Final Document

Munitions Response Site 6
Site-Specific Work Plan Addendum to the Program Level Work Plan for Munitions and Explosives of Concern Remediation of Alpha and Bravo Munitions Response Areas of McClellan, Anniston, Alabama

Prepared for:
Calhoun County McClellan Development Authority

Prepared by:
Matrix Environmental Services, LLC
283 Rucker Street
Anniston, AL 36205

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Matrix Environmental Services, L.L.C.
Integrated Environmental Solutions

Matrix Environmental Services, L.L.C.
Integrated Environmental Solutions

283 Rucker Street
Anniston, Alabama 36205-5102
(256) 847-0780 Tel
(256) 847-0905 Fax
www.matrixenvironmentalservices.com

December 14, 2008

Mr. Stephen A. Cobb, Chief
Government Hazardous Waste Branch Land Division
Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, AL 36110-2059

Mr. Tom Lederle (*via Lisa Holstein*)
Director Base Realignment and Closure
2530 Crystal Dr. Rm 5000
Taylor Bldg/NC3
Arlington, VA 22202

Re: Response to Comments on *Draft Final Munitions Response Site 6 Site-Specific Work Plan Addendum to the Program-Level Work Plan Munitions and Explosives of Concern Remediation Alpha and Bravo Munitions Response Areas of McClellan*; dated August 2008
McClellan, Calhoun County, Alabama
Facility ID No. AL4 210 020 562

Dear Mr. Cobb and Mr. Lederle:

Attached are our responses to ADEM's comments on *Draft Final Munitions Response Site 6 Site-Specific Work Plan Addendum to the Final Program-Level Work Plan Munitions and Explosives of Concern Remediation Alpha and Bravo Munitions Response Areas of McClellan* and the revised document. No comments were received from the Army.

Sincerely,

MATRIX ENVIRONMENTAL SERVICES, LLC.

Richard L. Satkin, P.G.
Senior Project Manager

cc: Ms. Miki Schneider/JPA
Ms. Julie Ange/ADEM
Ms. Lisa Holstein/Army TF
Mr. Jim Pastorick/UXOPro

ADEM COMMENTS

1. Please revise the formatting at the beginning of Chapter 3. It appears that the page numbers should be reset to 3-1, as is the style for the other chapters. Furthermore, in both the text and the Table of Contents, Chapter 3 seems to be a continuation of Chapter 2. The document should be revised accordingly.

   Response: Concur. The document has been reformatted.

2. Section 2.5.6: From the descriptions given of Saturated Response Areas and High Density Response Areas, it is difficult to discern the distinguishing features of each type of area. To clarify the defining distinction between the two areas, please add additional information about the defining features of these types of areas and how they will be handled.

   Response: Concur. The following text has been added. "The mV response in a Saturated Response Area (SRA) is greater than 75mV and oftentimes can be up to several 100s to several 1000mV. The SRA is either a large mass of metal or multiple large pieces of metal for which the metallic response is so strong one can't distinguish or dig individual targets. The SRA will appear on a geophysical map as a large pink blob and is generally a minimum of 5 - 10 feet in one direction. "

   "The HDTA consists of an overlapping response from tens/hundreds of anomalies in an area, but individual targetable peaks can still be distinguished. The mV response of an HDTA is generally much lower than an SRA. The mV response generally ranges from background up to 75mV and greater. An HDTA is often comprised of mostly smaller scrap/bits of metal at shallow depths with a few larger items (which could potentially be MEC) mixed in."

   "Because there is overlapping response, there is the possibility of masking a small target between the peaks so the UXO contractor is required to dig up the whole bounded area in one pass (which is a little more efficient than trying to clear all the individual target locations by ever-expanding holes)."

3. Section 5.0: The statement is made that, "Geophysical field teams will not begin production work until the equipment and operator system performance is determined to be acceptable." The statement should be revised to define what is acceptable.

   Response: Concur. This sentence has been revised to read, "Geophysical field teams will not begin production work until the equipment and operator system performance has been certified in the GPO test grid as meeting the DQOs in Section 10.5 (e.g. find 95% of seed items and be able to accurately locate and position an anomaly within a critical radius (Rcrit) of 2.5 feet).

4. Section 6.3.3.5: Please add the requirements for data spatial density to the list of DQOs in Section 10.5

   Response: Concur. The spatial data density DQOs (e.g <=20cm along track spacing and

2.5 feet across track spacing) will be added as requested.

5. Section 6.3.4.3: Please add the following requirement presented in this section to the quality control (QC) checks listed in Table 10-3: Evaluate the data for false positives, calculate the percentage of false positives, evaluate the results to ensure a false positive rate of 15 percent or less, re-evaluate the data and detection methods if the false positive rate exceeds this level.

   Response: Concur, we note that this takes place concurrently with the dig result-target mV review.

6. Section 10.7: Please modify the text to state that the Definable Features of Work (DFWs) are described in Table 10-3 instead of Section 10.4.

   Response: Concur. The change has been made.

Table of Contents

Appendices

List of Figures

List of Tables

Acronyms and Definitions

Acronyms

ADEM	Alabama Department of Environmental Management
APP	Accident Prevention Plan
AR	Army Regulation
ASP	Ammunition Supply Point
ASR	Archives Search Report
ATF	Alcohol, Tobacco, and Firearms
BIP	Blow-in-Place
BP	Before Present
BRAC	Base Realignment and Closure Act
CADD	computer-aided design & drafting
CCMDA	**Calhoun County McClellan Development Authority**
CD	Compact Disc
CDTF	ID Chemical Decontamination Training Facility
CEHNC	U.S. Army Corps of Engineers Huntsville Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
cm	centimeter
CPR	Cardio Pulmonary Resuscitation
CSP	Certified Safety Professional
CWM	Chemical Warfare Material
DCAA	Defense Contract Audit Agency
DDESB	Department of Defense Explosives Safety Board
DFW	Definable Feature of Work
DGM	Digital Geophysical Mapping
DID	Data Item Description
DMM	Discarded Military Munitions
DNR	Deficiency Notice Report
DoD	Department of Defense
DOE	Directorate of Environment
DOT	Department of Transportation
DQO	Data Quality Objectives
EBS	Environmental Baseline Study
EE/CA	Engineering Evaluation/Cost Analysis
EMS	Emergency Management Service
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESMP	Endangered Species Management Plan
ESRI	Environmental Systems Research Institute
ESS	Explosives Safety Submission
EZ	Exclusion Zone
FAR	Federal Acquisition Regulation
FCA	Functional Check Area
FGDC	Federal Geographic Data Committee
FOSET	Finding of Suitability for Early Transfer
FTP	File Transfer Protocol
GEOQCM	Geophysics Quality Control Manager
GeoQCS	Geophysics Quality Control Specialist
GIS	Geographic Information Systems
GPO	Geophysical Prove-Out

GPS	Global Positioning System
HAZMAT	Hazardous Materials
HSM	Health and Safety Manager
HDTA	High Density Target Area
IAR	Industrial Access Road
ID	Identification
IDW	Investigation Derived Waste
JPA	Joint Power Authority
LLRW	Low Level Radioactive Waste
LUC	Land Use Controls
LUCIP	Land Use Control Implementation Plan
MBTA	Migratory Bird Treaty Act
MEC	Munitions and Explosives of Concern
MES	Matrix Environmental Services, LLC
MFD	Maximum Fragmentation Distance
MGFD	Munition with Greatest Fragmentation Distance
MMRP	Military Munitions Response Program
MOUT	Military Operations in Urbanized Terrain
MRA	Munitions Response Area
MRS	Munitions Response Sites
MS	Microsoft
MSD	Minimum Separation Distance
MSL	Mean Sea Level
mV	milliVolt
NAEVA	NAEVA Geophysics, Inc.
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NCR	Nonconformance Report
NCS	National Safety Council
NEW	Net Explosives Weight
NHPA	National Historic Preservation Act
NONEL	Non-electric
NRHP	National Registry of Historic Places
NSA	New South Associates, Inc.
ODC	Other Direct Cost
OE	Ordnance and Explosives
OSHA	Occupational Safety and Health Administration
PDA	Personal Data Assistant
PgM	Program Manager
PM	Project Manager
PWP	Program-Level Work Plan
QA	Quality Assurance
QC Team	The GeoQC and/or the UXOQCS or their designees
QC	Quality Control
QC/QM	Quality Control/Quality Management
QCM	Quality Control Manager
QCP	Quality Control Plan
QCS	Quality Control Specialist
RAR	Removal Action Report
RCRA	Resource Conservation & Recovery Act of 1976
RCWM	Recovered Chemical Warfare Materiel
SAA	Small Arms Ammunition
SDSFIE	Spatial Data Standards for Facilities, Infrastructure and Environment
SHPO	State Historic Preservation Office
SHSM	Site Health and Safety Manager
SINA	Special Interest Natural Area
SOM	Site Operations Manager

SOP	Standard Operating Procedure
SOW	Statement of Work
SRA	Saturated Response Area
SS	Site Superintendent
SSHP	Site Safety and Health Plan
SSWP	Site-Specific Work Plan
STD	Standard
SUXOS	Senior UXO Supervisor
SVOC	Semi-Volatile Organic Compound
SZ	Support Zone
T&M	Time and Materials
TAPP	Technical Assistance for Public Participation
TEU	Technical Escort Unit
TTFW	Tetra Tech Foster Wheeler, Inc.
TTEC	Tetra Tech EC, Inc.
THPO	Tribal Historic Preservation Officer
TMA	Target Matching Algorithm
TPP	Technical Project Planning
TSD	Team Separation Distance
UoP	Unit of Production
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USATCES	U.S. Army Technical Center for Explosive Safety
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer
VDS	Validation of Detection Systems
VECP	Value Engineering Change Proposals
VOC	Volatile Organic Compound
WBS	Work Breakdown Structure
WP	Work Plan

Definitions

MEC: Military munitions that are (1) UXO, as defined in 10 United States Code (USC) 101(e)(5); (2) abandoned or discarded, as defined in 10 USC 2710(e)(2); and (3) munitions constituents [e.g., Trinitrotoluene (TNT), RDX, etc.] present in soil, facilities, equipment, or other materials in high enough concentrations so as to pose an explosive hazard. MEC will be disposed of on-site by detonation.

- **UXO**: Military munitions that have been primed, fuzed, armed, or otherwise prepared for action, and have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material, and remain unexploded either by malfunction, design, or any other cause [10 USC 101(e)(5)].
- **Other MEC**: MEC as described above, other than UXO.

MEC (Related) Scrap: Scrap, components, parts, fragmentation, or other materials associated with MEC, that have been determined to pose no explosive safety hazard. MEC-related scrap will be managed in accordance with state and federal solid waste and recycling requirements, as well as DoD and Defense Logistics Agency trade security, demilitarization, and inert certification requirements (DoD Demilitarization Program Bulletin No. 99-005, DoD Manual 4160.21-M-1, and DoD Directive 2030.8).

- **MEC Fragmentation**: Produced by ordnance designed to kill by detonation of HE and fragmentation of the delivery vehicle casing. These are generally thick cased munitions.
- **Other MEC (Related) Scrap**: MEC-related scrap as described above, other than MEC fragmentation (tail fin, cartridge case, etc.).

Non-MEC (Related) Scrap/Material: Scrap metal or other materials, which may be discovered in the study area, that are not MEC-related scrap as described above (tin can, gate hinge, barbed wire, etc.). Non-MEC-related scrap and other materials will be managed in accordance with state and federal solid waste and recycling requirements.

- **Scrap Metal**: Bits and pieces of metal parts, or metal pieces that may be combined together with bolts or soldering that, when worn or superfluous, can be recycled [40 Code of Federal Regulations (CFR) 261.1(c)(b)]. U.S. Environmental Protection Agency (EPA) guidance states that the material "must have a metal content of at least 50%" [Office of Solid Waste and Emergency Response (OSWER) Directive 941.1990(09a)] and that it be in "solid, nondispersible form (61 Federal Register 2362, 25 January 1996).
- **Other Material**: Non-MEC-related material other than scrap metal as described above.

Small Arms Ammunition: Ordnance that is. 50 caliber and smaller are considered small arms for the purposes of ordnance projects. The determining factor is that caliber .50 and smaller ammunition rarely contains explosive projectiles and presents a very low risk to the public (CEHNC-OE-CX 200-1c, April 21, 1999).

1.0 INTRODUCTION

This is a Site-Specific Work Plan (SSWP) addendum to *Revision 1 to the Final Program-Level Work Plan (PWP) Munitions and Explosives of Concern (MEC) Remediation Alpha and Bravo Munitions Response Areas of McClellan, Anniston, Alabama* (ADEM approval letter dated November 16, 2007). This SSWP addendum is being submitted to add an additional munitions response site (MRS), MRS-6, to be remediated in the Bravo munitions response area (MRA). Significant modifications to the PWP for the MRS-6 remediation include modification of the exclusion zone and team separation distances in accordance with the new Department of Defense Explosives Safety Board (DDESB) guidance (Technical Update dated September 11, 2007).

This SSWP is designed to be a useable field document. As such, the commonly referenced and (field-) relevant portions of the PWP are restated here. To facilitate the use and review of this document, the MRS-6 specific text and any significant differences from the PWP are presented in bold font.

This SSWP was prepared on behalf of the Calhoun County McClellan Development Authority (CCMDA) successor to the Anniston-Calhoun County Fort McClellan Development Joint Powers Authority (JPA) to support MEC remediation associated with the transfer of Army property to the CCMDA. The former Fort McClellan (McClellan), which was previously used by the U.S. Department of Defense (DoD) as an active military installation, was closed and most of this property was transferred to the CCMDA under the Base Realignment and Closure (BRAC) program.

1.1 General Scope of Work Information

This SSWP addresses all the phases of work planned for MRS-6 and includes the following:

- **Preparation of this Site-Specific Work Plan (SSWP) and an amendment to the conventional Explosive Safety Submission (ESS).**
- Professional land surveying to facilitate accurate data collection.
- Brush removal to support surface clearance and geophysical surveying.
- Surface sweep activities for the location, identification, removal, and disposal of surface MEC.
- Digital Geophysical Mapping (DGM) and reacquisition of selected targets.
- Intrusive operations for identification, removal, and disposal of MEC.
- On-site disposal of all MEC items containing or suspected to contain energetic materials.
- Transporting MEC scrap and “cleared” hard targets to a holding area for later disposal.
- Generating and maintaining an inventory of MEC, MEC-related scrap, and non-MEC-related scrap.
- Remapping, reacquisition, and clearance to depth of selected areas.
- Management of a geographic information system (GIS) tracking system.
- Preparation of a removal action report.

MES will provide management and oversight of the necessary labor, equipment, materials, supplies, and subcontractors associated with the project in accordance with applicable Federal, state, and local regulations and CCMDA requirements.

1.2 Project Location

McClellan occupies 18,929 acres in the City of Anniston, in Calhoun County, Alabama. To the west of McClellan are the areas known as Weaver and Blue Mountain and to the north is the

City of Jacksonville. The Talladega Forest is located east of McClellan. **MRS-6 addressed in this SSWP is located in the Bravo MRA. The location of MRS-6 is shown in Figure 1-1 (Appendix A). MRS-6 borders MRS-3 and MRS-11 to the east, and the facility boundary to the west, north, and south.**

1.3 Site History

McClellan has documented use as a military training area since 1912, when the Alabama National Guard used it for artillery training. However, the Choccolocco Mountains may have been used for artillery training by the units stationed at Camp Shipp in the Blue Mountain Area during the Spanish American War as early as 1898. The 29th Infantry Division used areas of McClellan for training prior to being ordered to France during World War I. In 1917, Congress authorized the establishment of Camp McClellan, and in 1929, the camp was officially designated as Fort McClellan. Prior to World War II, the 27th Infantry Division assembled at McClellan for training, and during the war, many other units used the site for various training purposes. Following World War II, in June 1947, McClellan was put in inactive status. McClellan was reactivated in January 1950 and the site was used for National Guard training and was selected as the site for the Army's Chemical Corps School.

The history of McClellan, as described in the Archives Search Report (ASR) Findings [U.S. Army Corps of Engineers (USACE) 1999a] and ASR Conclusions and Recommendations (USACE 1999b), includes training activities and demonstrations that used conventional weapons (i.e., mortars, anti-tank guns, and artillery pieces). McClellan was recommended for closure under the 1995 BRAC Program and was officially closed in September of 1999.

