or designee, will verify that unsatisfactory and/or nonconforming conditions have been corrected prior to the commencement of the operation being inspected.

8.2 Initial-Phase QC Inspection

The Initial-Phase QC Inspection occurs at the startup of field activities associated with a field DFW (for the investigation and management of MEC and other explosives-related operations). The Initial-Phase QC Inspection is completed by the UXOQCS, or designee, through the verification and inspection of the following:

- Checking that preliminary work for compliance with procedures, specifications, and requirements detailed in the MEC QAPP Addendum, SOPs, and SSWP
- Establishing an acceptable level of workmanship
- Checking for omissions and resolve differences of interpretation

At the onset of a particular DFW, the UXOQCS, or designee, will perform an Initial-Phase QC Inspection and complete an Initial-Phase QC Inspection Checklist that is specific to each SOP. Generic Initial-Phase QC Inspection checklists can be found in the MEC QAPP Addendum, Attachment C Forms.

During the Initial-Phase QC Inspection, the UXOQCS, or designee, will ensure that discrepancies between site practices and approved plans or specifications are identified and resolved. The resolution of discrepancies is a critical step in the Initial-Phase QC Inspection. The Initial-Phase QC Inspection will also verify that the Accident Prevention Project Plan (APP) adequately identifies all hazards associated with actual field conditions and verifies that appropriate safe work practices are being followed.

The UXOQCS, or designee, will document the inspection results in the form of QC checklists and daily reports. Should the results of the inspection be unsatisfactory, work will be stopped, corrective actions will be initiated, and deficiencies will be corrected. Furthermore, an additional Initial-Phase QC Inspection will be rescheduled, and more frequent Follow-up QC Inspections will be conducted to verify the quality of work.

8.3 Follow-up-Phase QC Inspection

The Follow-up Phase QC Inspection occurs as field activities associated with a specific DFW (related to the investigation and management of MEC and other explosives-related operations) are ongoing. The Follow-up Phase QC Inspection is completed by the UXOQCS, or designee, through the verification and inspection of the following:

- Checking that ongoing work for compliance with procedures, specifications, and requirements detailed in the MEC QAPP Addendum, SOPs, and SSWP
- Verifying that the current level of workmanship is acceptable
- Checking for omissions and resolve differences of interpretation

As a particular field DFW is in operation, the UXOQCS, or designee, will perform a Follow-up-Phase QC Inspection and complete a Follow-up Phase QC Inspection Checklist that is specific to each SOP. Generic Follow-up-Phase QC Inspection checklists can be found in the MEC QAPP Addendum, Attachment C Forms.

During the Follow-up-Phase QC Inspection, the UXOQCS, or designee, will ensure that discrepancies between site practices and approved plans or specifications are identified and resolved. The Follow-up-Phase QC Inspection will continue to verify that the APP adequately identifies all hazards associated with actual field conditions and verifies that appropriate safe work practices are being followed.

The inspection results will be documented by the UXOQCS, or designee, in the form of QC checklists and daily reports. Should the results of the inspection be unsatisfactory, work will be stopped, corrective actions will be initiated, and deficiencies will be corrected. Furthermore, an additional Initial-Phase QC Inspection will be rescheduled, and more frequent Follow-up-Phase QC Inspections will be conducted to verify the quality of work.

8.4 Final Inspection

The final inspection is performed upon conclusion of a DFW and prior to closeout to verify that project requirements relevant to the particular DFW have been satisfied. Outstanding and nonconforming items are identified and documented on the Final Inspection Outline (MEC QAPP Addendum, Attachment C Forms).

9.0 Deficiency Identification and Resolution

While deficiency identification and resolution occur primarily at the operational level, QC audits provide a backup mechanism to address problems that are not identified or cannot be resolved at the operational level. Deficiencies identified by the UXOQCS, or designee, are to be corrected by operational staff and documented in the field activity daily log or CAR as determined by the UXOQCS, or designee.

9.1.1 Corrective Action

A CAR (MEC QAPP Addendum, Attachment C Forms) can be issued by any member of the Ahtna Team, including subcontractor employees. The CAR will be forwarded to the UXOQCS, or designee, who will then be responsible for evaluating the validity of the request. If the CAR is valid, the UXOQCS, or designee, will address the corrective action with the appropriate individuals to resolve the deficiency.

The UXOQCS, or designee, will determine if an RCA and/or CAP (MEC QAPP Addendum, Attachment C Forms) are necessary. The CAP will include assigning personnel and resources and will specify and enforce a schedule for corrective actions. Once a corrective action has been resolved, the CAR, CAP, and supporting information will be forwarded to the Ahtna CQCS for closure.

The recommendations provided in the CAPs that are to be implemented will be reviewed during Follow-up-QC Inspections. The purpose of this CAP review is to do the following:

- Ensure that established protocols are implemented properly.
- Verify that corrective actions have been implemented.
- Ensure that corrective actions are effective in resolving problems.
- Identify trends within and among similar work units.
- Facilitate a system RCA of potential larger systemic problems.

9.1.2 CAR and CAP Tracking

Each CAR and subsequent CAP, if needed, will be given a unique identification number and tracked until corrective actions have been implemented and verified by the UXOQCS, or designee, prior to the closure of the CAR and CAP.

10.0 Associated SOPs

- GEO SOP 2 – Blind Seed Item Installation
- Unexploded Ordnance (UXO) SOP 1 – FCA Installation and Use
- UXO SOP 2 – Technology-Aided Surface MEC Removal
- UXO SOP 3 – Intrusive Investigation Using Analog Methods
- UXO SOP 4 – Intrusive Investigation of DGM Targets
- UXO SOP 5 – MEC and MPPEH Management
- UXO SOP 6 – Demolition of MEC and MPPEH
- UXO SOP 7 – Explosives Management
- UXO SOP 8 – Explosives Siting
- UXO SOP 9 – Exclusion Zones

11.0 Documentation

The following information will be recorded during QC of MEC and explosives operations:

- QC Checklists (specific to each SOP)
- QC Surveillances
- BSI information (installation and investigation results)
- CAR (if required)
- RCA (if required)
- CAP (if required)

- Logbook entries

12.0 Health and Safety

Conducting QC of MEC and explosives operations in areas that potentially contain MEC items will involve hazards typically associated with military munitions. Adequate health and safety measures must be taken to protect project personnel from potential exposure to explosives, explosive components, and munitions items. Safety measures are to be addressed in the APP and Site Safety and Health Plan to mitigate these hazards. Procedures for establishing EZs are described in the MEC QAPP Addendum, Attachment B UXO SOP 9 (Exclusion Zones).

13.0 References

Department of Defense Explosives Safety Board (DDESB), 2020. Technical Paper (TP) 18. *Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel*. Revision 1. June.

Environmental Security Technology Certification Program, 2009. *Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response*. July.

United States Army Corps of Engineers (USACE), 1995. Engineering Regulation (ER) 1180-1-6. *Construction Quality Management*. September.

USACE, 2021. Engineering Regulation (ER) 1110-3-12. *Military Engineering and Design Quality Management*. March.

USACE, 2024. Engineering Manual (EM) 200-1-15. *Technical Guidance for Military Munitions Response Actions*. March.