1.4 Site Description

MRS-6 is approximately 135 acres and is located along the southwestern boundary of McClellan (see Figure 1-1). The area is moderately to heavily wooded with mixed pines and hardwoods, with some open areas that were cleared for various activities during the active operation of the installation. Grids, delineation transects and mountain transects were previously used to characterize this area in the Draft Bravo EE/CA (TTFW 2004). MRS-6 will be cleared to depth in locations not designated as part of the McClellan Park System (future land use designation) and cleared to one-foot using mag/dig methods in locations designated as McClellan Park System. The McClellan Park System will be a wildlife habitat/conservation area and land use controls (LUCs) including signage will be implemented prohibiting digging.

1.4.1 Topography and Features

The topography and features of MRS-6 are shown on Figure 1-1. The elevation of MRS-6 ranges from approximately 800 feet to over 1120 feet above mean sea level. The highest elevations are along the southern portion of the site and the lowest elevation occurs along the unnamed drainage that exits the site near Lagarde Park. Along the east side of the site are a number of steep sloped hills. West of the unnamed drainage, the elevations gradually decline toward the installation boundary. MRS-6 is accessible by a few dirt roads including one road that follows the installation boundary.

1.4.1.1 Hydrology

There is one small pond located within approximately 75 feet of the north boundary of the site and an unnamed drainage in the central portion of the site that flows in a general northwest direction eventually merging with Cane Creek.

1.4.1.2 Geology

McClellan is situated near the southern terminus of the Appalachian Mountain chain. All but the easternmost portion of the former Main Post lie within the Valley and Ridge Province of the Appalachian Highlands. The portion of McClellan east of Choccolocco Creek lies within the Piedmont Province. The age of consolidated sedimentary and metamorphic rocks ranges from Precambrian to Pennsylvanian. On a large scale, most of the rocks have been intensely folded into an aggregate of northeast-southwest trending anticlines and synclines with associated thrust faults. The shallow geology in the area is characterized by colluvial deposits. The presence of metamorphic rocks, as well as iron-bearing cements within the sedimentary rocks, increases the potential for minerals such as magnetite and other associated magnetic minerals.

1.4.1.3 Climate

Calhoun County sits on 611 square miles in the foothills of the Appalachian Mountains in northeastern Alabama. Its western border is the Coosa River. The mean annual temperature is 61 degrees Fahrenheit, with seasonal averages of 38 in January and 80 in July. The average annual precipitation is 65 inches and the elevation is 721 ft above sea level.

2.0 TECHNICAL MANAGEMENT PLAN

The following Technical Management Plan states the project objective; describes key personnel, specific project approach, methods, and operational procedures; and presents the deliverables that will be used to perform MEC operations at MRS-6.

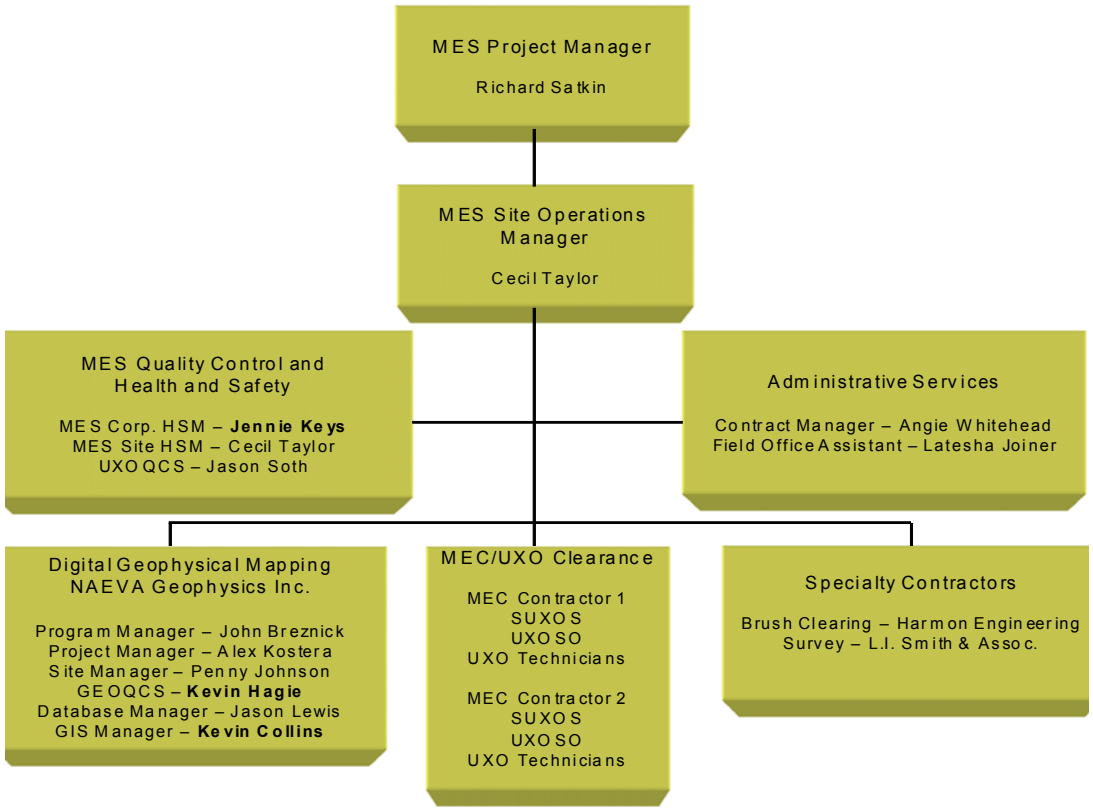
2.1 Project Objectives

The primary objective of this project is to conduct MEC clearance activities in order to gain concurrence of no further action. To meet this objective, the UXO Contractor will use the unexploded ordnance (UXO) industry's current Standard of Care but not be strictly limited to USACE guidelines of conducting MEC remediation.

2.2 Qualified Project Personnel

All key project personnel are qualified, possessing the level of technical knowledge and experience to execute assigned project tasks and responsibilities. The organizational chart presented in Figure 2-1 identifies the general organization and reporting chain-of-command.

Figure 2-1. Project Organization



The key MES, UXO and Geophysics Contractor project positions and a brief list of responsibilities for each follow:

MES Program Manager (PgM)

- Ensure contract, SOW, and plan conformance.

- Sponsor team partnering.
- Monitor safety and quality control (QC).

MES Project Manager (PM)

- Sequence work and resources.
- Approve and implement work plans.
- Manage to schedule and budget.
- Negotiate SOW and manage subcontractors.
- Approve all project purchases, labor, and other direct costs (ODCs).
- Select Units of Production (UoP).

MES Site Operations Manager (SOM)

- Sequence work flow on-site and manage on-site specialty subcontractors.
- Establish exclusion zones.
- Report daily performance.
- Apply lessons learned or corrective actions.
- Conduct on-site training.

MES Health and Safety Manager (HSM)

- Review and approve the Accident Prevention Plan.
- Approve any changes to the Site Safety and Health Plan (SSHP).
- Provide support to Contractor UXO Safety Officer (UXOSO) on all safety matters.

MES UXO Quality Control Specialist (UXOQCS)

- Conduct routine QC audits of MEC operations.
- Ensure compliance with the quality control plan (QCP).
- Monitor dig results.
- Coordinate QC activities of subcontractor during post excavation.
- Prepare daily QC reports.
- Certify scrap.

Geophysics Project Manager

- Review and approve QC procedures.
- Conduct routine QC audits of geophysical operations.
- Approve plans and reports.
- Provide **oversight** support for the Geophysics Quality Control Specialist (GeoQCS).

Geophysics Site Manager

- **Manage daily field operations.**
- **Manage daily work assignments and provide oversight for field teams**.

Geophysics Quality Control Specialist (GeoQCS)

- Implement geophysical prove-out (GPO) and deploy seed items.
- Conduct QC audits.
- Observe and monitor Geo team performance.
- Review Geo data daily for completeness/precision.

- Accept/reject field methods.

MEC Contractor Senior UXO Supervisor (SUXOS)

- Point of Contact for MES.
- Responsible for Contractor's MEC operations.
- Identify MEC and report to MES SOM.
- Certify scrap.
- Manage UXO Team.

MEC Contractor UXO Safety Officer (UXOSO)

- Ensure compliance with Contractor SSHP.
- Conduct surveillance of UXO Teams.
- Maintain medical and training certifications.
- Conduct on-site training and daily safety briefings.

2.3 Project Communication and Reporting

The Contractor Project Managers communicate closely with the CCMDA and Matrix Environmental Services, LLC (MES) project team (CCMDA/MES) to ensure that project requirements are met, and to keep all personnel informed of any technical or administrative issues that may impact the project schedule, budget, or technical approach. Any communication that has the potential to impact the project, schedule, or budget will be discussed and confirmed via written correspondence between the Contractor and CCMDA/MES.

The UXO and Geophysics Contractors will provide daily production reports and pertinent field information to CCMDA/MES and applicable stakeholders via an FTP site. The information included in the daily production reports will include, but not be limited to:

- Daily personnel rosters.
- Daily production rates.
- Daily geophysical survey production.
- Updated GIS maps.
- Results of intrusive investigations MEC disposal operations conducted.
- Results of safety and QC audits performed.
- Standardized forms anticipated for use at McClellan are included in Appendix D (PWP 2007).

2.3.1 Meetings, Regulatory Interaction and Stakeholder Support

MES will hold biweekly teleconferences with CCMDA, Alabama Department of Environmental Management (ADEM) and the Geophysics Contractor. This close interaction will allow team staff to share vision and implementation strategies, explain work plans and the rationale in activity sequencing, and describe how the work effort will progress. These meetings provide the management staff time to develop work practices and communication styles that increase productivity.

MES will work closely with ADEM and stakeholders to affirm expectations, stay informed of regulations, and to facilitate thorough but fair reviews and acceptance of work plans, technical deliverables, and site closure plans in time cycles that do not impact forward progress. When beneficial, MES will brief ADEM and other stakeholders, as to the status of ongoing and proposed site work. MES will coordinate any regulator and public awareness efforts.

2.3.2 Information Management

The DGM and MEC clearance activities will generate large volumes of data. Among these are raw and processed geophysical data, positional (survey) data, target lists and dig sheets, MEC logs, UXO disposition summaries and photographs, inventories of explosives in storage, MEC frag and MEC scrap disposition logs, and all daily production, QC logs, weekly and monthly status reports, and technical deliverables. Beyond the traditional hardcopy and routine email attachments, data will also be made available via a file transfer protocol (FTP) site.

To accommodate public interest, MES will either export files to the CCMDA's website or provide access to information authorized by CCMDA for general release.

The Geophysics Contractor will manage raw and processed geophysical data, database, and GIS shape files using the FTP site. This allows CCMDA/MES direct access to technical data once verified. Data transfer by FTP is more efficient than browser interface for sharing large volumes of data spanning multiple directories. Geophysics Contractor project management files/deliverables will be placed on the FTP site.

2.4 Project Execution

The project execution strategy for completing MEC remediation actions is presented in the following sections. This strategy reflects operational experience in conducting MEC remediation actions including geophysics, location, identification, clearance, disposal, quality control, and data collection utilizing time-proven procedures, team member relationships, and local subcontractors. **This plan discusses the field elements necessary to mobilize to the site and complete work at MRS-6.**

As alternative approaches/technologies are identified that will shorten the schedule or improve efficiency through site-specific experience, they will be employed where feasible to complete remaining work. A general process flow chart relating to all activities that may be required is presented in Figure 2-2 in Appendix A (PWP 2007) and each significant element is discussed in the following sections of text.

2.4.1 Pre-mobilization and Mobilization

During this phase of work the project planning documents (Explosives Safety Submission and Work Plans) are created and approved. The mobilization phase to McClellan commences upon approval of the planning documents and notice to commence field operations is received. Key personnel start arriving at the site to perform specific functions to aid in the procurement of equipment, hiring of local resources, perform site training and orientation. Table 2-1 identifies some of the tasks associated with these phases of work.

Table 2-1. Pre-Mobilization and On-Site Mobilization Startup Activities

PRE-MOBILIZATION	MOBILIZATION
Work Plan and Sub-plans	**Site Set Up**
• Explosives Safety Submittal Addendum **• Site Specific Work Plan Addendum to the PWP** —	**• Safety survey** **• Signage** **• Survey of security fencing** • Set up a second intentional detonation area • Set up a portable magazine
Assign Personnel (non-"key" employees)	**Site Orientation**
• UXO Technicians (I, II and III)	• Emergency routes
• Administrative Office Support	• Facility rules and regulations
Local Hires	**Team Training**
• Labor and Services as required • UXO Technicians	• Job-specific duties and responsibilities • Mechanical equipment
Subcontracts and Vendor accounts	**Site Specific Equipment Training**
• Finalize Subcontracts: — Land Surveyor — Brush Cutting/Grubbing — Demilitarization/recycling • Establish vendor accounts for supplies and materials — Explosives for demolition/disposal — Rental equipment — Utilities and lodging	• Site-specific training (UXO, Safety, other site hazards) • Explosives transportation and handling • Personal hygiene stations • Use of power tools • Communications • Hand-held geophysical instruments
Liaison with local authorities	**Geophysical Prove-Out**
• Fire, police, EMS, Hospital and Local Employment Office	**• Certify teams/equipment in GPO** **• Prepare GPO addendum**

2.4.2 Site Preparation

MRS-6 will be prepared to facilitate surface clearance and DGM. This preparation consists of boundary surveying, surface sweep, selective brush removal, and establishing grid corners. Contractors conducting this work will be provided with UXO escorts consisting of qualified UXO Technicians performing UXO avoidance support. If MEC is discovered on the surface during these UXO avoidance support operations, the item will be visually inspected, characterized, and flagged. MEC will be consolidated at the intentional detonation area for disposal, or stored in an ATF Type II portable magazine to await disposal. Any items unacceptable to move will be marked for blow-in-place (BIP) procedures at the end of each day as described in Section 2.5.6.

2.4.2.1 Boundary Surveying

An Alabama licensed professional land surveyor will be retained to survey the site boundaries relative to an existing first-order benchmark using traditional land surveying techniques or, where possible, differential GPS. All survey data will be delivered in Alabama East Zone, State Plane coordinates using U.S. survey feet for incorporation into the site GIS. Boundary marking may occur simultaneously with brush cutting providing that two operations are separated by at least 200 ft to maintain a safety buffer between the operations. The surveyors will be escorted by a UXO safety technician who will work in front and conduct a visual and hand-held detector-aided surface search for MEC. A 200-foot buffer will be maintained between the surveyors/escorts and other simultaneous operations.

2.4.2.2 Surveying of the Grid Corners

As the brush cutting is completed within a site footprint, 100 ft x 100 ft grids will be established across the site. Each southwest grid corner will be surveyed and the grid identified by a unique number on the corner stake. Grid corners will be utilized by geophysical mapping teams to facilitate data collection and target reacquisition. As described above, all survey data will be delivered in Alabama East Zone **(1983),** State Plane coordinates using U.S. survey feet for incorporation into the site GIS. A 200-foot buffer will be maintained between the surveyors/escorts and other simultaneous operations. If an anomaly is discovered at a grid corner location, the stake and survey pin will be offset in a north-south or east-west direction, with the offset marked on the corner stake.

2.4.2.3 Brush Cutting

Clearance of brush and undergrowth (grubbing) will be performed by a Brush Cutting/Grubbing contractor. A surface sweep will be performed in advance of brush cutting as described in Section 2.5.2. All brush cutting work will also be supported by a UXO escort. The UXO escort will walk ahead of brush cutters and perform a visual and hand-held detector-aided search as required.

The Brush Cutting Contractor will coordinate all brush cutting evolutions with the MES Site Operations Manager and/or the MES UXO QA. Particular attention will be applied to areas containing the protected mountain longleaf pine (Pinus palustris) trees. These trees will not be trimmed or thinned unless they negatively impact the removal of MEC, and then trimming will be closely coordinated with MES. All other trees 3 inches in diameter or less will be cut, as needed, to facilitate site work. Tree thinning and brush clearance will be accomplished by mechanized equipment and hand clearing. The clearance team includes equipment operator(s) and on-ground laborer(s) with chain saws and hand tools. The areas that are not accessible by the mechanized equipment will be cut and cleared via manual means. Based on prior experience at McClellan, the preferred mechanized equipment for this project will include:

- **Hydro Ax with a Fecon grinder** – This is a large rubber-tired tractor unit capable of grinding brush, trees, downfall, etc., on flat to gently sloping ground. The resultant mulch will be spread on the forest floor to return nutrients and organic matter to the soil and aid in erosion control.
- **Kobelco trackhoe with Fecon grinder and auxiliary power unit** – This assembly will work from the road, reaching into roadside ditches and up roadside slopes.
- **Tractor with a rotary mower** – This equipment will be used for grassy areas along the roadside and relatively open areas with small shrubs and grasses. Brush from the Kobelco trackhoe unit and hand clearing areas will all be mulched and spread.