Appendix A: SOP Signature Page

Project Information
UXO SOP 10: QC of Tasks, MEC and Other Explosives-Related Operations
Contract and Task Order:
Site:

The following persons have read and understand this SOP:

Signature:	Date:

Attachment C. Forms

LIST OF FORMS

Form D-1	Field Activity Daily Log
Form E-1	Site Habitat Checklist
Form E-2	Field Report Form, Black Legless Lizard Report Form
Form E-3	Field Report Form, California Tiger Salamander
Form M-1	Explosive Demolition Operations
Form M-2	Detonation Approval Checklist/ Risk Assessment
Form M-3	Presidio of Monterey Fire Department Munitions Response and Ordnance Removal Fire Risk Assessment
Form M-4	Misfire Checklist
Form M-5	Motor Vehicle Inspection (Transporting Hazardous Material)
Form M-6	Explosives Usage Record
Form M-7	Report of Theft or Loss – Explosive Materials (ATF Form 5400.5)
Form M-8	Preparatory Phase Demolition Inspection Checklist Form
Form M-9	Initial Phase Demolition Inspection Checklist
Form M-10	Final Phase Demolition Inspection Checklist
Form M-11	Magazine Data Card (DA Form 3020-R)
Form M-12	Issue Release/Receipt Document (DD Form 1348-1A)
Form QC-1	Preparatory Phase QC Inspection Checklist
Form QC-2	Initial Phase QC Inspection Checklist
Form QC-3	Follow-up Phase QC Inspection Checklist
Form QC-4	Final Inspection Outline
Form QC-5	Inspection Schedule and Tracking Form
Form QC-6	Quality Control Surveillance Report
Form QC-7	Corrective Action Request
Form QC-8	Corrective Action Plan
Form QC-9	Contractor Quality Control Daily Report

Ahtna

Form D-1

FIELD ACTIVITY DAILY LOG

Daily Log			
Date:			
No.			
Sheet	Of		

PROJECT NAME: FORMER FORT ORD, CA	Project Number:
FIELD ACTIVITY SUBJECT:	
DESCRIPTION OF DAILY ACTIVITIES AND EVENTS	
VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
WEATHER CONDITIONS:	IMPORTANT TELEPHONE CALLS:
PERSONNEL ON SITE:	
SIGNITURE:	DATE:

SITE HABITAT CHECKLIST

The following are requirements to minimize biological disturbances to protected species and habitat.

Please notify Shawn Wagoner, Harris Environmental Group, Inc, Ahtna Senior Biologist (925-487-7335), *before* proceeding if work tasks or work boundaries change, additional vegetation removal is necessary, vegetation cutting methods change, or any other conditions change. Field Supervisors must receive a copy of this checklist.

SITE:		**DATE:**	
WORK TO BE CONDUCTED:			

1. LAND USE:	☐ **Habitat Reserve**	☐ **Development Area**	☐ **Other (specify):**
2. LANDOWNER:	☐ **Army**	**Location:**	
	☐ **BLM**	**Location:**	
	☐ **Other:**	**Location:**	

3. ENDANGERED, THREATENED, RARE, OR HMP-LISTED SPECIES	☐ **Yes**	☐ **No**	☐ **Flagged/Marked**
Species:			
Location:			
Grid Numbers:			
Restrictions:			

4. VERNAL POOLS/PONDS PRESENT	☐ **Yes**	☐ **No**	☐ **Flagged/Marked**
Location:			
Grid Numbers:			
Work Can Proceed in Pools/Ponds:	☐ **Yes**	☐ **No**	
Restrictions:			

5. VEGETATION REMOVAL	
☐ **No Removal Needed**	**Location:**
☐ **Manual Removal Needed**	**Location:**
☐ **Mechanical Removal Needed**	**Location:**
☐ **Wood Chip Piles Needed**	**Location:**
☐ **Wood Chips Used for Erosion Needed**	**Location:**
Vegetation Removal Restrictions:	

6. WOOD CHIP PILE INSPECTION:

7. EROSION CONCERNS:

8. SITE ACCESS:

9. INVASIVE SPECIEIS:

10. ADDITIONAL SITE CONCERNS:

This checklist has been read, approved, and signed by the following:

Ahtna Senior Biologist: ____ **Date:** ______________

Ahtna CQCS or UXOQCS: ____ **Date:** ______________

BRAC Biologist: ____ **Date:** ______________

FIELD REPORT FORM BLACK LEGLESS LIZARD

If a black legless lizard is found (live, injured, or dead), please call Shawn Wagoner, Harris Environmental Group, Inc, Ahtna Senior Biologist (925-487-7335) out to the site to identify and record. If not available, please fill out this form and return to Shawn Wagoner the same day.

Location (Burn Unit, Range # etc.): ____
Date/Time: ____
Grid#: ____
Northing/Easting or Approx. Grid Coordinates (in ft): ____________________________________

Type of Activity (check one or write in):

˜ Surface clearance (non-intrusive activity)
˜ MEC removal (intrusive, excavation)
˜ Geophysical work
˜ Other ____

Weather: Air Temp.__________ Wind ___________ Sunny/Cloudy _______________

Depth found (if known): __________________

Habitat Description (e.g. maritime chaparral, oak woodland, grassland; vegetation height; presence of surface litter/debris; soil type; plant species where specimen found; etc.):

____
____

Description of lizard (live/injured/dead, color [black or silvery], condition, behavior etc.):

____
____

Total Length (inches): _____________

Other Notes: ____
____
____

Found by (Team #): _____

Disposition:

˜ Released to same location or adjacent habitat
˜ Report Form completed By:____
˜ Injured (left on site) or killed (saved in plastic bag or container) and Report Form submitted
˜ Other ____

Attachments: ˜Location map ˜ Photographs (lizard and surrounding habitat where found)

FIELD REPORT FORM
CALIFORNIA TIGER SALAMANDER

If a California tiger Salamander is found, please call Shawn Wagoner, Harris Environmental Group, Inc, Ahtna Senior Biologist (925-487-7335). If not available, Call Bart Kowalski, BRAC Biologist (832) 595-5569.

Location (Site, Range):

Date/Time:

Found by (Person, Team #):

Grid #:

Northing/Easting or Approx. Grid Coordinates (in feet): __°_____'__"__; __°___'__"___

Type of Activity (check one or write in):

Surface clearance or other non-intrusive activity
MEC removal or other type of excavation
Geophysical work
Other:

Depth found (if known):

Weather: *Air Temp:* __° *Wind:*_ *Sunny/Cloudy:*_

Habitat Description (e.g. maritime chaparral, oak woodland, grassland; vegetation height; presence of surface litter/debris; soil type; plant species where specimen found; etc.):

Description of salamander (live/injured/dead, color, condition, behavior, etc.):

Size: *Total Length:* ___ *Snout to Vent Length:* ___ *Weight:* ___

Other Notes:

Disposition:

Released to same location or adjacent habitat:
Report Form completed by:
Injured or killed (left on site) and Report Form submitted
Other:

Attachments:

Location map
Photographs

EXPLOSIVE DEMOLITION OPERATIONS

HOW MANY SHOTS: ______________________________

SIZE AND WEIGHT: ______________________________

TIME OF SHOT: ______________________________

LOCATION: ______________________________

DATE: ______________________________

AT LEAST 30 MINUTES PRIOR TO PLANNED DETONATION: ______________

LOCATION FOR FIRE FIGHTING EQUIPMENT: ______________

CALLED:		TIME:
Presidio of Monterey Fire Department	Non-Emergency (831) 242-7701	
Presidio of Monterey Police Department	Non-Emergency (831) 242-7851	

Detonation Approval Checklist/ Risk Assessment

Date of Shot: ______________________ Window for Shot: ________________

Location of Shot: ___________________ Types of munitions: ________________

Net Explosive Weight (NEW) [Estimated]: __________________ Number of Detonations: ______________________

Type of Engineering Control(s):		**Site Preparation Measures:**	
Sand Bagging		Site Wet Down	
Soil Tamping		Vegetation Removal	
Barricades		Other	
Comments:			

A qualitative measure of the worst credible event resulting from personnel exposure to the demolition event:

LOW		MEDIUM		HIGH
1	2	3	4	5+

Distance to nearest inhabited location/structure likely to be at risk from the explosives safety hazard:

LOW		MEDIUM		HIGH
1	2	3	4	5+

Weather Conditions:

LOW		MEDIUM		HIGH
1	2	3	4	5+

Wind Conditions:

LOW		MEDIUM		HIGH
1	2	3	4	5+

Detonation Approval Checklist/
Risk Assessment

Assessment Total:	Low Risk	Caution	High Risk
	1-7	8-14	15-20

- No individual detonation will exceed 15lbs NEW without prior approval
- All notifications will be sent two hours prior to detonation.
- USACE Ordnance and Explosives Safety Specialist will be on site during detonation operations.
- Engineering Controls will be in place prior to detonation.
- Fire Department has conducted a fire risk assessment, and equipment is on site for fire suppression.