2.5 Production

MEC production activities include surface sweep in advance of brush cutting, aggressive surface/near surface clearance, clearance to 1-foot, DGM, intrusive clearance to depth of detection, MEC disposal, post-excavation activities, step-out procedures, scrap (MEC and non-MEC) hard target processing and disposal, and GIS data management which are all described in the following sections.

2.5.1 PDAs

The UXO Contractor will be responsible for entering team surface and intrusive data into Personal Digital Assistants (PDAs). **The PDAs will be Dell Axim X51v, Hewlett Packard IPAQ hx2795, or equivalent PDAs.** The PDAs will have a drop-down menu to ensure all UXO personnel utilize consistent terminology. The Log Forms located in Appendix D (PWP 2007), contain the type of information that will be collected on the PDAs. The UXO Contractor shall

immediately replace any PDA that is not properly functioning. Programming of PDAs, loading with initial daily data and downloading of field data collected at the end of each day will be performed by the Geophysics contractor. PDA data will be downloaded and placed in the site database/GIS system.

2.5.2 Surface Sweep in Advance of Brush Cutting

A UXO team led by a UXO Tech III (Team Leader) will conduct a surface sweep of each grid to remove MEC, MEC scrap, and non-MEC scrap in advance of the grubbing crews. MEC will be consolidated within the grid for disposal and items unacceptable to move will be marked for BIP procedures at the end of each day. All scrap will undergo an initial inspection to ensure it is explosives-free and then staged along the boundary of the grid in one of two areas designated by the Team Leader in each grid. Area No. 1 will be for scrap identified as MEC scrap to include re-inspected MEC scrap resulting from UXO disposal operations, that is subsequently determined to be explosives-free. Area 2 will be for non-MEC scrap. MEC scrap will be kept segregated from non-MEC scrap through final disposition. MEC scrap and non-MEC scrap will be re-inspected for subsequent pickup and transported to a temporary holding area for QC and QA inspection, certification and final disposition at an approved facility as described in Section 2.5.8.1.

If any MEC is detected during surface sweep operations, only authorized UXO personnel will be permitted to take actions to minimize risks. Other team personnel will use the three "***R**'s"* - **R**ecognize the item as potential MEC, **R**eport the item's location to the UXO Technician, and **R**etreat to a safe location as designated by UXO personnel.

The UXO Contractor will take actions to protect the safety of the personnel on site, the public, and the environment. All UXO personnel are aware that if suspect chemical warfare material (CWM) is discovered, they will ensure that all personnel withdraw immediately from the work area to an area upwind of the suspect CWM item and report the item to the MES Operations Manager. The suspect item will be secured by the UXO Contractor's UXO personnel until relieved by appropriate authority, such as Technical Escort Unit (TEU) or Explosive Ordnance Disposal (EOD) personnel. See Section 14 for the Recovered Chemical Warfare Material Plan.

2.5.3 Aggressive Surface/Near Surface Clearance

A UXO team led by a UXO Tech III (Team Leader) will conduct an aggressive surface /near surface clearance to a depth of approximately 6 inches in each grid to identify, remove and/or dispose of as much MEC, MEC scrap, and Non-MEC scrap as possible. The team will establish controlled lanes approximately 5 feet in width and use magnetometers to assist in detection of metal objects. During aggressive surface/near surface clearance, intrusive excavation procedures in Section 2.5.6 apply. The ultimate goal of the effort is to identify and remove as much metallic clutter within approximately 6 inches of the ground surface so it does not interfere with subsequent DGM activities. MEC will be consolidated within the grid for disposal and items unacceptable to move will be marked for BIP procedures at the end of each day. All scrap will undergo an initial inspection to ensure it is explosives-free and then staged along the boundary of the grid in one of two areas designated by the Team Leader in each grid. Area No. 1 will be for scrap identified as MEC scrap and MEC frag, to include re-inspected MEC scrap resulting from UXO disposal operations, that is subsequently determined to be explosives-free. Area 2 will be for non-MEC scrap. MEC scrap will be kept segregated from non-MEC scrap through final disposition. MEC scrap and non-MEC scrap will be re-inspected for subsequent pickup and transported to a temporary holding area for QC and QA inspection, certification and final disposition at an approved facility as described in Section 2.5.8.1.

If any MEC is detected during the aggressive surface/near surface clearance operations, only authorized UXO personnel will be permitted to take actions to minimize risks. MEC discovered during the surface clearance will be photographed, identified, and documented as to type, condition, and location. Other team personnel will use the three "***R**'s"* -**R**ecognize the item as potential MEC, **R**eport the item's location to the UXO Technician, and **R**etreat to a safe location as designated by UXO personnel.

The UXO Contractor will take actions to protect the safety of the personnel on site, the public, and the environment. All UXO personnel are aware that if suspect chemical warfare material (CWM) is discovered, they will ensure that all personnel withdraw immediately from the work area to an area upwind of the suspect CWM item and report the item to the MES QA. The suspect item will be secured by the UXO Contractor's UXO personnel until relieved by appropriate authority, such as Technical Escort Unit (TEU) or Explosive Ordnance Disposal (EOD) personnel. See Section 14 for the Recovered Chemical Warfare Material Plan.

The UXO Contractor will be responsible for entering summary data from the aggressive surface/near surface clearance into their PDAs. Total non-MEC and total MEC scrap weights for each grid and additional positional and location data should a MEC item be recovered during the near surface clearance will be entered into the PDA. The PDAs will have a drop-down menu to ensure all UXO personnel utilize consistent terminology.

2.5.4 Clearance to One foot Depth

A UXO team led by a UXO Tech III (Team Leader) will conduct an aggressive instrument-aided MEC clearance to a depth of 1 foot. The clearance teams shall utilize standard mag and dig clearing techniques such as establishing control lanes approximately 5 ft wide and use of hand held magnetometers and all metal detectors to assist in detection of MEC and MEC-like metal objects. During 1 foot clearance, intrusive excavation procedures in Section 2.5.6 apply.

MEC will be consolidated within the grid for disposal and items unacceptable to move will be marked for BIP procedures at the end of each day. All scrap will undergo an initial inspection to ensure it is explosives-free and then staged along the boundary of the grid in one of two areas designated by the Team Leader in each grid. Area No. 1 will be for scrap identified as MEC scrap, to include re-inspected MEC scrap resulting from UXO disposal operations, that is subsequently determined to be explosives-free. Area 2 will be for non-MEC scrap. MEC scrap will be kept segregated from non-MEC scrap through final disposition. MEC scrap and non-MEC scrap will be re-inspected for subsequent pickup and transported to a temporary holding area for QC and QA inspection, certification and final disposition at an approved facility as described in Section 2.5.8.1.

If any MEC is detected during 1 foot clearance operations, only authorized UXO personnel will be permitted to take actions to minimize risks. MEC discovered during the surface clearance will be photographed, identified, and documented as to type, condition, and location. Other team personnel will use the three "***R**'s"* -**R**ecognize the item as potential MEC, **R**eport the item's location to the UXO Technician, and **R**etreat to a safe location as designated by UXO personnel.

The UXO Contractor will take actions to protect the safety of the personnel on site, the public, and the environment. All UXO personnel are aware that if suspect chemical warfare material (CWM) is discovered, they will ensure that all personnel withdraw immediately from the work area to an area upwind of the suspect CWM item and report the item to the MES QA. The suspect item will be secured by the UXO Contractor's UXO personnel until relieved by appropriate authority, such as Technical Escort Unit (TEU) or Explosive Ordnance Disposal (EOD) personnel. See Section 14 for the Recovered Chemical Warfare Material Plan.

The UXO Contractor will be responsible for entering data from the clearance into their PDAs. Total non-MEC and total MEC scrap weights for each grid and additional positional and descriptive data should a MEC item be recovered during the clearance will be entered into the PDA.

2.5.5 Digital Geophysical Mapping

Upon completion of the aggressive surface/near surface clearance, DGM will be conducted to locate subsurface metallic anomalies. A detailed discussion of geophysical methods and equipment are presented in Section 6.

2.5.6 Intrusive Operations - Clearance to Depth of Detection

Intrusive operations in support of MEC clearance to depth of detection involves excavation of subsurface anomalies identified by DGM and, where necessary in areas not accessible to DGM, handheld instruments. All non-DGM areas, including a 2-foot radius around tree clusters (more than 1 tree) **and single-tree DGM gaps with any horizontal dimension ≥ 5 feet,** are to be verified as cleared by the intrusive excavation team with hand held metal detectors **or an EM61 MK2, as practical**. The Vallon (model VMH3CS) EM-based detection sensor has proved to be the most reliable hand held detector. When compared to the various other handheld detectors that were evaluated, the Vallon detected the most GPO blind seed items. The Vallon will be used to locate geophysical anomalies in areas not covered by the EM61-MK2. During this search, if additional anomalies are located by the intrusive team, these anomalies will be excavated and the findings recorded in the team's PDA. These records shall include the number of individual excavations, MEC scrap weight, and non-MEC scrap weight. If MEC items are found, unique target identifiers will be assigned to these items along with their positions. These records will be uploaded for inclusion in the overall site database. Upon completion of this task of verifying that the subsurface in a 2-foot radius around gaps **identified on the geophysical maps** are free of metal, **the UXO team leader will initial all non-DGM areas on his copy of the geophysical map**. **The maps will be kept in the grid folder to allow QC and QA to verify that the gaps have been cleared**. In addition, the QC team will inspect a random selection of trees with analog metal detectors in each grid to verify that the areas around the trees have been cleared by the intrusive dig teams.

Intrusive work will be performed or directly supervised by UXO qualified personnel (UXO Tech IIs or higher). Seven person dig teams will be used which will include at least one UXO Tech III (one of which will be the team leader) and one UXO Tech II. The remainder of the dig team will be comprised of UXO tech Is working under the direct supervision of a UXO Tech II for manual excavation or under the direct supervision of a UXO Tech III for mechanical excavation. UXO Technicians will be responsible for hand digging anomalies that are 12 inches or less while, at the same time, two technicians will be responsible for excavating suspected MEC that are deeper than 12 inches assisted by a mini-excavator. The mini-excavator will be used to excavate overburden from target anomalies that are deeper than 12 inches. Equipment operators who are not UXO-qualified may operate the mini-backhoe, but only when supervised by a UXO Tech III. All excavations will be performed by carefully digging to the side of the suspected MEC item until a positive identification is made. Excavation operations, whether by hand or using the mini-backhoe, will employ a layered approach, meaning that soil will be removed in lifts of 6 inches or less. Under no circumstances will any excavation be made directly over suspected MEC items. Once the mini-excavator team is within 12 inches of the suspect item, they will use hand excavation techniques only. After the MEC item is exposed, debris/dirt will be cleared only enough to permit positive identification of the item. Dig results will be recorded on PDAs using drop-down menus and then incorporated into the site GIS/database daily. MEC items that are acceptable to be moved will be

consolidated within the grid for subsequent disposal. MEC items identified as unacceptable to move will be marked for BIP disposal operations. Disposal activities will be conducted daily to dispose of all MEC recovered for that day. Blast and fragmentation protective measures may be necessary depending upon the location of the item(s) relative to inhabited buildings and other infrastructure in accordance with a Department of Defense Explosives Safety Board (DDESB)-approved ESS. The USACE, HNC-ED-CS-5-98-7 of August 1998, ***"Use of Sandbags for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions"*** **or HNC-ED-CS-S-003 of September 2000, "*Use of Water for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions"*** will be used as the references for all blast mitigation procedures. MEC items that cannot be positively identified as explosive-free will be disposed of in the same manner.

The dig teams will inspect the grid maps and re-acquisition notes for the grid such that any anomalies or mark outs larger than the 2.5-ft clearance radius are identified. Anomalies larger than the 2.5 ft radius will be cleared to the extent of footprint/mark out. If any pin flags are missing, or the dig team has questions about the grid map, the dig team leader will contact the Site Operations Manager to get the re-acquisition team to replace the flags or clarify anomalies/grid maps as needed.

To facilitate dig clearance operations, spoils will be piled 2 ft away from the dig holes, as practical. Upon completion of each dig the dig anomaly flag will be bent and replaced at the dig location to visually indicate that the dig has been completed. If "hot" spoils are left in the grid (spoils containing nails, SAA, large concrete blocks, etc.) the hot pile will be flagged with a white pin flag, with the known cause of the metallic material written on the flag.

All scrap will undergo an initial inspection to ensure it is explosives-free and then staged along the boundary of the grid in one of two areas designated by the Team Leader in each grid. Area No. 1 will be for scrap identified as MEC scrap, to include re-inspected MEC scrap resulting from UXO disposal operations, that is subsequently determined to be explosives-free. Area 2 will be for non-MEC scrap. MEC scrap will be kept segregated from non-MEC scrap through final disposition. MEC scrap and non-MEC scrap will be re-inspected for subsequent pickup and transported to a temporary holding area for QC and QA inspection, certification and final disposition at an approved facility as described in Section 2.5.8.1.

Areas geophysically mapped and determined to consist of dense, overlapping subsurface anomalies that make prosecuting individual targets impractical will be identified as Saturated Response Areas (SRAs). **The mV response in a Saturated Response Area (SRA) is greater than 75mV and oftentimes can be up to several 100s to several 1000mV. The SRA is either a large mass of metal or multiple large pieces of metal for which the metallic response is so strong one can't distinguish or dig individual targets. The SRA will appear on a geophysical map as a large pink blob and is generally a minimum of 5 - 10 feet in one direction.** SRAs may be related to non-MEC fill materials (such as construction debris, trash dump sites, road fill, etc.), or to utilities, above-ground structures, or below-ground structures. The SRAs will be primarily prosecuted by backhoe excavation - to the extent possible without undermining or endangering structures to be retained. The intention is that SRAs will be cleared in their entirety unless alternate methods are authorized by the MES Operations Manager or PM. When these areas are encountered, an effort will be made to clear and QC the adjacent point targets first, to minimize the impact of large amounts of spoils generated from the SRA excavations.

Areas geophysically mapped and determined to consist of a high density anomaly area where discrete anomalies can be selected but prosecuting individual targets are impractical may be considered high density target areas (HDTA). The HDTA consists of

an overlapping response from tens/hundreds of anomalies in an area, but individual targetable peaks can still be distinguished. The mV response of an HDTA is generally much lower than an SRA. The mV response generally ranges from background up to 75mV and greater. An HDTA is often comprised of mostly smaller scrap/bits of metal at shallow depths with a few larger items (which could potentially be MEC) mixed in. Geophysical anomalies in these areas will not be reacquired but the limits of the area will be marked out by the reacquisition team. These areas will be cleared either manually or with the use a backhoe. Because there is overlapping response, there is the possibility of masking a small target between the peaks so the UXO contractor is required to dig up the whole bounded area in one pass (which is a little more efficient than trying to clear all the individual target locations by ever-expanding holes). Alternatively, the HDTA may be selected for a mag/dig operation with the use of a backhoe with the goal of reducing the millivolt response so that the area can be mapped or remapped and individual targets then reacquired and prosecuted.

Following the intrusive investigations, each area excavated will be QC checked for the source removal using the same geophysical instrument used for the DGM surveys (EM61-MK2). To facilitate the QC effort, all excavations will be temporarily left open after initial prosecution by the dig teams. A trained EM operator assisted by the UXOQCS or designee will maneuver the instrument over the open hole while monitoring the data logger for any residual anomaly. If the instrument response indicates the anomaly has been removed, the dig will be considered complete and holes will be backfilled. Excavation QC is discussed in greater detail in Section 10. For locations where an elevated residual response remains, corrective actions will be initiated by UXOQCS.

2.5.6.1 Step-Out Approach

If a MEC item is identified and removed along boundaries of the MRS, a step-out will be performed until there is a 200-foot buffer free and clear of MEC. The step-outs will be conducted in those areas where no future MEC remediation is planned either because 1) the area is pending a No Further Action from ADEM; 2) the area has received a No Further Action from ADEM; 3) the area will be remediated in the future; 4) the area is outside of a suspected MEC area (offsite or in the main cantonment). As targets are intrusively investigated, dig results will be uploaded to the database which is then geo-spatially represented in the GIS. If a MEC item is found during the intrusive investigation, the distance between the MEC item and the initial boundary of the area will be measured using the GIS. If that distance is greater than 200 ft, then no additional investigation is necessary. If the distance between the MEC item and the initial site boundary is less than 200 ft, then the area of investigation will be expanded by to an area comprising a 200-foot radius circle around the item. Areas not previously cleared within this circle will be cleared in the same manner as the original site, including any needed surveying, brush removal, geophysics, reacquisition and excavation, MEC disposal, QC check and backfilling. This process will continue until no more expansion grids are required (i.e., no additional MEC is found).