Approved
Date:______________

Joelle Lobo
Fort Ord BRAC Environmental Coordinator
US Army DCS G9 BRAC Branch

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Form M-3

PRESIDIO OF MONTEREY FIRE DEPARTMENT
MUNITIONS RESPONSE & ORDNANCE REMOVAL FIRE RISK ASSESSMENT

OPERATIONAL AREA: ______________________________
DATE OF ASSESSMENT: ______________________________
OPERATIONAL PERIOD: ______________________________

RISK VALUES

NUMBER VALUE

(1) LOWEST RISK – (5) HIGHEST RISK

SITE ACCESS: (Fire Suppression, Road Conditions, Obstructions, Etc.)
Value:

PRE-SUPPRESSION (Fuels, Site Access, Clearance Zone)
All shots will be pre-suppressed
Value:

DEMOLITION SHOT: (Surface, Subsurface, Type of OE, Removal Method)
Value:

TOPOGRAPHY: (Slopes, Ridges, Barriers, Canyons, Chimneys)
Value:

WEATHER: (Wind, Temperature, Relative Humidity)
Value:

FIRE SUPPRESSION: (Accessibility, Weather, Fuels, Suppression Factors)
Value:

TOTAL NUMBER VALUE:

TOTAL ASSESSMENT VALUES

0-12 LOW RISK **12-23 CAUTION** **24-35 HIGH RISK**

ASSESSED BY: ____

FORM UPDATED 13 January 2006

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Form M-3

PRESIDIO OF MONTEREY FIRE DEPARTMENT MUNITIONS RESPONSE & ORDNANCE REMOVAL FIRE RISK ASSESSMENT

SPECIAL NOTATIONS

OPERATION:

DATE:

RED FLAGS

____
FIRE DEPARTMENT REPRESENTATIVE

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Form M-4

Misfire Checklist

NON-ELECTRIC MISFIRES

Working on a non-electric misfire is the most hazardous of all operations. Investigation and corrective action should be undertaken by the technician that placed the charge using the following procedure:

1. If a charge fails to detonate at the determined time, initiate a 60-minute wait period plus the time of the safety fuse (i.e., 5-minute safety fuse plus 60 minutes, for a total of 65-minute wait period).

2. After the wait period has expired, the designated technician will proceed to the site to inspect the firing system. A safety observer must watch from a protected area.

3. Prime the shot with a new non electric firing system and install a new fuse igniter.

4. Follow normal procedures for initiation of the charge.

NONEL MISFIRE

The use of a shock tube for blast initiation can present misfires which require the following actions:

1. If charge fails to detonate, it could be the result of the shock tube not firing. Visually inspect the shock tube, if it is not discolored (i.e., slightly black), it has not fired.

2. If it has not fired, cut a 1-foot piece off the end of the tube, re-insert the tube into the firing device, and attempt to fire again. (Try this at least twice)

3. If the device still does not fire, wait 30 minutes and proceed to the site to replace the shock tube with a new tube.

NOTE: If the tube is slightly black, then a "Black Tube" misfire has occurred, and the shock tube will have to be replaced. When replacing the shock tube, be sure to remove the tube with the detonator attached. Without removing the detonator from the end of the tube, place the defective tube on the shot for disposal.

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Form M-4

Misfire Checklist

DETONATING CORD MISFIRE

Detonation cord will be used to tie in multiple demolition shots. Since detonation cord initiation will be non-electrical, these procedures will be used to clear a detonation cord misfire.

1. If there is no problem with the initiating system, wait the prescribed amount of time and inspect the initiator to the cord connection to ensure it is properly connected. If it was a bad connection simply attach a new initiator and follow the appropriate procedures

2. If the initiator detonated and the cord did not, inspect the cord to ensure it is the detonation cord and not time fuse. Also, check to ensure there is PETN in the cord at the connection to the initiator.

3. At this point, it may be necessary replace the detonating cord. If this is required, it must be accomplished carefully to ensure that the demolition charge and the OE item(s) are not disturbed.

PERFORATOR MISFIRE

The use of perforators is both cost-effective and considerably safer than the use of C-4 and many other demolition materials. If everything went but the perforator, one of four things has occurred:

1. The detonation cord grain size was insufficient to initiate the perforator
2. The detonation cord was dislodged from the perforator when placing tamping materials
3. The perforator was defective
4. The perforator was moved during the placement of tamping materials.

Check to ensure the grain size of the detonation cord is sufficient, with 80 grain size or greater being the recommended size.

If the detonation cord connection to the perforator was the problem, ensure that the next connection is secure (use duct tape if necessary).

If it is evident that the perforator was moved, then ensure it is properly secured for the next shot.

If the detonating cord size and connection are sufficient, replace the perforator, leaving the defective one on the demolition shot in accordance with demolition procedures.

Prescribed by: DTR 4500.9-R

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS & SENSITIVE MATERIALS)

(This form provides a limited inspection of the general operation of the vehicle and is not to be confused with the more thorough vehicles' periodic inspection. Read Instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.	**1. BILL OF LADING/TRANSPORTATION CONTROL NUMBER**

SECTION 1 - DOCUMENTATION	**ORIGIN a.**	**DESTINATION b.**
2. CARRIER/GOVERNMENT ORGANIZATION		
3. DATE/TIME OF INSPECTION		
4. LOCATION OF INSPECTION		
5. OPERATOR(S) NAME(S)		
6. OPERATOR(S) LICENSE NUMBER(S)		

7. *(X if satisfactory at origin)*							**8. PERIODIC INSPECTION CURRENT (WITHIN 1 YEAR)***	**YES**	**NO**
7.a. HAZMAT ENDORSEMENT		**7.d. ERG OR EQUIVALENT COMMERCIAL:**		**YES**		**NO**			
7.b. VALID LEASE*		**7.e. DRIVER'S CERTIFICATION OF SAFE EQUIPMENT***					**8.a. TRUCK/TRACTOR**		
7.c. ROUTE PLAN		**7.f. COPY OF 49 CFR PART 397**					**8.b. TRAILER**		

SECTION II - VEHICLE INSPECTION

All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.

9. TYPE OF VEHICLE(S)	**10. VEHICLE NUMBER(S)**

11. PART INSPECTED *(X as applicable, for military, government-owned, or commercial vehicles)*	**ORIGIN (1)**		**DESTINATION (2)**			**ORIGIN (1)**		**DESTINATION (2)**		**COMMENTS (3)**
	SAT	UNSAT	SAT	UNSAT		SAT	UNSAT	SAT	UNSAT	
11.a. HORN OPERATIVE					**11.h. COUPLING DEVICES**					
11.b. WINDSHIELD/WIPERS					**11.i. CARGO SPACE**					
11.c. MIRRORS					**11.j. LANDING GEAR***					
11.d. WARNING EQUIPMENT					**11.k. TIRES, WHEELS, RIMS**					
11.e. SAFETY EQUIPMENT					**11.l. TAILGATE/DOORS***					
11.f. LIGHTS AND REFLECTORS					**11.m. TARPAULIN***					
11.g. BRAKES*					**11.n. OTHER** *(Specify)*					

12. INSPECTION RESULTS *(X one)* **ACCEPTED** ☐ **REJECTED** ☐

(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)

13. SATELLITE MOTOR SURVEILLANCE SYSTEM: *(X one)* **ACCEPTED** ☐ **REJECTED** ☐

14. REMARKS

15. INSPECTOR PRINTED NAME *(Origin)*	**16. INSPECTOR SIGNATURE** *(Origin)*

SECTION III - POST LOADING INSPECTION

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.	**ORIGIN (1)**		**DESTINATION (2)**		**COMMENTS (3)**
	SAT	UNSAT	SAT	UNSAT	
17. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR					
18. LOAD PROPERLY SECURED TO PREVENT MOVEMENT					
19. SEALS APPLIED TO CLOSED VEHICLE; TARPAULIN APPLIED ON OPEN EQUIPMENT					
20. PROPER PLACARDS APPLIED					
21. SHIPPING PAPERS/DD FORM 2890 FOR GOVERNMENT VEHICLE SHIPMENTS					
22. COPY OF DD FORM 626 FOR DRIVER					
23.SHIPPED UNDER DOT SPECIAL PERMIT 868 OR OTHER DOT SPECIAL PERMIT(S)					

24. INSPECTOR PRINTED NAME/SIGNATURE *(Origin)*	**25. DRIVER(S) PRINTED NAME(S)/ SIGNATURE(S)** *(Origin) (By signing I certify all motor carrier equipment is in safe operating condition)*
26. INSPECTOR PRINTED NAME/SIGNATURE *(Destination)*	**27. DRIVER(S) PRINTED NAME(S)/SIGNATURE(S)** *(Destination)*

INSTRUCTIONS

SECTION I - DOCUMENTATION

General Instructions.

All items (2 through 8) will be checked at origin prior to loading. Items with an asterisk (*) apply to commercial operators or equipment only. Only Items 2 through 7 are required to be checked at destination.

Items 1 through 5. Self explanatory.

Item 6. Enter operator's Commercial Driver's License (CDL) number or Military OF-346 License Number. CDL and OF-346 must have the HAZMAT and other appropriate endorsements IAW 49 CFR 383.

Item 7.a. Hazardous Materials Certification. In accordance with applicable service regulations, ensure operator has been certified to transport hazardous materials. Check the expiration date on driver's HAZMAT Certification.

b. *Valid Lease. Shipper will ensure a copy of the appropriate contract or lease is carried in all leased vehicles and is available for inspection. (49 CFR 376.12 and 376.11(c)(2)).

c. Route Plan. Prior to loading any Hazard Class/Division 1.1, 1.2, or 1.3 (Explosives) for shipment, ensure that the operator possesses a written route plan in accordance with 49 CFR Part 397. Route Plan requirements for Hazard Class 7 (Radioactive) materials are found in 49 CFR 397.101.

d. Emergency Response Guidebook (ERG) or Equivalent. Commercial operators must be in possession of an ERG or equivalent document. Shipper will provide applicable ERG page(s) to military operators.

e. *Verify the driver has completed a pre-trip inspection. The driver's signature in item 25 serves as the certification that both the motor vehicle and trailer are in safe operating condition.

f. Copy of 49 CFR Part 397. Operators are required by regulation to have in their possession a copy of 49 CFR Part 397 (Transportation of Hazardous Materials Driving and Parking Rules). If military operators do not possess this document, shipper will provide a copy to operator.

Item 8. * Check the last periodic inspection date for the Truck/Tractor and Trailer to ensure currency (1 year). Acceptable documentation: (1) A copy of the inspection report or (2) A sticker or decal with the date of inspection, name and address of the motor carrier, information uniquely identifying the vehicle inspected and a certification the vehicle has passed an inspection in accordance with § 396.17.

SECTION II - VEHICLE INSPECTION

General Instructions.

Item 9. Type of Vehicle(s). For military tactical vehicles, enter Nomenclature/ Model of vehicle (and trailer, if applicable). For GSA or commercial vehicles, enter Make & Model of vehicle (and trailer, if applicable).

Item 10. Vehicle Number(s). For military tactical vehicles, enter bumper number(s). For GSA or commercial vehicles, enter Vehicle Identification Number (VIN) or Company-assigned number(s) for vehicle (and trailer, if applicable).

All items (11.a. through 11.n.) will be checked on all incoming military, government-owned, or commercial empty equipment prior to loading. All UNSATISFACTORY conditions must be corrected prior to loading.

Item 11.a. Horn Operative. Ensure that horn is securely mounted and of sufficient volume to serve purpose. (49 CFR 393.81)

b. Windshield/ Wipers. Inspect to ensure that windshield is free from breaks, cracks or defects that would make operation of the vehicle unsafe; that the view of the driver is not obscured and that the windshield wipers are operational and wiper blades are in serviceable condition. Defroster must be operative when conditions require. (49 CFR 393.60, 393.78 and 393.79)

c. Mirrors. Every vehicle must be equipped with two rear vision mirrors located so as to reflect to the driver a view of the highway to the rear along both sides of the vehicle. Mirrors shall not be cracked or dirty. (49 CFR 393.80)

d. Warning Equipment. Equipment must include three bidirectional emergency reflective triangles that conform to the requirements of FMVSS No. 125. FLAME PRODUCING DEVICES ARE PROHIBITED. (49 CFR 393.95)

e. Safety Equipment. Military vehicles must be equipped with one serviceable fire extinguisher with an Underwriters Laboratories rating of 10 BC or more (Commercial motor vehicles must be equipped with one serviceable 10 BC Fire Extinguisher). Fire extinguisher must be located so that it is readily accessible for use and securely mounted on the vehicle. The fire extinguisher must be designed, constructed and maintained to permit visual determination of whether it is fully charged. A set of wheel chocks is required to prevent movement of unattended vehicles. (49 CFR 393.95 and 49 CFR 398.4(p))

f. Lights and Reflectors. (Head, tail, turn signal, brake, clearance, marker and identification lights, Emergency Flashers). Inspect to see that all lighting devices and reflectors required are operable, of proper color and properly mounted, and are not obscured by dirt or grease or have broken lenses. High/Low beam switch must be operative. Emergency Flashers must be operative on both the front and rear of vehicle. (49 CFR 393.24, 25, and 26)

g. Brakes (to include hand brakes, parking brakes and Low Air Warning devices). Check to ensure that brakes are operational and stop and hold the vehicle or tractor/trailer combination. Check for audible air leaks around air brake components and air lines. Check for fluid leaks and visible cracked or damaged lines. Ensure that parking brake is operational. Low air warning devices must be operative. (49 CFR 393.40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 51, 52, 53, and 55)

INSTRUCTIONS

SECTION II *(Continued)*

h. Coupling Devices (inspect without uncoupling). Fifth Wheels: Inspect for unsecured mounting to frame or any missing or damaged parts. Inspect for any visible space between upper and lower fifth wheel plates. Ensure that the locking jaws are around the shank and not the head of the kingpin. Ensure that the release lever is seated properly and safety latch is engaged. Pintle Hook, Drawbar, Towbar Eye and Tongue and Safety Devices: Inspect for unsecured mounting, cracks, missing or ineffective fasteners (welded repairs to pintle hook is prohibited). Ensure safety devices (chains, hooks, cables) are in serviceable condition and properly attached. (49 CFR 393.70 and 71)

i. Cargo Space. Inspect to ensure that cargo space is clean and free from exposed bolts, nuts, screws, nails or inwardly projecting parts that could damage the lading. Check floor to ensure it is tight and free from holes. Floor shall not be permeated with oil or other substances. (49 CFR 393.84)

j. Landing Gear. Inspect to ensure that landing gear and assembly are in serviceable condition, correctly assembled, adequately lubricated, and properly mounted.