2.5.6.2 GIS

Geophysical, target and dig data will all be stored within an Environmental Systems Research Institute (ESRI) Arcview-based GIS for the site using the same reference coordinate system as the survey. These input and output data will be used to graphically represent work progress and produce graphics for project status updates and removal action reports. Grid data will be updated daily to reflect the current status of a grid with regard to progress through the MEC clearance process. The GIS will also be used to facilitate the step-out process. The Geophysics Contractor will manage the site database and GIS system used to store, manage

and produce graphics. Daily updates will be posted such that stakeholders can access the data.

2.5.7 Removal Action Report

A Removal Action Report (RAR) will be prepared for MRS-6 and submitted to ADEM for review and approval. The RAR will describe methods and findings at the MRS and present all raw and processed data from the field. QC and QA findings will be included along with GIS maps of the site showing grids, MEC items found, no-finds and cultural features. Deviations from the work plan and records of work plan modification will also be included in RARs.

2.5.8 MEC Disposal

The MES demolition team will conduct disposal operations in the event that MEC is encountered. For safety and control, disposal will be accomplished by using either electrical or non-electric means. The donor charges will consist of jet perforators, cast boosters, or other approved donor charges that are available. In situations where there is a static electricity or an electromagnetic radiation hazard, non-electric initiation will be utilized. All disposal operations will be conducted in accordance with the Demolition SOPs (Appendix E, PWP 2007) and all applicable safety publications. Upon completion of demolition operations, the area will be inspected to ensure complete destruction, munitions scrap will be collected for further processing and all resultant holes will be backfilled.

2.5.8.1 MEC Scrap, MEC Frag and non-MEC Scrap Collection and Disposal

Handling, processing, and disposal of MEC scrap, MEC frag, and non-MEC scrap is designed to comply with USACE EM 1110-1-4009. MES will pre-position lockable scrap metal containers located in an area reserved for scrap collection, segregating, and final inspection. This area will be located in the magazine area. One container(s) will be designated "*Scrap Metal"* and will be used to collect non-MEC scrap such as C-ration cans, barbed wire, construction debris, metal roofing, and or other metals not associated with munitions or range targets. The other container(s) will be marked "*MEC Scrap"* and will be used to collect MEC scrap and MEC frag (ordnance/munitions related scrap metal such as target material, fins, empty projectile casings, ordnance frag and other metal components) that do not contain any explosives or energetic materials).

Collection procedures begin at the time the metal item is discovered by the UXO technician in the grid. The UXO technician makes a preliminary screening as to the classification of the item. If the item is identified as MEC scrap containing energetic material or scrap that cannot be positively identified, it will remain in the grid and be flagged for disposal (demolition). If the item is positively identified as non-MEC scrap metal, it is placed in a non-MEC scrap bucket located on the boundary of the grid being worked. If the item is identified as MEC scrap (not containing energetic material) or MEC frag material it will be placed in the appropriately labeled scrap buckets. This initial screening is the first step in the sorting, inspection and segregation of the scrap.

After completing clearance operations within a grid, or at the end of the day if the grid is not completed, the Team Leader will perform a 100% inspection by sorting and separating all recovered scrap items. If any questionable scrap is found, it is moved to the MEC scrap bucket for treatment. The segregated scrap will then be taken directly to the scrap processing area. At the scrap processing area, the UXOQCS **or his designee** will conduct a 100% re-inspection of all recovered scrap. The non-MEC scrap will then be placed with like materials in labeled lockable containers. The MEC scrap and MEC frag will be staged for disfigurement, as required. All MEC scrap and MEC frag will be stored in labeled lockable containers to prevent any co-mingling of non-MEC and MEC scrap.

In preparation for transportation to the disposal facility, Matrix UXO QA will also perform an inspection of the scrap, certify it as non-hazardous, and seal the containers. The scrap manifest will be signed and the seal numbers recorded. All MEC scrap and MEC frag will be disposed of at a foundry or recycler where it will be processed through a shredder, smelter or furnace (remelt) before resale or release. MES will require that all MEC scrap containers remain segregated from all other scrap and sealed until such time as it will be immediately processed (shredded and/or smelted). All MEC scrap is to be rendered unrecognizable as munitions-related debris/scrap, disposed of safely and permanently, and tracked from point of origin to final disposition. A signed DD Form 1348-1 will be required to track all scrap as well as a certificate of destruction signed by the disposal facility. These documents will become part of the permanent record for submittal with the final report.

2.5.8.2 Hard Target Processing and Disposal

The processing of hard targets such as tanks, armored personnel carriers, jeeps and other vehicles requires a skill set quite different from the normal scrap handling capabilities described above. **The dismantling and disposal of any hard targets encountered in MRS-6 will be handled with other hard targets toward the end of the MEC remediation program and is further described in Section 2 of the PWP (2007).**

2.6 MRS-6

MRS-6 is approximately 135 acres and is located in the southwestern portion of the Bravo MRA. MRS-6 will be cleared to depth in locations not designated as part of the McClellan Park System (future land use designation) and cleared to one-foot using mag/dig methods in locations designated as McClellan Park System. The McClellan Park System will be a wildlife habitat/conservation area. LUCs including signage will be implemented prohibiting digging.

MRS-6 overlaps with three Army-designated sectors and is described in the following text.

The M3-2H Mortar Area-PR sector consists of approximately 104 acres in the western Bravo MRA bordering the planned Eastern Bypass road. Grids and delineation transects were previously used to characterize this area. Nine Mortars, 60mm, HE, M49 were found on the surface and to depths of 8 inches during field activities in this sector (detailed list in Draft Bravo EE/CA, TTFWI 2004).

The M3-2H Mortar Area-D sector consists of approximately 42 acres west of the M3-2H Mortar Area PR sector. Grids and delineation transects were previously used to characterize this area. Twenty-seven MEC items were found on the surface and to depths of 12 inches during field activities in this sector. The following types of MEC were identified (detailed list in Draft Bravo EE/CA, TTFWI 2004):

- **Mortar, 60mm, HE, M49**
- **Mortar, 60mm, smoke, WP, M302**

The M3-1L Rocket Area-D sector consists of approximately 115 acres along the western border of the Bravo MRA. Grids and delineation transects were previously used to characterize this area. Twenty-eight MEC items were found on the surface during field activities in this sector. The following types of MEC items were identified (detailed list in Draft Bravo EE/CA, TTFWI 2004):

- **Rocket, 2.36inch HEAT, M6**
- **Mortar, 60mm, HE, M49**

3.0 EXPLOSIVES MANAGEMENT PLAN

This Explosives Management Plan provides details for the control and management of explosives at McClellan. MES recognizes the critical nature of properly managing the explosives required for the project. This Explosives Management Plan details the procedures to manage the explosives for this project in accordance with the following policies and local, state, and Federal laws and regulations:

- 2003 International Fire Code, Chapter 33 as adopted by the City of Anniston.
- 27 CFR Part 555, Commerce in Explosives.
- 29 CFR 1910, General Industry Standards.
- 29 CFR 1926, Construction Standards.
- Applicable sections of DOT, 49 CFR Parts 100 to 199, Transportation.
- Applicable sections of EPA, 40 CFR Parts 260-299, Protection of Environment.
- AR 200-1, Environmental Protection and Enhancement.
- AR 385-10, The Army Safety Program.
- AR 385-16, System Safety Engineering and Management.
- AR 385-64, Ammunition and Explosives Safety Standards.
- ATFP 5400.7, Alcohol Tobacco and Firearms Explosives Laws and Regulations.
- DA PAM 385-64, Ammunition and Explosives Safety Standards.
- DoD 4145.26-M, Contractor's Safety Manual for Ammunition and Explosives.
- DoD 4160.21-M, Defense Reutilization and Marketing Manual.
- DoD 6055.9-STD, DoD Ammunition and Explosives Safety Standards.
- TM 60 Series Publications as applicable.
- TM 9-1300-200, Ammunition General.
- TM 9-1300-214, Military Explosives.
- USAESCH EM 385-1-1, Safety and Health Requirements Manual.
- USAESCH ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous Waste Remedial Actions.
- USAESCH Safety Considerations for UXO.

3.1 Licenses/Permits

MES will maintain a copy of the following documents on-site. These documents will be made available, upon request, to any authorized local, state, or Federal authority.

- Bureau of Alcohol, Tobacco, and Firearms (ATF) User of High Explosives License; License Number 1-AL-015-33-9D-00484 (expiration date: April 1, 2009).
- State of Alabama Blasting Contractor License, Permit Number C-01205.
- State of Alabama Blaster Certificate, Number B-07056, issued to Cecil Taylor, the MES Operations Manager. **Alabama Blasters Certificates are also held by multiple on-site MES employees.**

3.2 Acquisition

3.2.1 Description and Estimated Quantity of Explosives

The initial explosives requirement estimate for the project is noted in Table 3-1. Replacement explosives will be re-supplied to maintain the inventory based upon rate of use.

Table 3-1. Estimated Explosives Requirements

Description	Class/Division	Quantity	NEW	Storage Compatibility Group
Jet Perforators (shape charges)	1.4S	500 each	26 lb	D
Detonation Cord (80 gr/ft)	1.4D	4,000 ft	46 lb	D
1/3-lb Pentolite Boosters	1.1D	84 each	63 lb	D
NONEL Shock Tube 2,000'	1.4S	10 each	<1 lb	B
NONEL Caps	1.1B	300 each	<1lb	B

3.2.2 Acquisition Source

The explosives vendors for explosive materials are:

Mr. Steve Windsor, Birmingham Powder, 2804 Cherry Avenue, Birmingham, Alabama. Cell 205-999-8643 Off: 205-674-5641 and Mr. Mike Peveto, Jet Research Center, A Division of Halliburton, 8432 South I-35 West, Alvarado, Texas. 1-800-451-5403 or 817-761-2155.

3.2.3 Storage of Explosives

The storage of explosives has been approved by DDESB in pre-existing earth covered magazines which have current inspections on file with the local Fire Marshal; these magazines are designated Buildings 4425 and 4426 as described in Table 3-2.

Table 3-2. Explosives Storage Data

Magazine Number	Type Explosive	Magazine Type	Maximum Explosive wt.	Inter Magazine Distance to 4426	Intraline Distance	Required Distance
4425	1.1	Earthen covered	45,000	101	580	570
	1.4	Earthen covered	capacity	101		50
Magazine Number	**Type Explosive**	**Magazine Type**	**Maximum Explosive wt.**	**Inter Magazine Distance to 4425**	**Intraline Distance**	**Required Distance**
4426	1.1	Earthen covered	65,000	101	670	660
	1.4	Earthen covered	capacity	101		50

3.2.3.1 Procedures for Receipt

The MES Responsible Person or Employee Possessor will inventory, initiate, and maintain all documentation concerning the demolition material upon receipt. The MES Responsible Person or Employee Possessor will assume accountability for the material by signing the receipt documents.

The MES Responsible Person or Employee Possessor will conduct a 100% inventory of the incoming explosives. The quantities annotated on the receiving document will match the quantities actually inventoried. If these quantities do not match, the MES Responsible Person or Employee Possessor will contact the originator of the receipt documentation. MES Responsible Person or Employee Possessor will only sign for the actual quantity of material received, as reflected by the inventory. Receipt documentation will be changed to reflect the correct quantities prior to acceptance. These procedures will be followed throughout for each delivery. Upon receipt, the receiving quantity will be added to the Master Magazine Data Cards and Magazine Data Cards.

3.2.3.2 Procedures for Transporting Explosives

MES will be responsible for transporting explosives for demolition operations from the storage magazines to disposal locations within MRS-6. Transportation of explosives and initiators will comply with all federal, state, and local regulations. For transportation of explosives and initiators on-site, MES will comply with the following procedures and general safety precautions:

- Vehicle operators transporting explosives will be UXO Technicians II and above and have a valid CDL driver's license with HAZMAT Endorsement and a current Medical Examiner's Certificate.
- Vehicle operators will be trained and informed of the explosive hazards involved with their cargo.
- Initiating explosives, such as blasting caps, will remain separated from high explosives at all times. Blasting caps may be transported in the same vehicle as long as they are in an ATF approved portable day box container and secured away from all high explosives.
- Explosives will remain covered in a waterproof and spark proof container at all times, except when loading or unloading.
- Vehicle engine will not be running when loading/unloading explosives.
- Vehicle wheels will be chocked.
- The loaded explosives will be, blocked, braced, tied down, or otherwise secured in the vehicle to prevent movement.
- Prior to transport, the vehicle operator will visually inspect the explosive laden vehicle to ensure the load is properly secured and safe-to-move.
- Explosives will not be transported in the passenger compartment of a vehicle.
- Personnel will not ride in the cargo compartment with explosives.
- Smoking within 50 feet of vehicles transporting explosives is prohibited.
- Refueling of vehicles will not be accomplished with explosive cargo.
- Explosive laden vehicles will not be left unattended.
- Vehicle operators transporting explosives will comply with posted speed limits and will not exceed 25 mph on unimproved roads.

3.2.3.3 Explosive Vehicle Requirements

- MES will have a designated vehicle for transporting explosives. It will be in safe working condition and meet the following requirements:
- Vehicle will pass the standards of the Explosive Vehicle Inspection Sheet and will be properly placarded.
- Bed of vehicle will have a wooden liner or box, chocking material or sandbags to brace and protect the explosives from contact with the metal bed.
- Vehicles transporting explosives will have a first aid kit, two 10-lb BC rated fire extinguishers, and communications capability.

3.2.3.4 Key Control Procedures

The keys to the magazines will be locked in a safe at the **MES Field Office, located at 283 Rucker Street**. All personnel having access to the safe and magazine keys will be identified in writing by the MES Project Manager as key custodians. A sign out log will be located inside of the safe, requiring the date, time of issue, time of return and signature of custodian using magazine keys.

3.2.4 Inventory and Loss Procedures

The follow two sections describe the procedures for inventory and for the steps to be taken in the case of losing explosives.

3.2.4.1 Inventory of the Magazine

MES personnel that are designated as Responsible Persons or Employee Possessors will perform at a minimum a weekly physical inventory of the stored explosives to reconcile the actual quantities with the quantities annotated on the Master Magazine Data Cards and the corresponding Magazine Data Cards. Any discrepancies will be immediately reported to the MES Operations Manager, who will initiate an audit to determine the source of the discrepancy.

3.2.4.2 Lost, Stolen, or Unauthorized Use of Explosives

Upon discovering lost, stolen, or unauthorized use of explosives, the Operations Manager will report the circumstances to the Project Manager. Loss, theft, or unauthorized use of explosives shall be reported as required by 27 CFR 555.30. Completion and submission of ATF Form 5400.5 to the ATF must be accomplished within 24 hours of a reportable event. The Project Manager will notify:

- CCMDA – (256) 236-2011 (within 1 hour).
- ATF – 1-800-800-3855 (immediately upon discovery).
- Anniston Police Department – (256) 238-1800 (within 1 hour).
- ADEM – Governmental Hazardous Waste Branch – (334) 270-5646.

3.2.4.3 Return to Storage of Unexpended Explosives

The Demolition Supervisor will return unexpended explosives to the storage magazines at the end of the work day and record the transaction as a receipt on the appropriate Magazine Data Cards and Master Magazine Data Cards.

3.2.4.4 Disposition of Remaining Explosives at the End of Site Activities

During MEC remediation operations, MES will minimize the explosives inventory. Upon completion of all MRS remediation activities, the remaining explosives will be destroyed on site.

4.0 EXPLOSIVES SITING PLAN

This plan provides explosives safety criteria for the planning and siting of safe explosives operations for selected MRSs at McClellan. This plan is written in accordance with the requirements of DID MR-005-04 and is based on the specific details given in the ESS with **five amendments**, approved by the U.S. Army Technical Center for Explosives Safety (USATCES) and the DDESB; as changes occur to the ESS this plan will be updated accordingly.

4.1 Munitions Response Areas

This plan addresses work in the Alpha and Bravo MRAs. These areas generally comprise the western half of the former Fort McClellan. The Charlie MRA was transferred to the U.S. Fish and Wildlife Service (USFWS) and is not addressed in this plan.

4.2 Munitions Response Sites

Specific MRSs within the Alpha and Bravo MRAs have been designated by ADEM as requiring MEC remediation in order to allow for a specific reuse of the site. Table 4-1 shows the designation, size, and response action currently planned for the identified MRSs.