k. Tires, Wheels, and Rims. Inspect to ensure that tires are properly inflated. Flat or leaking tires are unacceptable. Inspect tires for visible cuts, bruises, breaks and blisters. Tires with cuts that extend into the cord body are unacceptable. Thread depth shall not be less than: 4/32 inches for tires on a steering axle of a power unit, and 2/32 inches for all other tires. Mixing bias and radial on the steering axle is prohibited. Inspect wheels and rims for visible cracks, unseated locking rings, broken, loose, damaged or missing lug nuts or elongated stud holes. (49 CFR 393.75)

l. Tailgate/ Doors. Inspect to see that all hinges are tight in body. Check for broken latches and safety chains. Doors must close securely. (49 CFR 177.835(h))

m. Tarpaulin. If shipment is made on open equipment, ensure that lading is properly covered with fire and water resistant tarpaulin. (49 CFR 177.835(h))

n. Other. Note any other unsatisfactory condition which would prohibit the vehicle from being loaded with hazardous or sensitive materials.

Item 13. For AA&E and other shipments requiring satellite surveillance, ensure that the Satellite Motor Surveillance System is operable. The DTTS Message Display Unit, when operative, will display the signal "DTTS ON". The munitions carrier driver, when practical, will position the DTTS message display unit in a manner that allows the shipping inspector or other designated shipping personnel to observe the "DTTS ON" message without climbing aboard the cab of the motor vehicle.

Item 15. Ensure inspector prints name on DD Form 626 at origin prior to loading vehicle.

Item 16. Ensure inspector signs name on DD Form 626 at origin prior to loading vehicle.

SECTION III - POST LOADING INSPECTION

General Instructions.

All placarded quantities/items will be checked prior to the release of loaded equipment. Shipment will not be released until deficiencies are corrected. All items will be checked on incoming loaded equipment. Deficiencies will be reported in accordance with applicable service regulations.

Item 17. Check to ensure shipment is loaded in accordance with 49 CFR Part 177.848 and the applicable Segregation or Compatibility Table of 49 CFR 177.848.

Item 18. Check to ensure the load is secured from movement in accordance with applicable service outload drawings.

Item 19. Check to ensure seal(s) have been applied to closed equipment; fire and water resistant tarpaulin applied on open equipment.

Item 20. Check to ensure each transport vehicle has been properly placarded in accordance with 49 CFR 172.504.

Item 21. Check to ensure operator has been provided shipping papers that comply with 49 CFR 172.201 and 202. For shipments transported by Government vehicle, shipping paper will be DD Form 2890.

Item 22. Ensure operator(s) sign DD Form 626, are given a copy and understand the hazards associated with the shipment.

Item 23. Applies to Commercial Shipments Only. If shipment is made under DOT Special Permit 868 or other applicable Special Permits, ensure that shipping papers are properly annotated and a copy of each Special Permit is with shipping papers.

Item 24. Ensure inspector signs & prints name on DD Form 626 at origin.

Item 25. Ensure driver(s)/operator(s) sign(s) & print(s) name on DD Form 626 at origin.

Item 26. Ensure inspector signs & prints name on DD Form 626 at destination.

Item 27. Ensure driver(s)/operator(s) sign(s) & print(s) name on DD Form 626 at destination.

Ahtna

Form M-6

EXPLOSIVES USAGE RECORD

Team Number:_________Date: ________________

Team Leader:_________ Project: ______________

EXPLOSIVES ISSUED Signature of Team Leader:__________________________________			
Item	**Quantity**	**Lot Number**	**Checker's Initials**
EXPLOSIVES EXPENDED Signature of Team Leader:__________________________________			
Item	**Quantity**	**Lot Number**	**Checker's Initials**
EXPLOSIVES RETURNED Signature of SUXOS: ______________________________________			
Item	**Quantity**	**Lot Number**	**Checker's Initials**

I certify the explosives listed above were used for their intended purpose.

____ Date: ______________________________

Senior UXO Supervisor

OMB No. 1140-0026 (04/30/2027)

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 E-Mailed to JSOC & Field Division	BATS ID
		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 ☐ Supplement to previous report of theft or loss ☐ Attempted Theft/Suspicious Activity

☐ Loss **-** Explosives failed to function **-** e.g., avalanche explosives did not detonate and remain in a snowfield; seismic explosives did not detonate and remain in the ground; or explosives in blastholes, did not detonate and fell into debris, but cannot be located *(Complete only items 1-6, 7c-e, 8-12, 13c, 16, 16a, 17 and 18).*

☐ Loss **-** Other **-** e.g., explosives fell off a truck while in transport; explosives were inadvertently left in a blasting area *(Complete only items 1-6, 7c-e, 8-12, 13c, 16, 16a, 17 and 18).*

☐ Loss - Failure to account for explosive materials - e.g., records do not match physical inventory.

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)*

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 Left Unlocked

☐ Keyway Drilled Out

☐ Other *(Explain)* ____________

☐ Lock Pried, Twisted or Levered

☐ Lock Picked or Shimmed

☐ Lock Body Drilled Out or Cut

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

☐ Other *(Explain)* ____________

☐ Hood Removed

☐ Hood Broken

Hood Width *(Inches)* ____________ Hood Length (Inches) ____________

Hood Depth *(Inches)* ____________ Hood Thickness (Inches) ____________

16. Circumstances Pertaining to the Theft/Loss of Explosives, Suspicious Activity, or the Recovery/Discovery of Explosives Previously Reported as a Loss. *(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

Reporting Instructions

Email or fax this completed form to the ATF address listed below or call if no fax is available:

Bureau of Alcohol, Tobacco, Firearms and Explosives
U.S. Bomb Data Center
99 New York Ave., N.E. 8.S-295
Washington, DC 20226
Toll Free Fax: 1-866-927-4570
Email Address: USBDC@atf.gov

Questions regarding the completion of this form should be referred to the U.S. Bomb Data Center toll free at 1-800-461-8841.

Privacy Act Information

The following information is provided pursuant to section 3 of the Privacy Act of 1974 (5 U.S.C. § 522a(e)(3).

1. **Authority.** Solicitation of this information is made pursuant to Title XI of the Organized Crime Control Act of 1970 (18 U.S.C. Chapter 40). Disclosure of a theft or loss of explosive materials is mandatory pursuant to 18 U.S.C. § 842(k) for any person who has knowledge of such theft or loss from his stock.

2. **Purpose.** The purpose for the collection of this information is to give ATF notice of the theft or loss of explosive materials, and to furnish ATF with the pertinent facts surrounding such theft or loss. In addition, the information is used to confirm and verify prior notification of this theft or loss of explosive materials.

3. **Routine Uses.** The information will be used by ATF to aid in the administration of laws within its jurisdiction concerning the regulation of explosive materials and other related areas. In addition, the information may be disclosed to other Federal, State, foreign, and local law enforcement of laws within their jurisdiction. System of records notice Justice/ATF-008 Regulatory Enforcement Record System FR Vol.68 No.16 Page 3558 dated January 24, 2003.