Table 4-1. Munitions Response Actions Summary

MRS	Area (Acres)	Munitions Response Action
Northern Alpha	14	Clearance to Depth
MRS-2 (including Industrial Access Road)	384 141	Clearance to Depth Clearance to 1’
MRS-3	233 166	Clearance to Depth Clearance to 1’
MRS-6	**108** **27**	**Clearance to Depth** **Clearance to 1’**

4.3 Type of MEC

Table 4-2 lists the MEC identified during past EE/CA work or ongoing remediation in each MRS.

Table 4-2. Type of MEC Recovered

MRS	MEC Recovered
Northern Alpha	• Hand grenade, debris, smoke • Mine, anti-tank, practice, M12 • Rifle grenade, M9 • Grenade, hand, practice • Signal, ground, illumination
MRS-2 (including Industrial Access Road)	• Projectile, 75 mm shrapnel, MKI • Projectile, 75mm, HE, M48 • Projectile, 3.8 in., shrapnel • Projectile, 37mm, practice, MKII • Mortar, 81 mm HE, M43 • Grenade, hand, practice, M69 • Mortar, 60 mm smoke, WP, M302 • Grenade, 40 mm • Grenade, rifle, smoke • Mortar, 3 in. Stokes, practice, MKI

MRS	MEC Recovered
MRS-3	• Projectile, 75 mm shrapnel, MKI • Projectile, 75mm, HE, M48 • Projectile, 3.8 in., shrapnel • Projectile, 37mm, practice, MKII • Mortar, 81 mm HE, M43 • Mortar, 60 mm smoke, WP, M302 • Mortar, 60 mm, HE, M49 • Rocket, 3.5inch, HE, M28A2 • Rocket, 66mm HEAT, M72 • Rocket, 2.36inch, HEAT, M6 • Grenade, 40 mm, HE • Grenade, rifle, AT, M9 • Grenade, rifle, smoke • Grenade, hand, practice, M69 • Grenade, hand, MKII
MRS-6	• **Mortar, 60 mm smoke, WP, M302** • **Mortar, 60 mm, HE, M49** • **Rocket, 2.36inch, HEAT, M6**

4.4 Minimum Separation Distances

The Minimum Separation Distances (MSDs) are the distances that must be maintained between project personnel working in an area and non-project personnel and are based on the DDESB-approved ESS for this project and will be implemented and enforced during munitions response field operations. The MSD is also called an exclusion zone (EZ). There is an EZ for both intentional and unintentional detonations. Preliminary site work such as surveying, laying grid lanes and anomaly detection do not require the establishment of an MSD. The unintentional detonation MSD restrictions from MEC areas to non-project personnel will be applied during all surface and subsurface MEC removal actions. Project personnel are defined as those on-site personnel required to participate in the MEC investigation/removal/sampling, along with all authorized visitors.

The USACE and DDESB have recently endorsed the use of the Hazardous Fragment Distance (HFD) for determining the MSD for unintentional detonations for all MEC (DDESB guidance (Technical Update dated September 11, 2007). The HFD for the munition with the greatest fragmentation distance (MGFD) is used to determine the EZ for non-project personnel in the event of an unintentional detonation. The maximum fragment range (MFR) for the MGFD is used to determine the EZ for non-project personnel in the event of an intentional detonation.

Table 4-3 shows the MSDs based on the MGFDs identified at the MRSs in accordance with the new DDESB guidance. Distances shown in Table 4-3 were taken from the ESS. The DDESB-approved Fragmentation Database described in DDESB Technical Paper 16 was utilized. Information on munitions not in the database were taken from other sources and referenced in the ESS. During the course of a munitions response, if a munition with a greater fragmentation distance is encountered, the MSD will be adjusted in accordance with the 'Fragmentation Database' and an amendment to the ESS submitted for approval.

Table 4-3. Minimum Separation Distances

MRS	MGFD	MSD	
		MSD for Intentional Detonation (ft)	MSD for Unintentional Detonation
Northern Alpha	Grenade, Rifle, M9	351	200
MRS-2 (East) MRS-2 (West)	Projectile, 75 mm, HE, M48 Projectile, 37mm, practice, MKII	1701 980	234 90
MRS-3	Rocket, 3.5inch, HE, M28A2	1420	235
MRS-6	**Mortar, 60 mm, HE, M49**	**1080**	**166**

Team separation distances (TSDs) apply to project personnel working within an MRS. The TSDs have been updated in accordance with the September 11, 2007 Technical Update, Implementation of DDESB Guidance on Minimum Separation Distances for Unintentional Detonations and are based on the K40 distances. Applicable TSDs from the ESS are shown below in Table 4-4.

Table 4-4. Team Separation Distances

MRS	MGFD	Net Explosive Weight (lbs)	K40 (feet)
Northern Alpha	Grenade, Rifle, M9	0.25	26
MRS-2 (East) MRS-2 (West)	Projectile, 75 mm, HE, M48 Projectile, 37mm, practice, MKII	1.47 0.053	48 16
MRS-3	Rocket, 3.5inch, HE, M28A2	1.88	56
MR-6	**Mortar, 60 mm, HE, M49**	**0.42**	**34**

4.4.1 Exclusion Zone Control

Prior to initiation of on-site MEC operations, all nonessential personnel will be moved to a location outside the EZ. Once intrusive operations commence, positive control of the EZ will be maintained and only essential personnel and authorized visitors will be allowed inside the EZ. Essential personnel are those personnel necessary for the safe and efficient completion of field work conducted in the EZ. Positive control of the EZ, based on the MSD, will be maintained at all times when MEC operations are being conducted. Prior to beginning intrusive operations, the Site Health and Safety Manager (SHSM) will ensure there are no non-essential personnel or **unauthorized** visitors within the EZ and that this area remains clear of such personnel throughout the MEC operations.

Exclusion zones will also be minimized through the use of DDESB-approved engineering controls such as miniature open front barricades for unintentional detonations (see HNC-ED-CS-S-98-8) in cases where operations take place within the HFD distance listed in Table 4-3.

Engineering controls for intentional detonations (demolition shots) will be used as described in the *Use of Sand Bags for Mitigation of Fragmentation and Blast Effects due to Intentional Detonation of Munitions*," HNC-ED-CS-S-98-7, dated August 1998 or in the *Use of Water for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions*, HNC-ED-CS-S-00-3, dated September 2000. These controls will be applied as appropriate to mitigate fragmentation and blast hazards created during demolition operations. A copy of HNC-

ED-CS-S-98-7 and HNC-ED-CS-S-00-3 will be available on-site when these engineering controls are to be used. If and when residents or workers are within the EZ of the current day's work area, each resident or worker will be provided protection by evacuation or the use of engineering controls. The roads within the EZ of the day's work area will be closed and barricaded at the EZ distance while intrusive work is conducted.

4.4.2 Intrusive Investigation

Only UXO technicians and UXO-qualified personnel will perform excavation and investigation of anomalies. UXO technicians will perform intrusive operations under the supervision of UXO-qualified personnel. To gain access to a subsurface anomaly, excavation will be initiated to the side of the anomaly and will not be conducted directly over the anomaly until such time as the depth of the anomaly can be ascertained. Additional excavation will be conducted with care using small hand tools only. A detailed accounting of all MEC located at each site will be made and maintained in the project database. A log entry will be made for each MEC item indicating the date the item was recovered, team that **removed** the item, unique target identification, description of the item, grid location (x, y, and z measurements) and final disposition.

4.4.3 Disposal Shots

During MEC disposal operations all nonessential personnel will be evacuated from the EZ and the number of personnel on-site will be kept to the minimum required to safely accomplish the disposal. Nonessential personnel will remain outside the EZ until all MEC disposal operations are completed. The SHSM will ensure that all required notifications of an impending demolition shot are made prior to detonation. The SHSM will be responsible for ensuring all personnel have been accounted for and that the area is secure prior to authorizing the detonation of explosive charges. Authority to initiate demolition operations will rest solely with the Operations Manager.

All MEC items requiring detonation will be marked and secured pending disposal. All explosive operations will be supervised by the demolition supervisor and coordinated with the Matrix Operations Manager. All explosive operations will follow the procedures outlined in TM 60A-1-1-31 and the EP 385-1-95a, *Basic Safety Concepts and Considerations for Munitions and Explosives of Concern (MEC) Response Action Operations*, dated 29 June 2001. Demolition operations will be performed as required.

4.5 Planned or Established Demolition Areas

Disposal activities will be conducted within each grid or at the approved intentional detonation areas.

4.6 Footprint Areas

The following three sections describe the footprint areas for this project.

4.6.1 Blow-in-Place

The MSD for BIP operations designated for intentional detonations are shown in Table 4-3.

4.6.2 Collection Points

The intentional detonation area will be used to consolidate and dispose of items that are safe to move. In addition, an ATF Type II portable magazine for up to 100 pounds net explosive weight will be used for storage of MEC that is safe to move and awaiting disposal. The location of the intentional detonation area and portable magazine is shown in Figure 4-1 in Appendix A (PWP, 2007).

4.6.3 In-Grid Consolidated Shots

MEC deemed acceptable to move may be placed within the search grid in a location designated by the Demolition Supervisor pending destruction at the end of the day. Consolidated shots will be conducted in accordance with the USACE publication, *Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (OE) Sites*, dated March 2000. A copy of this report will be available on-site.

4.7 Explosives Storage Magazines

Explosives storage magazines and demolition materials are discussed in this section.

4.7.1 Types of Magazines Used

All demolition material will be stored in existing earth-covered magazines previously used at McClellan. Initiating caps will be stored in one magazine while shaped charges and cast boosters will be stored separately in the other. These two magazines were previously sited for 1.2 Ammunition; additional information about the two magazines is presented below:

- Magazine 4425 – Standard Earth Covered Magazine rated at 45,000 lbs net explosive weight (NEW).
- Magazine 4426 – Standard Earth Covered Magazine rated at 65,000 lbs NEW.

Each magazine is 25 ft wide and 60 ft long with a ceiling height of 13.5 ft at the center. Walls are constructed of 18-inch thick steel-reinforced concrete with an 18-inch earth cover at the top and over 35 ft of cover to each side and the rear of the magazine. The doors are made of 7-inch thick steel and each is 10 ft tall with a rail glider for opening/closing. Locking mechanisms required long-hasp ATF-certified locks. Each magazine has a current grounding certification.

No more than 150 lbs of demolition explosives will be stored in either magazine. At no time will MEC items be placed in these magazines.

4.7.2 Explosives Data

Expected demolition materials are shown in Table 3-1.

5.0 GEOPHYSICAL PROVE-OUT PLAN

GPO test plot(s) will be used to test and confirm equipment and operator system performance across all work elements including sensor, positioning, personnel, data processing, and quality control. Before and throughout the field work, performance will be demonstrated at GPO test plot(s) to confirm and certify that Contractor personnel and procedures can meet the project goals and that the detection and navigation systems are operating within expected parameters. Geophysical field teams will not begin production work until the equipment and operator system performance has **been certified in the GPO test grid as meeting the DQOs in Section 10.5 (e.g. find 95% of seed items and be able to accurately locate and position an anomaly within a critical radius (Rcrit) of 2.5 feet**). Any uncertified personnel or new or modified equipment will also require performance validation and certification prior to performing production work. See Section 10.7.3.1.2 for additional GPO information as related to QC Step 1.

In addition to the digital geophysical instruments, the UXO Contractor will demonstrate and test other hand-held EM-based analog instruments (including the Vallon VMH3CS, Minelab Explorer II, and Fisher All Metals) in the GPO to determine which instrument(s) prove most functional, reliable and consistent at McClellan. Testing will be conducted by the GeoQCS and the instrument selected will then be used by UXO dig teams during intrusive operations to gauge completion of a dig. (We recognize that the EM61-MK2 will be used to QC digs, however, our dig teams must also use an analog instrument in order to efficiently prosecute and finalize digs.) Further, it is anticipated that there may be limited areas that are inaccessible to DGM methods due to extreme terrain or obstructions and will therefore require the use of hand-held analog instruments (ML-1 or Schonstedt magnetometer, Minelab Explorer II or Vallon). UXO dig teams will also be required to demonstrate proficiency in use of the analog instruments selected. They will utilize the selected analog instruments in the GPO to demonstrate their ability to locate and reacquire MEC items with the selected instruments. Follow-up certification of the UXO team members for proficiency with sweep instruments will be supervised by the UXO QCS.

5.1 Geophysical Prove-Out Site

This GPO plan was developed in accordance with the plans and specifications of the USACE. The anticipated tasks to be performed during the project include DGM and intrusive investigations to remove surface and subsurface MEC hazards at the site. The GPO test site was designed and constructed in the former Ammunition Supply Point (ASP) area of McClellan to reflect the field conditions and survey geometry that will be utilized and effectively tests the collection of DGM data over grids located in heavily wooded areas on difficult terrain representative of the majority of the Alpha and Bravo MRAs. The GPO test site is not envisioned as an unchanging entity. The GPO test plot may be changed or augmented, or additional test plots constructed, in order to better evaluate the performance of geophysical equipment and methodologies reflective of the encountered site conditions, MEC items, or burial depths.

5.1.1 GPO Plot Design

The data quality objectives (DQOs) pertaining to the GPO are presented in Section 10 of this Work Plan. The elements outlined in the following subsections describe the GPO plot design and procedures associated with the GPO. The specifics of the seed items, burial locations, and burial depths will be released on an as-needed basis by MES. While control points and “known” seed items depths and locations will be released to the UXO and Geophysics Contractors for use in QC and for optimizing survey parameters and anomaly selection criteria, the retention of

"blind" seed item locations and depths allows for consistent evaluation of the inter- and intra-Contractor GPO DGM and sensor testing results.

5.1.2 GPO Size and Location

The GPO site is located in the former ASP area of McClellan. The GPO test plot is constructed as a 100 ft by 100 ft grid which includes geology, soil types, wooded conditions, and topography representative of the Alpha and Bravo MRAs.

5.1.2.1 Seed Items

The frequency and burial depths of the MEC items recovered during the previous investigation of the Alpha and Bravo MRAs, as documented in the EE/CA reports for these areas, were used to develop the initial seeding strategy for the GPO test plot construction. DQOs pertaining to the GPO are presented in Section 10. The seed items range in size from (inert) grenades and 37mm projectiles to 155mm projectiles and AT mines and are intended to 1) include representative items expected from the Alpha and Bravo MRAs; and 2) to meet the DQOs for the removal actions. The overall plan is for the GPO test plot to remain useable for field activities beyond the current project scope.

The GPO seed items, are inert ordnance items painted blue and affixed with waterproof label tags emplaced at various depths, orientations, and locations. The locations of all seed items have been surveyed by a professional land surveyor to document their horizontal and vertical positions as well as depth below ground surface. A master tabulated list containing the items, identification numbers, and final orientations and X, Y, and Z locations is maintained and kept confidential by MES.

5.1.2.2 Site Preparation

The GPO test plot site was prepared for seeding by first removing small trees and brush. An aggressive surface clearance was performed to remove pre-existing metallic contacts and to ensure that other metallic contaminants/anomalies are not present which would interfere with the detection of the seed items.

5.1.2.3 Location Surveying

The location of the GPO plot corners and seed items were surveyed by a professional land surveyor to a horizontal accuracy of +/- 1 inch and a vertical accuracy of +/- 2 inches. The location, orientation, and depth of each target was recorded and used for the GPO validation process. Target markings in the GPO grid have been and the grid returned as near as possible to its natural condition.

5.1.2.4 Pre- and Post-Seeding Geophysical Mapping

Prior to and after emplacement of the seed items in the new test plot, geophysical mapping was conducted using EM61-MK2. This survey provided baseline response data, and confirmed the suitability of the GPO site.

5.1.3 Function Check Area

A function check area (FCA) has been constructed near the GPO to allow geophysical and UXO personnel to test sensor functionality and detection. A line of items are buried and their location and depth is made known to field crews so that they can calibrate instruments each day prior to use. Temporary FCAs may also be established in the production areas using standard test items to facilitate operational efficiency.

6.0 GEOPHYSICAL INVESTIGATION PLAN

This chapter provides the geophysical investigation plan for this project.

6.1 UXO Safety

UXO Technicians will conduct visual surveys for surface ordnance prior to the geophysical survey crew entering the areas of investigation. A metal detector will be used to ensure that the survey points are anomaly-free prior to the crew setting monuments or driving stakes. In the event that MEC is encountered, personnel will secure the immediate area, and notify the SUXOS.