4. **Effects of not supplying information requested.** 18 U.S.C. § 842(k) makes it unlawful for any person, who has knowledge of the theft or loss of explosive materials from his stock, to fail to report such theft or loss within twenty-four hours of discovery thereof, to the Secretary and to appropriate local authorities. The penalty for violation of this section is a fine of not more than $1,000 or imprisonment for not more than one year, or both. 18 U.S.C. § 844(b).

Paperwork Reduction Act Notice

This request in accordance with the Paperwork Reduction Act of 1995. The purpose of this information collection is to report the theft or loss of explosive materials. The information is used for investigative purposes by ATF officials. This information is mandatory by statute. (18 U.S.C. § 842)

The estimated average burden associated with this collection of information is 1 hour and 48 minutes per respondent or recordkeeper, depending on individual circumstances. Comments concerning the accuracy of this burden estimate and suggestions for reducing this burden should be directied to Report Management Officer, Resource Management Staff, Contracts and Forms Office, Bureau of Alcohol, Tobacco, Firearms and Explosives, 99 New York Ave, N.E. Washington, DC 20226.

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Ahtna

Form M-8

PREPARATORY PHASE DEMOLITION INSPECTION CHECKLIST FORM

Contract No:	**Project Number:**
Work Order:	**Date:**
Project Name:	**Location:**
Definable Feature(s) of Work:	**Specification Reference:**

I. Key Personnel (Present):

Name	*Position*	*Sign*

II. Checklists, Submittals and Notifications:

Checklist Question:	**Yes**	**No**	**NA**
Are all equipment and procedural checklists SUXOS approved?			
Is Form M-1, Explosive Demolition Operations used?			
Is Form M-3, Presidio of Monterey Fire Department Munitions Response & Ordnance Removal Fire Risk Assessment used?			

III. Event Planning:

Checklist Question:	**Yes**	**No**	**NA**
Are items to be “Explosively Treated” identified and documented?			
Is the planned DEMO site Exclusion Zone mapped?			
Are DEMO Team members identified and team assignments made? (Assigned by the DEMO Supervisor)			
Is there a clear plan for the operation? (Briefed by the DEMO Supervisor)			
Is an alternate radio channel required (situational)?			

IV. Materials and Equipment:

Checklist Question:	**Yes**	**No**	**NA**
Are planned DEMO materials to be used, on site (magazine) and available?			
Is the vehicle to be used to transport the explosive materials designated, and capable of meeting the requirements of the MEC QAPP Addendum UXO SOP 7			

Ahtna

Form M-8

PREPARATORY PHASE DEMOLITION INSPECTION CHECKLIST FORM

Checklist Question:	Yes	No	NA
Is POMFD personnel/assets present or is a water truck available for pre and post shot fire suppression? (POMFD Fire Risk Assessment dependant)			

V. Safety:

Checklist Question:	Yes	No	NA
Are Activity Hazard Analysis's approved?			
Is the site Health and Safety Plan signed by each worker?			

VI. Organization:

Checklist Question	Yes	No	NA
Are responsibilities clearly outlined for all members?			

VII. QC Comments:

VIII. Client/USACE Representative Comments:

QC Representative Signature / Date:

____
Name

______________________________________ ____________________
Sign Date

Client/USACE Representative Signature / Date

____
Name

____________________________________ _________________
Sign Date

Ahtna

Form M-9

INITIAL PHASE DEMOLITION INSPECTION CHECKLIST

Contract Number:	**Project Number:**
Work Order:	**Date:**
Project Name::	**Location:**
Definable Feature of Work:	**Specification Reference:**

I. Key Personnel Present:

Name	*Position*	*Sign*

II. Preparatory Procedures:

Checklist Question	Yes	No	NA
Does the vehicle used to transport the explosive materials meet the requirements of the MEC QAPP Addendum UXO SOP 7?			
Is positive magazine key control being adhered to?			
Are equipment checklists completed and verified by the DEMO Supervisor?			
Is the DEMO Operations Brief checklist used, and the DEMO Supervisor Brief comprehensive?			

III. Materials:

Checklist Question	Yes	No	NA
Is/are equipment and materials used, in accordance with the DEMO Plan?			

IV. Workmanship:

Checklist Question	Yes	No	NA
Is the operation being performed/conducted in accordance with the DEMO Plan?			

V. Discrepancies:

Checklist Question	Yes	No	NA
Are there any discrepancies between planned events and actual events?			

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INITIAL PHASE DEMOLITION INSPECTION CHECKLIST

If so, are discrepancies noted? What actions were taken?			
Are further corrective actions required?			

VI. Safety:

Checklist Question	Yes	No	NA
Is a JSA issued and signed by all attendees?			
Is proper Personal Protective Equipment (PPE) worn?			
All explosive operatons performed/conducted in accordance with SOPs and SSWP			

VI. QC Comments

VII. Client/USACE Representative Comments:

QC Representative Signature / Date:

____
Name

______________________________ ______________
Sign Date

QA Representative Signature / Date:

____
Name

______________________________ ______________
Date

Ahtna

Form M-10

FINAL PHASE DEMOLITION INSPECTION CHECKLIST

Contract Number:	**Project Number:**
Task Order:	**Date/Time:**
Project Name::	**Location:**
Definable Features of Work:	**Specification Reference:**

I. Key Personnel Present:

Name	*Position*	*Sign*

II. Workmanship:

Checklist Question	**Yes**	**No**	**NA**
Were DEMO Plan goals met for this event?			

III. Discrepancies:

Checklist Question	**Yes**	**No**	**NA**
Are there any discrepancies between planned events and actual events?			
Are there any Safety Concerns that need to be addressed?			
If so, are discrepancies noted? What actions were taken?			
Are further corrective actions required?			

IV. QC Comments

FINAL PHASE DEMOLITION INSPECTION CHECKLIST

V. Client/USACE Representative Comments:

QC Representative Signature / Date:

____
Name

____________________________________ ________________
Sign Date

Client/USACE Representative Signature / Date

____
Name

____________________________________ ________________
Sign Date

1. DODIC	2. NSN	3. LOT NO	4. LOCATION	B.	D.
5. DESCRIPTION			A.	C.	E.

6. DATE	7. DOCUMENT NO.	8. ACTION/PURPOSE	9. QUANTITY		10. BALANCE	11. PRINTED NAME
			A. GAIN	B. LOSS		

DA FORM 3020, JUN 2021
PREVIOUS EDITION IS OBSOLETE

MAGAZINE DATA CARD

For use of this form, see DA PAM 700-16; the proponent agency is DCS, G-4

Continued on Reverse
APD AEM v1.00ES

1. DODIC	2. NSN	3. LOT NO	4. LOCATION	B.	D.
5. DESCRIPTION			A.	C.	E.

6. DATE	7. DOCUMENT NO.	8. ACTION/PURPOSE	9. QUANTITY		10. BALANCE	11. PRINTED NAME
			A. GAIN	B. LOSS		

REVERSE, DA FORM 3020, JUN 2021

MAGAZINE DATA CARD

Use Other Side First
APD AEM v1.00ES

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED.

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				M&S	UNIT		ISS	QUANTITY				SER	SUPPLEMENTARY ADDRESS					SIG	FUND		DISTRIBUTION			PROJECT			PRI		REQD	DEL DATE		ADV		RI			O/P	COND	MGT		UNIT PRICE DOLLARS					CTS	

1. TOTAL PRICE		2. SHIP FROM	3. SHIP TO
DOLLARS	CTS	4. MARK FOR	

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS

10. QTY. REC'D	11.UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE

22. RECEIVED BY	23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (4-6)
UI (23-24)
QTY (25-29)
CON CODE (71)
DIST (55-56)
UP (74-80)

27. ADDITIONAL DATA

Form Approved
OMB No. 0704-0246
Expires 20270131

Ahtna

FORM QC-1

PREPARATORY PHASE QC INSPECTION CHECKLIST

Contract No.:
Work Order No. Date:
(Former) Fort Ord, California

Title and No. of Technical Section:	

Reference Contract Drawings:

A. Planned Attendants:

Name Position Company

1) ______
2) ______
3) ______
4) ______
5) ______
6) ______
7) ______
8) ______
9) ______
10) ______
11) ______
12) ______
13) ______
14) ______
15) ______
16) ______

B. Submittals required to begin work:

Item Submittal No. Action Code

1) ______
2) ______
3) ______

I hereby certify, that to the best of my knowledge and belief, that the above required materials delivered to the job site are the same as those submitted and approved.