6.2 Personnel Qualifications

Geophysical data will be acquired by an experienced two-person crew that is overseen by a qualified site geophysicist. A Geophysical Quality Control Specialist (GeoQCS) will be responsible for the quality control of the geophysical operations. The qualified geophysicist and the GeoQCS will each have a degree in geology, geological engineering, or a closely related field and a minimum of 5 years of directly-related geophysical experience.

6.3 Geophysical Investigation Plan Outline

The following sections detail the geophysical investigation plan to be followed for this project.

6.3.1 Geophysical Mapping Tasks

Geophysical operations will include the following tasks:

- Acquisition of geophysical data at the GPO. This data will be used to validate the proposed DGM procedures, the anomaly selection criteria, and to finalize DQO metrics for the production data.
- Data will be collected in the GPO by each field team prior to production mapping in the same manner as will be used during the field mapping. This data will be used to certify personnel and equipment prior to their collection of production data. The GPO will be maintained throughout the life of the project to allow the testing of new personnel and replaced or repaired equipment.
- Digital geophysical mapping in the Alpha and Bravo MRAs.
- Output of geophysical grid data packages including target maps and target lists.
- Reacquisition of all targeted anomalies using the same instrument that was used for the geophysical mapping.
- Post-intrusive QC checks of selected target locations using the same instrument that was used for the geophysical mapping to confirm removal of the source material.

6.3.2 Geophysical Site Conditions

This section of text describes physical site conditions that may affect the performance of geophysical instruments and/or personnel using these instruments.

6.3.2.1 Past, Current, and Future Uses

Past land uses at the MRSs include use as military field operations training areas, bivouac areas, and ranges. The land is currently not being utilized due to past use for military operations. **Planned future land use within MRS-6 includes mixed commercial and industrial development and McClellan Park system.**

6.3.2.2 Anticipated UXO, Type, Composition, and Quantity

MEC items discovered during previous EE/CA work for MRS-6 are shown on Table 4-2. The MEC density in MRS-6 is expected to be high due to several known ranges in the area.

6.3.2.3 Depth Anticipated

Previous EE/CA results show that over 95% of MEC items are found at the surface or within 2 feet of the surface.

6.3.2.4 Topography

The topography of the site consists primarily of moderately steep to very steep hills. Locally steep topography may preclude the use of digital geophysics in small areas. These areas will be cleared by UXO dig teams using hand-held analog instruments or deemed inaccessible and documented with the concurrence of MES QC personnel.

6.3.2.5 Vegetation

Vegetation at McClellan consists primarily of moderately thick to heavy woods. Vegetation will be cleared of brush smaller than 3 inches in diameter prior to the geophysical mapping.

6.3.2.6 Specific Geologic Conditions

The Bravo MRA is located within the Valley and Ridge province of the Appalachian Highlands. Bedrock beneath the site ranges in age from early Ordovician to Mississippian and includes the Newala and Little Oak Limestones and the Floyd and Athens shale units.

6.3.2.7 Soil Conditions

Major soil associations found at McClellan include Stony Rough Land, the Anniston-Allen-Decatur-Cumberland Association, and the Rarden-Montevallo-Lehew group. Descriptions of each follow:

- Stony Rough Land is comprised of shallow, steep, and stony soils underlain by sandstone, limestone, and Talladega slate. Characterized by stony or rough land, high water runoff, and slopes over 25 percent, this soil association does not lend itself to construction without proper erosion management practices. These soils are generally unsuited to cultivation. Typical uses include woodlands, wildlife management and grazing.
- The Anniston-Allen-Decatur-Cumberland association is found in the northern and west-central portions of the cantonment area. This series is composed of deep, well-drained, level to moderately steep soils in valleys underlain by limestone and shale. The soils range from gravelly loam to silty clay loam. These soils are suitable for cultivation, but depending upon slope, may need careful management to prevent erosion. Cumberland and Decatur soils are dark reddish-brown gravelly loam developed from limestone saprolite source (SAIC, 1995a).
- The Rarden-Montevallo-Lehew group is composed of moderately deep or shallow soils on ridge tops and steep slopes and in local alluvium on foot slopes or in draws. This soil group is found in the northwestern and western portions of the cantonment area. Soils developed from the residuum of shale and fine-grained, micaceous sandstone. These soils are typically reddish-brown to dark gray brown to yellow brown silt loam, clay, or silty clay (SAIC, 1995a).

Soils are generally colluvial or residual in origin. This derivation of soils lends itself to reflecting the parent rock's mineralogy and chemistry. As such, magnetite and other ferrous cementations

from the parent rock can result in localized areas of significant electromagnetic susceptibility and/or a high magnetic background.

6.3.2.8 Shallow Groundwater Condition

Shallow groundwater conditions at this site may exist in creeks/drainages on a localized level, but are not expected to interfere with DGM work.

6.3.2.9 Site Utilities and Other Man-made Features

Subsurface utilities are not expected to be regularly encountered at this site.

6.3.2.10 Site Specific Dynamic Events

There are no known dynamic events associated with the MRS aside from afternoon thunderstorms which are common in the summer months.

6.3.2.11 Accessibility

Remote portions of the site may only be accessible by foot or using All-Terrain Vehicles.

6.3.2.12 Potential Worker Hazards

Potential hazards that may exist onsite are addressed in the Accident Prevention Plan in Appendix C (PWP 2007).

6.3.3 Geophysical Investigation Methods

6.3.3.1 Survey Type

The Geophysics Contractor will collect geophysical data using parallel survey lines spaced no more than 2.5 ft apart using a grid-based geometry.

6.3.3.1.1 Equipment and Navigation and Mapping System

The Geophysical Contractor will conduct geophysical operations at McClellan as a subcontractor to CCMDA and will be directly managed by MES. The Geophysical Contractor will use an EM61-MK2, 1.0 x 0.5 meter coil to collect geophysical data over all accessible portions of each survey area. Due to dense tree canopy, traditional tape and rope methods are anticipated to be the primary method used to provide accurate data positioning. Alternate navigational/positioning techniques may be accepted if proven in the GPO. Survey data will be collected along parallel lines spaced no greater than 2.5 ft apart. The EM61-MK2 will be operated on wheels with the coils oriented with the 1-meter axis perpendicular to line direction. An odometer wheel will trigger instrument readings at 20 cm or less intervals. Marked survey ropes will be placed laterally across each survey grid at 25-ft intervals and will be referenced to grid corner stakes surveyed on 100-ft centers. Alternating colored marks on the ropes will aid the geophysical field teams in the collection of geophysical data in straight-lines and will also identify locations for the placement of fiducial marks within the recorded data. The geophysical and local positional data will be logged and stored in a data logger.

A professional land surveyor will establish 100 ft x 100 ft grid corners over each of the survey areas prior to the start of geophysical mapping. All local coordinates will be referenced to surveyed grid corner stakes and converted to State Plane coordinates during post processing.

6.3.3.1.2 Electromagnetic Sensor

The EM61-MK2 is a high-resolution time domain electromagnetic induction sensor that is capable of detecting both ferrous and non-ferrous metallic objects. In comparison with other metal detectors and magnetometers, it is much better suited for work in close proximity to buildings, vehicles, metal fences, and underground utilities. The EM61-MK2 system typically

consists of two air-cored coils, a digital data recorder, batteries, and processing electronics. The EM61-MK2's transmitter generates a pulsed primary magnetic field, which then induces eddy currents in nearby metallic objects. These eddy currents are measured by the receiver coil. Secondary voltages induced are measured in millivolts (mV) at four separate time gates. The typical arrangement of the receiver coil is such that there is a vertical separation of 40 cm from the ground surface to the coil. At a minimum, geophysical data collected using the EM61-MK2 will be recorded at a rate of no less than one reading every 20 cm in wheel mode.

6.3.3.1.3 Data Processing

Data will be transferred from field data loggers to a field computer to assess data quality and initial editing. Data will then be transferred to The Geophysical Contractor's office for further processing and analysis using Geosoft's Oasis Montaj software.

6.3.3.2 Procedures

The following procedures will be accomplished during each work day of geophysical investigations:

- Morning health and safety brief.
- Equipment setup and warm up.
- Mechanical and electrical setup.
- All equipment will be warmed up for at least 5 minutes before use.
- Mobilize to survey area/grid.
- Morning QC checks and tests
- Acquire morning survey data and QC repeat data for each survey area/grid.
- Download morning survey data with initial QC check and lunch.
- Change batteries as required.
- All equipment will be warmed up for at least 5 minutes before use following lunch.
- Acquire afternoon survey data and QC repeat data for each survey area/grid.
- Afternoon QC checks and tests.
- Survey QC line.
- Download afternoon data with initial QC checks.
- Equipment breakdown and put batteries on chargers.

6.3.3.3 Personnel

Geophysical data will be acquired by an experienced two-person crew that is overseen by a qualified site geophysicist. A GeoQCS will be responsible for the quality control of the geophysical operations. The qualified geophysicist and the GeoQCS will each have a degree in geology, geological engineering, or a closely related field and a minimum of 5 years of directly-related geophysical experience.

6.3.3.4 Production Rates

The proposed work week consists of four 10-hour days. It is estimated that approximately 0.8 acre will be geophysically surveyed per team, per work day. Reacquisition of targeted anomalies has been estimated at the rate of 140 targets per team, per work day. QC of intrusively investigated targets will be performed at a rate dictated by the progress of the dig teams.

6.3.3.5 Data Spatial Density

Sample spacing along-path will be ≤ 20 cm (0.33 ft) in wheel mode. Across-path line spacing will be ≤ 2.5 ft.

6.3.3.6 Instrument Standardization

Geophysical instruments used will be field-tested daily in the FCA, or at temporary FCAs established in the production areas, to ensure that they are operating properly. Instrument standardization will generally follow the guidelines established in DID MR-005-05 Attachment B. If the standard response cannot be attained, the instrument will be re-calibrated, repaired, or replaced. The following procedures will be conducted each day:

- Warm-up time (a minimum of 5 minutes).
- Ensure personnel tests do not exceed 2.5 mV peak to peak in the third time gate or 3.5mV peak to peak in the second time gate, as appropriate.
- Perform cable shake test each time the sensor is assembled, typically in the beginning of each survey day. Monitor sensor signals for shake-induced data spikes. If data spikes are evident, a root cause analysis will be conducted by the geophysical subcontractor. Once the problem has been identified and corrected, the cable shake test will be repeated. Once the problem has been verified to have been corrected, geophysical operations may resume.
- Conduct a static background and static spike test at the beginning and end of each day, during which readings will be collected for 1 to 3 minutes. Evaluate the data from the static test for consistency and repeatability. Perform a standard spike test using a standardized metallic test item (e.g., a 2-inch tow ball or equivalent). This spike test entails the placing of the metallic item in the center of the EM61-MK2 coil using a jig to ensure repeatability. Static background data will not vary more than 2.5 mV peak to peak in the third time-gate or 3.5mV peak to peak in the second time gate, as appropriate, and the response to the known target does not exceed +/- 20 percent after background correction. Note that personnel and cable shake tests will typically be performed during the first minute of the static background test.
- Identify, using a line over at least one test item in the GPO plot, FCA, or temporary FCA, for morning and evening geophysical sensor and positioning system checks. During the initial GPO surveys, this line may be established outside the test plot. The data from this line will be compared to previously collected data over the same line. Sensor response amplitudes do not exceed +/- 20 percent in amplitude and positional accuracies do not exceed +/- 20 cm for each data collection team.

Consistent with the instrument standardization metrics listed above, the DGM teams will generally perform instrument standardization and QC tests at temporary FCAs established in the production areas as follows:

- Static tests will be performed before beginning data collection for the day. The EM61-MK2 operators will identify and mark, to the best of their ability, a location free of subsurface geophysical response in or around the area where data collection is to be performed. They will then collect at least one minute of data in a stationary position, insert a standard response object in the center of the coil (using a jig to standardize the item position) and continue data collection for at least one minute, then remove the object and collect at least an additional minute of data. Performing this test in the field areas offers the added ability to document the local geophysical conditions for the associated adjacent survey grids.
- Latency tests will be performed utilizing the grid corners (control points) that are marked in the field with metal survey nails. A 50-foot length line will be established centered on the control point nails. Before beginning data collection for the day, the team will collect two data profiles along the line in opposite directions ensuring that the odometer wheel is in the “6 o’clock” position at the start of the line. This test will also be repeated at the end of the day, not necessarily using the same grid corners.

6.3.3.7 Data Processing, Correction, and Analysis

6.3.3.7.1 Initial Field Processing

Initial evaluation of digital geophysical data will be performed in the field by the geophysical team using Geonics software for downloading and viewing of profile lines. Data will be reviewed for complete coverage and good data quality. Data will then be exported to an ASCII format to allow contouring and processing. Once the data has been prepared and evaluated to ensure its integrity, it will be electronically transferred to the Geophysics Contractor's office for final processing and QC evaluations.

6.3.3.7.2 Standard Data Analysis

The primary geophysical data processing and interpretation software will be the Geosoft® data processing software with the UX-Detect module. Geophysical data processing will include the following procedures:

- Conversion to State Plane Coordinates.
- Lag corrections.
- Normalization or leveling (removal of background).
- Gridding of data.
- Digital filtering and enhancement.
- Selection of anomaly picks (above an appropriate mV threshold).
- Preparation of geophysical maps, target maps, and target lists.

6.3.3.7.3 Advanced Data Processing

No advanced data processing is anticipated at this time.

6.3.3.7.4 Anomaly Selection and Decision Criteria

The anomaly selection criteria will be established using the mV responses that were previously recorded over the GPO targets as a guide. A target threshold will be selected that maximizes the number of seed items detected while minimizing the number of background and system noise anomalies. Targets will be selected from these maps initially by running the data through Geosoft's UX-Detect module. Each of the anomalies selected by Geosoft as a target will be analyzed by trained geophysicists, and evaluated as to their validity and position. Targets found to be invalid or incorrectly located will be removed or adjusted. Additionally, anomalies that were not selected by the UX-Detect module, yet deemed to represent a potential UXO target, will be manually selected.

The criteria for selecting and locating anomalies for the anomaly (or target) list include the following items:

- The maximum amplitude of the response with respect to local background conditions.
- The lateral extent (width) of the response.
- The three-dimensional shape of the response.
- The location of the response with respect to the edge of the survey area, unsurveyable areas, land features, cultural features, or utilities within or adjacent to the survey area.
- The shape and amplitude of the response with respect to the response of known targets buried in the GPO test plot.
- The shape and amplitude of the response with respect to relevant anomalies encountered in previous MEC removal grids.

There may be areas of very strong and overlapping geophysical responses present in the production areas due to permanent structures, utilities, burial pits/trenches, reinforced concrete,

former impact areas, etc. where it is not appropriate to target individual anomalies and which may require an alternative clearance methodology. These areas will be referred to as saturated response areas (SRAs). This designation is not intended to cover areas of lower amplitude overlapping anomalies (nailbeds and the like) or very strong anomalies of restricted areal extent. Proposed SRA boundaries and justification will be supplied to the GeoQCS and MES for concurrence prior to finalizing the grid target list.

6.3.3.8 Target List Development

The anomalies selected as targets will be exported to a Microsoft Excel file labeled target list. This file will generally conform to the *Geophysical Anomaly Dig Sheet and Target History*, as described in Attachment C of DID MR-005-05. However, the target list will be an in electronic format. Targets will be identified with a unique identification that includes the survey grid ID as part of the ID. Appropriate comments or data flags will be placed on the target lists for targets which appear to be associated with surface metal noted in the grid or with obvious cultural features (structures, utilities, manholes, fence posts, survey nails, etc.) or which may be associated with data artifacts or geologic response. Initial target lists will be sorted by peak amplitude response. Targets which are located in special case areas (SRAs, under pavement, in archeological sites, etc.) will be placed at the bottom of the target lists with the appropriate comments or data flags.

6.3.3.9 Anomaly Reacquisition

Reacquisition will be performed over all targeted anomalies using the EM61-MK2. Targeted x-y locations (in local coordinates relative to each grid) will be read directly from the dig sheet. The field team will then place a PVC pin flag labeled with the unique target ID at the target location. Once all the targets in a grid have been flagged, the EM61-MK2 will be slowly maneuvered over each location in two perpendicular directions, while monitoring the readings for the peak response. The maximum response will be recorded and the flag will be moved to the new location, noting any offset (distance and direction) from the original target.

If multiple distinct peaks are encountered within the search radius, the field team may add daughter targets to the dig list (as *targetID*A, *targetID*B, etc.), placing a labeled pin flag at the peak location of the daughter target and recording the peak amplitude of the anomaly. If distinct targets cannot be discriminated, a boundary (mark out) of the area of elevated response will be marked with spray paint.

The reacquisition team will also locate and mark with spray paint the boundaries of any non-DGM areas (*not* including single **or multiple-tree gaps**) such as unmapped steep slopes, creek beds, SRAs, and archaeological areas.

6.3.3.10 Feed-Back (Comparison of Dig-Sheets with Dig Results)

Following excavation of each anomaly, the UXO contractor will record results of the intrusive investigation (i.e., scrap/ordnance type, actual location, depth, orientation, and condition) on the PDAs. Reviews of dig results will be supervised by the GeoQCS in an effort to better refine target selections and to ensure the appropriateness of the recovered objects.

6.3.3.11 Internal Quality Control

All QC processes and procedures conducted independently, both in the field, and in the Geophysics Contractor's office during the geophysical investigations, will be fully documented and made available upon request. The QC documentation will also be included in the final reporting. While site-specific requirements may dictate site-specific processes and procedures, the following will be adhered to in all investigations:

- All personnel conducting specific QC tasks will have the appropriate training and understanding of their responsibilities. Additionally, these personnel will have the authority to stop work and the organizational freedom to identify, evaluate, initiate, recommend or provide solutions, and approve corrective actions to ensure all work complies with stipulated contractual requirements. The GeoQCS or designee will be responsible for oversight of geophysical quality control checks during fieldwork. A daily log will be maintained by the Geo Team leader(s) that will serve to document any instrument malfunction or other conditions that may adversely affect data quality. Field notes will be recorded during data collection in an effort to identify cultural items and grid specific data, in addition to any other pertinent information, in an effort to aid the off-site geophysical processor. Field notes /logs will be recorded on PDAs where possible. The Geophysical Contractor will be responsible for management and oversight of all QC data associated with post processing and deliverables.
- To assure proper positioning and data integrity (repeatability), 3 percent of all lines collected in a survey area will be repeated. If any significant discrepancies exist in the positioning or repeatability of the data, the problem will be identified and corrected. Following the corrective action, the grid will be resurveyed. Additionally, an experienced geophysicist will carefully evaluate all geophysical data for potential problems including, but not limited to, abnormal data spikes or inconsistent background values. All problems will be documented and resolved.
- A QC test line in the GPO, FCA, or temporary FCA containing seeded ordnance items or standard test items will be collected at the start and end of each day for each geophysical instrument to be operated. This exercise ensures repeatability, positional accuracy, and documents any instrument drift and functionality variations that might have occurred throughout the day. The geophysical profiles will be immediately examined and compared to data collected previously. Should any significant deviations or problems in the geophysical data be recognized, the geophysical subcontractor will immediately notify the PM and conduct a root cause analysis to identify the source of the error. The results of this root cause analysis will be brought to the attention of the PM and any areas that require rework will be discussed immediately.
- Internal QC procedures will be conducted during data processing to ensure data integrity.

A detailed description of the Contractor QC program is included in Section 10.

6.3.3.12 Corrective Measures

If any significant discrepancies exist in the positioning or repeatability of the data, the problem will be identified, resolved, and documented.

6.3.3.13 Records Management

The Geophysics Contractor will track and account for each data file from acquisition through delivery and final reporting. All raw and processed survey data will be archived daily on the Geophysics Contractor's server and backed up on a regular basis

6.3.3.14 Interim Reporting

The Geophysics Contractor will report status of geophysical mapping to the project manager in sufficient time for inclusion in the weekly progress report.

6.3.3.15 Map Format

All delivered maps will conform to the format specified in DID MR-005-05.

6.3.4 Geophysical Investigation Performance Goals

The following three sections describe the performance goals of the geophysical investigation.

6.3.4.1 MEC Detection

The depth of detection for MEC items will be in accordance with Table 10-2 found in Section 10.

6.3.4.2 Horizontal Accuracy

Horizontal accuracy is discussed in the Quality Control Plan presented in Section 10.

6.3.4.3 False Positives

The false positive rate is expected to be less than 15 percent. Unique geologic conditions at the site, described earlier, may result in real, repeatable geophysical response to non-metallic objects. While not truly "false positives" every effort will be made to eliminate targets that do not correspond to subsurface metallic objects. If there are more than 15 percent false positives (calculated as a running average for a sector), a re-evaluation of the data and detection methods will be performed. Any and all corrective action(s) will be documented in daily QC logs.

6.3.5 Geophysical Mapping Data

The following sections describe the management of the geophysical mapping data.

6.3.5.1 Geophysical Data and Map Packages

After collection, the geophysical field data shall be provided in delineated fields as x, y, z, v(1), v(2), etc., for delivery upon request. After completion of survey and processing activities, all final geophysical maps, dig-sheets, and supporting geophysical interpretations shall be produced for delivery and posted to the project ftp site. Anomaly dig sheets in Microsoft Excel format generally following the format specified in DID MR-005-05. Maps that display the geophysical anomalies and identified physical features shall be delivered in both a .jpg **or pdf** and a spatially referenced format - either in a Geosoft packed .map format or an ESRI ArcView (8.x) ArcView Tiff format as appropriate.

6.3.5.2 Geophysical Target Lists for Reacquisition

The Geophysics Contractor will provide grid target maps and anomaly dig sheets in electronic format on PDAs for the reacquisition teams generally following the format specified in DID MR-005-05. These will include any additional targets specified during QA/QC review and any relevant comments associated with the targets. Final dig list data will be uploaded to the project database and QC'd.

6.3.5.3 Anomaly Reacquisition and Marking

Information collected during reacquisition (peak mV response and offset, daughter anomalies) will be added to the dig sheets. The reacquisition data will be uploaded to the project database and QC'd.

7.0 GEOSPATIAL INFORMATION AND ELECTRONIC SUBMITTALS

Procedures for handling geospatial information and electronic submittals are contained in Chapter 7 of the PWP (2007).

8.0 WORK, DATA, AND COST MANAGEMENT PLAN

This chapter describes how work and data will be managed and costs controlled.

8.1 Project Management Approach

MES has evaluated the work requirements for this MEC remediation and has developed a comprehensive approach for meeting the project objectives. MES's project management procedures are designed to effectively execute multitask projects using multiple contractors that are able to continually demonstrate quality workmanship with adherence to cost and schedule.

MES and CCMDA has identified multiple subcontractors and established master service agreements. As projects and tasks are identified, the McClellan project management team will divide these tasks into manageable portions and select one or multiple subcontractors to provide a cost and schedule for issuing a task ordering agreement, where fixed unit pricing and production rates are stipulated. Separate work authorization letters will be issued to subcontractors for work at MRS-6 as it is sequenced into the program.

8.2 Schedule

A boundary survey of MRS-6 will be performed in September 2008. Field work is anticipated to begin in October 2008 and be substantially completed in December 2009.

8.3 Recurring Deliverables

Subcontractors will provide MES monthly project status reports with their invoices. These reports will contain quality control, production and safety information along with projected work for the next month. These reports are consolidated and discussed biweekly during quality control conference calls with ADEM, CCMDA and other critical team members, as necessary, to discuss work progress and facilitate necessary work plan modifications.

9.0 PROPERTY MANAGEMENT PLAN

NOT REQUIRED.

10.0 QUALITY CONTROL

This section addresses the QC methods and procedures associated with MEC removal operations at McClellan. The overarching goals of the QC Program are to ensure that:

- Data are of known and documented quality and suitable for their intended use.
- Data collection meets the stated requirements.

Ultimately, the benefit of adherence to the quality program will be an enhanced accountability and public confidence in the MEC remediation. The MEC QC program meets the spirit and intent of the Uniform Federal Policy for Implementing Environmental Quality Systems, (EPA/DoD/DOE, 2005).

10.1 Introduction

This section establishes procedures that ensure all work meets or exceeds the project specifications and conforms to the contract requirements and applicable regulations. Specifically, this QC section:

- Identifies QC objectives and procedures for specific project elements.
- Identifies the project QC organization, defines authorities, responsibilities, and qualifications.
- Defines project communication, documentation, and record-keeping procedures.
- Describes a continuous inspection program to examine the quality of materials, maintain standards of workmanship, identify and correct deficiencies, and provide finished products that meet or exceed contract requirements.
- Describes procedures for the management of deficiencies, nonconforming conditions, and FCRs.
- Defines procedures for project submittals and/or recordkeeping.

10.2 Project Organization

The following paragraphs describe the entire organizational structure of the MES Quality Management Team and their responsibilities during operations at McClellan. Project personnel contact numbers and organizational charts for each Contractor are presented (by task) in Appendix B (PWP 2007). See Table 2-1 for the general project organization.

10.2.1 Program Manager

The Program Manager (PgM) will monitor planning, performance, and safety compliance and will serve as the primary point of contact on all programmatic matters during the project planning, execution, and post-execution phases. The PgM is responsible for the following:

- Responds to CCMDA and ADEM requirements and ensures that the required QC elements are addressed.
- Reviews and approves the Programmatic and Site-Specific Work Plans.
- Provides resources and oversees project management of the funding, personnel, and equipment necessary to safely conduct McClellan removal action operations.
- Maintains liaison with MES SHSM to ensure proper attention is focused on safety and health matters related to conducting MEC removal operations.

10.2.2 Project Manager

The Project Manager (PM) will be responsible for the following:

- Manages overall contract conformance to CCMDA requirements and specifications, with respect to technical, cost, and schedule issues.
- Reviews all required submittals.
- Allocates sufficient and appropriate resources to ensure successful completion of the scope of work.
- Manages all field activities including directing project staff and contractors in accordance with the Contract requirements.
- Tracks proposed changes to the project requirements.
- Communicates directly with Contractors regarding project execution and accountability.
- Coordinates with the MES Operations Manager, UXO Quality Control Specialist (UXOQCS) and GeoQCS to ensure compliance with standard protocols and procedures and implementation of all project plans.
- Coordinates with the SHSM and MES Operations Manager to ensure implementation of the SSHP.
- Resolves project quality issues.
- Procures equipment, materials, and supplies necessary for project performance.

10.2.3 Site Operations Manager

The Site Operations Manager will report directly to the PM. The Site Operations Manager will coordinate QC operations with the Project Manager. The Site Operations Manager duties include oversight of the following:

- Ensures compliance with the PWP and SSWP.
- Schedule task assignments and contractor personnel.
- Provide oversight to contractor data collection and reporting efforts.
- Performs oversight of project data.
- Ensures there are no deviations from SOPs or the scope of work.
- Documents and maintains MES personnel qualification and training.
- Ensures contractors perform their assigned tasks.
- Acts as primary spokesperson on QC matters when interfacing with external organizations/agencies.
- Coordinates with the SHSM to ensure the quality and safety of all field activities.

10.2.4 UXO Quality Control Specialist

The UXOQCS reports directly to the Site Operations Manager on matters pertaining to QC. The UXOQCS has the authority to act independently of the Site Operations Manager in all QC matters. The UXOQCS and QC staff have the authority to stop work if operations are found to be out of compliance with contract requirements and/or specifications. UXOQCS duties include oversight of the following:

- Supervisor over all QC personnel and procedures.
- Ensures quality compliance with contract plans and specifications as defined in this Work Plan.
- Ensures there are no deviations from SOPs or the scope or work.
- Ensures QC oversight of project plans.
- Ensures QC oversight of project data.
- Tracks and maintains corrective actions until they are resolved.
- Ensures contractors perform their assigned tasks.
- Conducts and documents daily QC inspections utilizing the 3 phase inspection of quality control.

10.2.5 Geophysics Contractor

The Geophysics Contractor will provide geophysical mapping, anomaly reacquisition, geophysical QC, and data and GIS support (see Section 6).

10.2.5.1 Geophysics Program Manager

The Geophysics PgM is responsible for the following:

- Responds to MES, CCMDA, and ADEM requirements and ensures that the required QC elements are addressed in the PWP and SSWP.
- Reviews and approves the PWP and SSWP.
- Provides resources and oversees project management of the funding, personnel, and equipment necessary to safely conduct McClellan geophysics and data support for the MEC removal action operations.
- Maintains liaison with MES to ensure proper attention is focused on safety and health matters.

10.2.5.2 Geophysics Project Manager

The Geophysics PM will be responsible for the following:

- Manages overall contract conformance to CCMDA requirements and specifications, with respect to technical, cost, and schedule issues.
- Reviews all required submittals.
- Allocates sufficient and appropriate resources to ensure successful completion of the scope of work.
- Manages all field activities including directing project staff and contractors in accordance with the Contract requirements.
- Tracks proposed changes to the project requirements.
- Communicates directly with MES regarding project execution and accountability.
- Coordinates with the MES Operations Manager, UXOQCS, GeoQCS and Geophysics Site Manager to ensure compliance with standard protocols and procedures and implementation of all project plans.
- Coordinates with the field team to ensure implementation of the SSHP.
- Resolves project quality issues.
- Procures equipment, materials, and supplies necessary for project performance.

10.2.5.3 Geophysics Quality Control Specialist

The Geophysics Quality Control Specialist (GeoQCS) reports directly to the Geophysics Program Manager. The GeoQCS has the authority to act independently of the Geophysics Program Manager in all geophysical QC matters. The GeoQCS and QC staff has the authority to stop geophysical work if operations are found to be out of compliance with contract requirements and/or specifications. The GeoQCS or his/her designated assistant will be on-site during the initial startup of the project and as required thereafter to ensure that operations are in accordance with project plans and specifications. The GeoQCS has stop-work authority and is responsible for the following:

- Ensures quality compliance with the geophysical aspects of the WP.
- Ensures project compliance with the work plan – paying particular attention to the technical aspects.
- Performs QC oversight of project plans.
- Performs QC oversight of project data.
- Performs QC oversight of the project database and GIS.

- Ensures there are no deviations from SOPs or the scope or work.
- Ensures the geophysical contractor performs their assigned tasks in accordance with the Work Plan and SOPs.
- Approves geophysical corrective actions to ensure all work complies with stipulated contractual requirements.
- Conducts and documents QC inspections both on- and off-site.

10.2.5.4 Geophysics Site Manager

The Geophysics Site Manager will be responsible for overall project day-to-day operation of geophysical operations and logistics in the field. He/she has overall stop-work authority and duties include:

- Working with the MES PM, MES Operations Manager, and the Geophysics Project Manager to plan day-to-day site activities.
- Allocating and scheduling Geo teams.
- Coordinating daily GIS and data support for the Geo teams and UXO teams.
- Serving as a resource for the Geophysics PM.
- Maintaining daily contact with MES QA personnel.
- Providing project status meetings locally at the request of CCMDA/MES.
- Developing project plans, reports and associated documentation.

10.2.5.5 Database Manager

The Geophysics Database manager will be responsible for overall project day-to-day geophysical data management and operation of the on-site GIS. His duties include:

- Maintaining the geophysical database and database.
- Ensuring all data is entered/uploaded to the project database and GIS.
- Supporting and synchronizing the Geo and UXO team PDAs.
- Developing project data reports, maps, and associated documentation.
- Producing GIS and data status maps and reports.

10.2.6 Contractors

All contractors will report to the MES Site Management Team and will provide all personnel, equipment, and materials required for their assigned tasks. Although it is expected that contractors ensure the quality of their own work, the Site Management Team will be responsible for site supervision, inspection, and approval of all contracted work. All contractors shall agree to adhere to the procedures identified in the project plans and to follow the procedures and QC protocols designated therein.

10.2.6.1 GIS Contractor

The Geophysics Contractor will provide GIS and data management services both on and off site (see Section 7).

10.2.6.2 Scrap Metal Removal Contractor

MEC-related scrap will be sorted and disposed of by trained UXO personnel. A local Recycling contractor will be responsible for the demilitarization and recycling of MEC, scrap metal, and hard targets.

10.2.6.3 Vegetation Removal Contractor

The Brush Cutting and Grubbing Contractor, will provide vegetation removal as necessary.

10.2.6.4 Land Surveying Contractor

An Alabama licensed professional land surveyor(s), will provide land surveying services.

10.3 Personnel Qualifications and Training

Project staff shall be qualified to perform their assigned jobs. This will be accomplished by establishing and enforcing minimum qualification requirements for key positions, verifying initial and continued proficiency, and implementing a formal training program. Personnel training requirements are presented in the following paragraphs.

10.3.1 Project Personnel Training

Minimum qualification requirements for key positions on this project have been established through the review of contractual and other project-related requirements as well as use of DID OE-025.02 as a general guide. Project personnel will not be assigned to a position or job for which they do not meet the minimum qualifications. If additional assignments are made on this project, the qualifications of the assigned personnel will be evaluated and documented as prescribed herein.