______ ______

UXOQCS Date

Contract No.:

Work Order No.:
(Former) Fort Ord, California

C. Equipment to be used in executing work:

1) ______________________________
2) ______________________________
3) ______________________________
4) ______________________________
5) ______________________________
6) ______________________________
7) ______________________________

D. Work areas examined to ascertain that all preliminary work has been completed:

____
____

E. Methods and procedures for performing Quality Control, including specific testing requirements:

The above methods and procedures have been identified from the project plans and will be performed as specified for the Definable Feature of Work.

______________________________ ______________________________

UXOQCS Date

Ahtna

FORM QC-1

PREPARATORY PHASE QC INSPECTION CHECKLIST

A. Persons in attendance: See Meeting Attendance Sheet (attached)

B. Because of mutual understanding developed during review of preparatory outline and Contract Requirements: (Contract items not specifically covered during the preparatory inspection conference are assumed to be in strict conformance with the contract requirements.)

The items noted above constitute a memorandum of mutual understanding and will be performed as planned and specified.

UXOQCS	USACE Technical Representative
Date	Date

FORM QC-2

INITIAL PHASE QC INSPECTION CHECK LIST

Contract No.:
Work Order No.
(Former) Fort Ord, California

Date:
Time:

Title and No. of Technical Section: ____
____

Description and Location of Work Inspected: _______________________________________
____

Reference Contract Drawings: ____

A. Key Personnel Present:

Name	Position	Company

1) ____
2) ____
3) ____
4) ____
5) ____

B. Materials being used are in strict compliance with the contract plans and specifications: Yes ____ No ____

If not, explain: ____
____
____
____
____
____

C. Procedures and/or work methods witnessed are in strict compliance with the contract specifications:

Yes _____ No _____

If not, explain: ____
____
____
____
____
____
____

Ahtna

FORM QC-2

D. Workmanship is acceptable: Yes ________ No ________

State where improvement is needed: ____
____
____
____
____
____

E. Workmanship is free of safety violations: Yes ________ No _______

If no, corrective action taken: ____

____
____
____
____
____

____
UXOQCS

Ahtna

Form QC-3

FOLLOW UP PHASE QC INSPECTION CHECKLIST

CONTRACTOR QUALITY CONTROL DAILY REPORT CONTINUATION SHEET
(ATTACH ADDITIONAL SHEETS IF NECESSARY)

Date:

Contractor:

Y=YES; N=NO; SEE REMARKS BLANK=NOT APPLICABLE	
WORK COMPLIES WITH CONTRACT AS APPROVED IN INITIAL PHASE	

IDENTIFY DEFINABLE FEATURE OF WORK, LOCATION, AND LIST PERSONNEL PRESENT

____
____
____
____
____
____
____
____
____
____
____

TESTING PERFORMED & WHO PERFORMED TEST (Include number of samples and/or tests taken)

____
____
____
____
____
____

USACE QA Representative ________________________________ **Date** _____________

UXOQCS ____ **Date** ____________

Ahtna

FORM QC-4

FINAL INSPECTION OUTLINE

Date:

Contract No.:

Work Order Number
(Former) Fort Ord, California

Project / Area of Inspection: ______________________________

A. Definable Features of Work: Status of Inspection:

I hereby certify, that to the best of my knowledge and belief, that the work inspected is complete and all materials and equipment used and work performed were completed in accordance with plans submitted and approved.

____
UXOQCS

B. Final Acceptance is Approved, Subject to the Correction of the Punch list Items Below:

Ahtna

FORM QC-4

FINAL INSPECTION OUTLINE

Date:

Contract No.:

Work Order Number
(Former) Fort Ord, California

A. Persons in Attendance: See Meeting Attendance Sheet (attached)

B. Resolution of Punch list Items:

The items noted above constitute a memorandum of mutual understanding and work has been performed as planned and specified.

CQCS

USACE Technical Representative

Ahtna

Form QC-5

INSPECTION SCHEDULE AND TRACKING FORM

Project:	**Project Manager:**	**UXOQCS:**

		Preparatory		**Initial**		**Follow-Up**		**Completion**		
Reference Number	Definable Feature of Work	Date Planned	Actual Date	Date Planned	Actual Date	Planned Begin/End	Actual Dates	Planned Begin/End	Actual Dates	Status

Ahtna

Form QC-6

QUALITY CONTROL SURVEILLANCE REPORT	Report Number:
Project Name:	Date:
Client:	MMRP Project Manager:

1 - Activity

☐ Project Management ☐ Field Mobilization ☐ Data Management ☐ Brush Cutting/Clearing/Reduction

☐ Intrusive Investigation ☐ FCA Location Selection ☐ Demolition ☐ UXO Avoidance

☐ MPPEH Management ☐ FCA Construction ☐ Mag and Dig Survey ☐ Detector Aided Visual Survey

☐ Boundary Survey ☐ Stump/Root Processing ☐ Soil Sifting ☐ Other:

2 - Phase

☐ Preparatory ☐ Initial ☐ Follow up ☐ Not Applicable

3 - References

4 - Observed Condition/Activities and Comments:

5 - Results of Surveillance

☐ Acceptable	☐ Unacceptable	Deficiency #: NCR #:
Conducted By:	Signature:	Date:

6 - SUXOS Review

☐ Concur ☐ Non-Concur	Signature:	Date:

7 - Distribution

☐ PM ☐ Site PM ☐ SUXOS ☐ QA Oversight ☐ Safety ☐ Other: -------- --------------

Ahtna

Form QC-7

CORRECTIVE ACTION REQUEST

(2)CAR #:	(3)PRIORITY: ☐HIGH ☐NORMAL	(4)DATE PREPARED:

PART A: NOTICE OF DEFICIENCY

(5)PROJECT: WAD#:	
(6)MMRP PROJECT MANAGER:	(7)CQC Supervisor:
(8)WORK UNIT:	(9)WORK UNIT MANAGER:
(10)ISSUED TO (INDIVIDUAL & ORGANIZATION):	
(11)REQUIREMENT & REFERENCE:	
(12) PROBLEM DESCRIPTION & LOCATION: (13) CAP REQUIRED? ☐YES ☐ NO (14)RESPONSE DUE:	
(15)ISSUED BY (PRINTED NAME & TITLE): SIGNATURE: DATE:	(16)MANAGEMENT CONCURRENCE:

PART B: CORRECTIVE ACTION

(17)PROPOSED CORRECTIVE ACTION/ACTION TAKEN: NOTE: SUPPORTING DOCUMENTATION MUST BE LISTED ON THE BACK OF THIS FORM AND ATTACHED.	
(18)PART B COMPLETED BY (NAME & TITLE): SIGNATURE: DATE:	(19)QC CONCURRENCE:

PART C: CORRECTIVE ACTION VERIFICATION

(20)CAR VERIFICATION AND CLOSE-OUT: (CHECK ONLY ONE & EXPLAIN STIPULATIONS, IF ANY) APPROVED FOR

☐CLOSURE WITHOUT STIPULATIONS

☐APPROVED FOR CLOSURE WITH FOLLOWING STIPULATIONS

COMMENTS/STIPULATIONS:

(21)CLOSED BY (PRINTED NAME & TITLE):

SIGNATURE: DATE:

Ahtna

Form QC-7

CORRECTIVE ACTION REQUEST (CAR) INSTRUCTION SHEET

(1) **CQC Supervisor**: Verify that the total number of pages includes all attachments.

(2) **CQC Supervisor**: Fill in CAR number from CAR log.

(3) **CQC Supervisor**: Fill in appropriate priority category. **High** priority indicates resolution of deficiency requires expediting corrective action plan and correction of deficient conditions noted in the CAR and extraordinary resources may be required due to the deficiency's impact on continuing operations. **Normal** priority indicates that the deficiency resolution process may be accomplished without further impacting continuing operations.

(4) **CAR Requestor**: Fill in date CAR is initiated.

(5) **CAR Requestor**: Identify project name, number, CTO, and WAD.

(6) **CAR Requestor**: Identify MMRP Project Manager.

(7) **CAR Requestor**: Identify CQC Supervisor.

(8) **CAR Requestor**: Identify project organization, group, or discrete work environment where deficiency was first discovered.

(9) **CAR Requestor**: Identify line manager responsible for work unit where deficiency was discovered.

(10) **CQC Supervisor**: Identify responsible manager designated to resolve deficiency (this may not be work unit manager).

(11) **CAR Requestor**: Identify source of requirement violated in contract, work planning document, procedure, instruction, etc; use exact reference to page and, when applicable, paragraph.

(12) **CAR Requestor**: Identify problem as it relates to requirement previously stated. Identify location of work activities impacted by deficiency.

(13) **CQC Supervisor**: Identify if Corrective Action Plan (CAP) is required. CAP is typically required where one or more of the following conditions apply: CAR priority is **High**; deficiency requires a rigorous corrective action planning process to identify similar work product or activities affected by the deficiency; or deficiency requires extensive resources and planning to correct the deficiency and to prevent future recurrence.

(14) **CQC Supervisor**: Identify date by which proposed corrective action is due to QC for concurrence.

(15) **CQC Supervisor**: Sign and date CAR and forward to responsible manager identified in (10) above.

(16) **Responsible Manager**: Initial to acknowledge receipt of CAR.

(17) **Responsible Manager**: Complete corrective action plan and identify date of correction. Typical corrective action response will include statement regarding how the condition occurred, what the extent of the problem is (if not readily apparent by the problem description statement in [12]), methods to be used to correct the condition, and actions to be taken to prevent the condition from recurring. If a CAP is required, refer to CAP only in this section.

(18) **Responsible Manager**: Sign and date corrective action response.

(19) **CQC Supervisor**: Initial to identify concurrence with corrective action response from responsible manager.

(20) **CQC Supervisor**: Check appropriate block to identify if corrective action process is complete so that CAR may be closed. Add close-out comments relevant to block checked.

(21) **CQC Supervisor**: Indicate document closeout by signing and dating.

Ahtna

Form QC-8

CORRECTIVE ACTION PLAN

Attach clarifications and additional information as needed. Identify attached material in appropriate section of this form.

PART A: TO BE COMPLETED BY MMRP PROJECT MANAGER OR DESIGNEE

(1)PROJECT:		
(2)MMRP PROJECT MANAGER:	(3)CQC SUPERVISOR:	
(4)CAR NO(S) AND DATE(S) ISSUED:		
(5)DEFICIENCY DESCRIPTION AND LOCATION:		
(6)PLANNED ACTIONS	(7)ASSIGNED RESPONSIBILITY	(8) COMPLETION DUE DATE
(9) MMRP PROJECT MANAGER SIGNATURE:		DATE:

PART B: TO BE COMPLETED BY CQC SUPERVISOR OR DESIGNEE

(10)CAP REVIEWED BY:	DATE:
(11)REVIEWER COMMENTS:	
(12)CAP DISPOSITION: (CHECK ONLY ONE AND EXPLAIN STIPULATIONS, IF ANY) ☐ APPROVED WITHOUT STIPULATIONS ☐ APPROVED WITH STIPULATIONS ☐ APPROVAL DELAYED, FURTHER REQUIRED PLANNING COMMENTS:	
(13)CQC SUPERVISOR SIGNATURE:	DATE:

Ahtna

Form QC-9

Page ___ of ____
Date: _______________
REPORT NO:___________

CONTRACTOR QUALITY CONTROL DAILY REPORT

LOCATION OF WORK: ____

DESCRIPTION: ____

WEATHER: (CLEAR) (FOG) (P.CLOUDY) (RAIN) (WINDY)

TEMPERATURE: MIN_______°F MAX_____°F

1. Work performed today:

2. Work performed today by subcontractor(s):

3. Preparatory Phase Inspections performed today (include personnel present, specification section, drawings, plans, and submittals required for definable feature of work):

4. Initial phase Inspections performed today (include personnel present, workmanship standard established, material certifications/test are completed, plans and drawings are reviewed):

5. Follow-up Phase Inspections performed today (include locations, feature of work and level of compliance with plans and procedures):

6. List tests performed, samples collected, and results received:

Form QC-9

Page _____ of ____

Date: _______________

REPORT NO:_____________

7. Verbal instructions received (instructions given by Government representative and actions taken):

8. Non-conformances/deficiencies reported:

9. Site safety monitoring activities performed today:

10. Remarks:

CERTIFICATION: I certify that the above report is complete and correct and that I, or my representative, have inspected all work identified on this report performed by Ahtna 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.

UXOQCS Date

Attachment D. Points of Contact

ATTACHMENT D
POINTS OF CONTACT

Emergency Services / Agency	**Point of Contact**	**Telephone Number**
Ambulance / Police /Fire	NA	911
Community Hospital of the Monterey Peninsula, Monterey, CA	Main number (24 Hours)	(831) 624-5311
Salinas Valley Health Medical Center	Main number (24 Hours)	(831) 757-4333
St Louise Regional Hospital	Main number (24 hours)	(408) 848-2000
Doctors on Duty Marina (non-emergency clinic)	NA	(831) 883-3330
MoGo Urgent Care (non-emergency clinic)	NA	(831) 622-6935
Presidio of Monterey Fire Department	Fire Chief David Wilcox	Emergency: 911 Station Numbers: (831) 242-7701 (831) 242-7545
Presidio of Monterey Police Department	Chief Paul Lerma	Emergency: 911 Non-Emergency Dispatch: 831-242-7851
Other Agencies		
Fort Ord BRAC Environmental Coordinator	Joelle Lobo	(831) 242-7920 (202) 763-6878 (cell)
Fort Ord BRAC Biologist	Bart Kowalski (Chenega Reliable Services LLC)	(831) 242-7918 (832) 595-5569 (cell)
Fort Ord BRAC Community Relations Office	Jason No (Chenega Reliable Services LLC)	(831) 393-1284
BLM - Fort Ord National Monument	Eric Morgan	(831) 206-2505 (cell)
Federal Aviation Administration	Monterey Regional Airport	(831) 375-1211
USACE OE Safety Specialist	James Britt	(831) 521-3720 (cell)
USACE Program Manager	MC Kellett	(916) 666-1893 (cell)
USACE Project Manager Forward	Kevin Siemann	(831) 291-2177 (cell)
Travis Air Force Base EOD	Command Post 24 Hour	(707) 424-5517
20th Chemical, Biological, Radiological, Nuclear and Explosives Command, Aberdeen Proving Ground, MD	Operations and Intelligence Center 24 Hour	(410) 306-4100