Senior technical staff shall provide on-the-job training to newly assigned technical staff related to their job requirements and techniques and with particular emphasis on problem prevention. Prior to conducting operations, all personnel will sign the Work Plan Signoff Sheet (Appendix D, PWP 2007). Work performed by newly assigned staff will be monitored by the senior staff. The frequency of the monitoring will depend on the individual's demonstrated proficiency to perform assigned duties.

On-site training at McClellan will include such topics as (but not limited to) work plan review, unique site-specific safety hazards, first aid, operation of communication equipment, and the types of ordnance expected to be found at McClellan.

The Site Operations Manager will maintain records of site-specific and routine training for MES personnel and will monitor certification expiration dates to provide advance warning to the Project Manager as to when employees will require refresher training or other requirements (i.e., physical). All contractor site personnel records and training will be located in an on-site file and will be documented on a qualification/training log that will be completed at the beginning of the project and will be updated and maintained by the contractor UXOSO and GeoQCS, as appropriate.

10.3.1.1 Geophysical Team Training and Certification

A QC test grid that has geologic and topographic characteristics similar to the areas to be geophysically investigated will be installed at McClellan. This GPO will be used to test each geophysical team as a unit (equipment and operators) to ensure that proper equipment operation and survey techniques are employed and that each team is capable of achieving the required performance standards with their assigned equipment. Determination of the adequacy of the level of training of assigned staff is the responsibility of the Geophysics Program Manager and GeoQCS. For a full description of the GPO process see Section 10.7.3.1.2 below.

10.3.1.2 UXO Team Member Training and Certification

A portion of the GPO test grid described above may be used to test UXO personnel to ensure that proper search techniques are utilized and that each person is capable of achieving the required performance standards with their assigned equipment. Determination of the adequacy of the level of training of assigned staff is the responsibility of the Site Operations Manager and UXOQCS. For a full description of the GPO process see section 10.7.3.1.2 below.

10.3.1.3 Data Management Personnel Training

All project personnel involved in data entry, data management, or data QC shall be trained for the specific activities for which they are responsible. Determination of the adequacy of the level of training of assigned staff is the responsibility of the Geophysics Project Manager and GeoQCS for geophysics personnel and the Site Operations Manager and UXOQCS for UXO personnel.

10.3.1.4 Entire Process Hands-On Training

At the startup of operations, and as needed as new personnel are integrated, all personnel associated with the collection and recording of DGM, reacquisition, or dig results data will go through a hands-on training session. All geophysical, UXO, and QC personnel involved with data management will participate in these hands-on training and practice sessions where the data collection, data flow process, and data recording procedures will be walked through. For DGM personnel, this will include the collection of a sample geophysical data set, and recording of data collection notes and completion of data collection forms on the PDAs. Reacquisition teams will reacquire a target data set and record the reacquisition data on their PDAs. UXO dig team personnel will undergo a hands-on training including grid geophysical map interpretation and PDA familiarization, operations, and dig results data entry.

10.3.1.5 New Personnel/Equipment

Throughout the project duration, new personnel and/or equipment may be assigned to either the geophysical or UXO team(s). Prior to team integration, new personnel and/or equipment require certification via GPO testing before integration into team operation. New personnel will not be allowed to commence operations until the GPO data have been reviewed and approved by MES QC personnel. Previously certified personnel may be rotated to different teams without recertification.

10.3.2 Contractor Qualifications

The Project Manager is ultimately responsible for verifying that employees and contractors possess the required qualifications prior to procurement. The QC staff is responsible for verifying contractor compliance with this SSWP and SOPs.

10.3.3 Health and Safety Training

Health and safety training requirements for on-site project personnel have been established in accordance with Federal and state requirements, Occupational Safety and Health Administration (OSHA) requirements for hazardous site workers (29 CFR 1910.120), and MES policies and procedures as specified in the Health and Safety section of the PWP (2007). At a minimum, any site worker or visitor who may encounter hazardous wastes shall have completed the OSHA Hazardous Material Site Worker Training (40-hour initial training and 8-hour annual refresher). Site Supervisors must have completed the OSHA Hazardous Material Site Worker Training and 8-hour Supervisor Training. The 40-hour OSHA training may be waived for infrequent site visitors at the discretion of the project SHSM. A minimum of two field office staff and one member of each survey/investigation team shall have first aid/cardiopulmonary resuscitation (CPR) training. McClellan-specific safety training will be conducted on-site for all personnel working on UXO-related activities. Daily safety briefings (morning tailgate meetings) will be conducted and are described in the accident prevention plan (APP) in Appendix C.

10.3.4 Documentation

Contractor personnel qualifications are to be maintained on-site by the contractor UXOSO along with copies of all pertinent training certificates. This information will be available for periodic review by the MES Site Operations Manager or designee.

10.4 Definable Features of Work

The overall project objective of this project includes a number of specific activities that are considered the definable features of work for the project. The Definable Features of Work are listed in Table 10-3 with the associated inspection points and QC actions.

10.5 Data Quality Objectives

DQOs for this project focus on specific elements of the geophysical survey and the intrusive investigation. The following is a list of the DQOs:

- Survey/positional accuracy – Equipment Performance Criteria
  - Due to canopy cover, conventional survey methods (total station) will be used to survey in grid corners/boundaries. Accuracy of these systems shall be within +/- 1 inch (survey grade).
- Geophysical Equipment Performance Criteria
  - Target Detection System. The geophysical contractor must find 95% of all seed items in the GPO test grid in order to certify equipment and personnel as having successfully passed the GPO.
  - Target Positional Accuracy. The geophysical contractor must be able to accurately locate and position an anomaly within a critical radius (Rcrit) of 2.5 ft.
  - **The geophysical contractor will detect and target all blind seed items.**
- **DGM Spatial Density**
  - **The geophysical contractor must be able to achieve an along track sample density of at least 20cm and an across track spatial density of 2.5 feet for DGM, excepting obstacles.**
- UXO Aggressive Surface/Near Surface Clearance Team Performance Criteria
  - Target Detection System. Each UXO surface clearance team must perform a daily instrument functional check at the FCA to verify that the instruments are working properly.
- **1-Foot Mag and Dig Clearance Performance Criteria**
  - **Target Detection System. The UXO contractor must certify equipment and personnel instruments to find 95% of all 1-foot or less seed items in the GPO.**
  - **The contractor will find all blind seed items.**
- Geophysical Data Integrity
  - Daily functional checks of the geophysical instruments must be within tolerances described in Section 6.3.3.6 **unless it is documented that this requirement cannot be met due to outside interference such as EM noise generated by powerlines**.
  - Continuous recording of geophysical data (i.e., no unexplained instrument data gaps).
  - Continuous recording of positional data (i.e., no unexplained positional data gaps).
- Operational Verification of Equipment
  - All hand-held detectors and data collection and positioning systems will perform daily performance checks in accordance with SOPs or manufacturer's specifications at the FCA.
- Intrusive Investigation
  - Field inspection and interrogation of a pre-determined number of targets with an EM61-MK2 within each Unit of Production (UoP), after all the targets in the UoP have been excavated, will be performed to verify that all anomaly locations have been intrusively investigated and properly cleared by the UXO teams. The percentages listed in Table 10-4 will be the minimum criteria used.
  - **The contractor will find all blind seed items.**

  - 100% QC reacquisition and EM61-MK2 interrogation will be performed on all no-find locations.
- Ordnance Identification
  - Positively identify 100% of MEC items as to type, fuze, condition, and filler based on knowledge/training/reference material.
  - The UXOQCS will verify the identification of 100% of all MEC items.
- Geophysical Data Processing
  - As UoPs are completed, a minimum of one grid out of each UoP will be reprocessed by the QC staff to produce a target map of anomalies and their coordinates. These QC targets will be compared with the geophysical contractor's targets. Discrepancies will be investigated and a root cause analysis will be conducted to find the extent of the potential problem (see Section 10.7.3.3 – QC Step III).
- Geophysical Confirmation Remapping
  - At the discretion of CCMDA/MES, approximately 10-30% of areas that have been geophysically surveyed and excavated will be remapped. Specific areas and percentages to be remapped will depend upon target density and whether MEC was present. Should discrepancies (i.e., additional targets) exist, the QC Team (the GeoQCS, UXOQCS, or their designees) will conduct a root cause analysis to find the extent of the potential problem and recommend corrective action.
- Database Management
  - Daily geophysical/positional data will be collected and stored in a data logger and subsequently downloaded to a personal computer. All geophysical data will be backed up daily and a copy transferred off-site for storage in accordance with the geophysical contractors' standard data protocols. MEC identification and intrusive investigation data will also be digitally recorded and backed up.

The DQOs for clearance depth are shown in Table 10-1 below.

Table 10-1. MEC Clearance Depths

Munition	Clearance Depth Range
Mk II Hand Grenade	0 – 14 in.
37mm Projectile	0 – 14 in.
M9 Rifle Grenade	0 – 18 in.
2.36-in. Rocket	0 – 24 in.
3.5-in. Rocket	0 – 24 in.
75mm Projectile	0 – 30 in.
3-in. Stokes Mortar	0 – 32 in.
60mm Mortar Projectile	0 – 24 in.
81mm Mortar Projectile	0 – 30 in.
3.8-in. Projectile Shrapnel	0 – 24 in
4.2-in. Mortar Projectile	0 – 36 in.
105mm Projectile	0 – 36 in.
155mm Projectile	0 – 48 in.
AT Mine	0 – 6 in.

10.6 Equipment Calibration/Maintenance Requirements

Equipment will be inspected and calibrated (if required) according to manufacturer's requirements prior to field use. Field equipment calibration will be documented and records kept on-site by the UXOQCS or GeoQCS, as appropriate. All equipment inspections and

calibrations will be conducted by persons with specific training and experience in the operation of that equipment. Calibration will not be performed for instrumentation which is calibrated by the manufacturer and is not intended for manual calibration in the field. Equipment found to be inoperable, damaged, or out-of-calibration shall be tagged, segregated, and not used until the discrepancy has been corrected and the acceptable condition of the equipment is verified by a member of the QC staff. A copy of the instrument manuals will be located on-site.

10.7 Inspections and Communication

The QC staff is responsible for verifying compliance with this QC section through the implementation of the three phases of control. This phased QC process ensures that all project activities comply with approved plans and procedures. The specific QC monitoring requirements for each Definable Feature of Work (DFW) are described in Table 10.3. This section specifies the minimum requirements that must be met and to what extent QC monitoring shall be conducted by the QC Staff. Although QC inspections of DFWs will be conducted by the QC staff, the main focus of QC inspections and audits will be on geophysical and intrusive operations as they relate to UoPs.

10.7.1 Three Phases of Control

The QC staff will implement the three-phase control process for specific DFWs (Table 10-3). Due to the importance of the geophysical and intrusive operations QC check sheets will be used by the QC Team to audit these operations that are specific to each DFW (see below). Execution of each phase of control is critical to ensure quality performance; however, the preparatory and initial inspections are of particular value in the identification and prevention of discrepancies before they become problematic. Production work will not be performed on specified DFWs until a successful preparatory and initial phase inspection has been completed and documented.

10.7.2 Units of Production

A UoP is a contiguous number of grids that are grouped together into a manageable unit that can then be tested by the QC process. The size of a UoP will be variable and may depend on a variety of factors such as the number of targets in the area (target density), end land use, environmental characteristics including topography, vegetation, noise, personnel, detection instrument used, area investigated by which UXO team(s), etc. It is preferable for QC that, where practical, distinct teams should be associated with each UoP. It is anticipated that a UoP will consist of two to ten-grids that are 100 ft x 100 ft in size (except for partial grids).

The UoPs will initially be grouped together based on their location to one another with the overriding factor being their end land use. However, this initial grouping may be modified as other factors described above and the number of targets in each grid (and surrounding grids) may override the initial “best guess” as to how to group the grids together. Therefore, final UoP grouping will be done by the Project Manager and GeoQCS only after the end land use and the number of targets in the entire area is known. **The initial UoPs for MRS-6 are shown in Figure 10-1 (Appendix A).** Changes to the initial UoPs and their rationale will be documented in Removal Action Report.

10.7.3 UoP Certification Process

10.7.3.1 QC Step 1, (FCA, GPO, Preparatory & Initial QC Inspection)

10.7.3.1.1 Functional Check Area (FCA)

The purpose of the FCA is its use as the place where the UXO and geophysical teams perform their daily function checks of their analog detectors and the EM61-MK2s prior to commencing

field operations (Section 10.6). The FCA is also used to for practical demonstration of detection thresholds for buried seed items. The FCA will be constructed in close proximity to the field office or adjacent to the area of investigation. The FCA will be comprised of approximately five to ten inert items, each placed at a depth not to exceed that listed in Table 10-1. If inert items are not available, then substitute items such as cut pipe/rebar that have a mV response similar to items of interest will be used instead. Temporary FCAs may also be established in the productions area using standard test items, at the discretion of MES, in order to increase operational efficiencies and reduce congestion at the FCA.

10.7.3.1.2 Geophysical Prove-Out

Each geophysical and UXO team will be tested through a GPO prior to commencing field operations. The GPO is discussed in more detail in Section 5. The purpose of the GPO is to demonstrate and document the site-specific capabilities of the proposed survey platform, sensors, navigation equipment, data analysis, data management and associated equipment and personnel to operate as an integrated system capable of meeting DQOs specific to that team.

The GPO will test and validate the following capabilities of the geophysical detection system process:

- Geophysical team data collection capabilities.
- Transfer and post processing of data.
- Target sheet development (target selection and location).
- Target re-acquisition.

The GPO will test and validate the following capabilities of the UXO team:

- UXO team member's ability to successfully operate the equipment.
- UXO team member's ability to successfully locate items of interest in the GPO.

The anticipated tasks to be performed during the project include DGM and intrusive investigations to remove surface and subsurface MEC hazards at the site. As such, a GPO test has been designed and constructed to reflect the field conditions and survey geometry that will be utilized. The GPO test site is not envisioned as an unchanging entity. The GPO test plot may be changed or augmented, or additional test plots constructed, in order to better evaluate the performance of geophysical equipment and methodologies reflective of the encountered site conditions, MEC items, or burial depths.

The type of seed items and depth of burial were determined by previous investigation of the Alpha and Bravo Areas, as documented in the Final EE/CA Alpha Area of the Redevelopment Fort McClellan, Alabama (TTFW, September 2003) and Draft EE/CA Bravo Area of the Redevelopment Fort McClellan, Alabama (TTFW, December 2004). Information provided in the TTFW Final Alpha Area EE/CA Report (September 2003) and Draft Bravo EE/CA Report (December 2004) includes the recovery depths of various MEC items found during the EE/CA investigations. This site-specific data has been used to establish the depths of seed items to be placed in the GPO (Table 10-2).

Table 10-2. GPO Construction Information

Munition	Expected Typical Maximum Detection Depths[a]	EE/CA Investigation Alpha and Bravo areas Maximum Recovery Depths[b]	Proposed GPO Depth Range
Mk II Hand Grenade	24 in.	6 in.	0 – 14 in.
37mm Projectile	15.6 in.	5 in.	0 – 14 in.
M9 Rifle Grenade	24 in.	2 in.	0 – 18 in.
2.36-in. Rocket	26.4 in.	18 in.	0 – 24 in.
3.5-in. Rocket	38.4 in.	2 in.	0 – 24 in.
75mm Projectile	32.4 in.	20 in.	0 – 30 in.
3-in. Stokes Mortar	33 in.	24 in.	0 – 32 in.
60mm Mortar Projectile	26.4 in.	14 in.	0 – 24 in.
81mm Mortar Projectile	34.8 in.	21 in.	0 – 30 in.
3.8-in. Projectile Shrapnel	41.8 in.	15 in.	0 – 24 in
4.2-in. Mortar Projectile	46.8 in.	0 in.	0 – 36 in.
105mm Projectile	45.6 in.	N/A	0 – 36 in.
155mm Projectile	67.2 in.	N/A	0 – 48 in.
AT Mine	N/A	N/A	0 – 6 in.

Legend
[a]Typical expected maximum detection depth for geophysical instrumentation is a theoretical value based on **EM 1110-1-4009 (USACE, 2007).** The empirical formula used to derive the maximum detection depth is *log*(d) = 1.002 *log* (dia) – 1.961, where d=the actual depth to the top of buried MEC (in meters) and dia=the diameter of the minor axis of MEC (in mm). For items that are not specifically listed in the USACE table, detection depths are estimated based on 11 X their diameter (as referenced in EM 1110-1-4009).
[b]Recovery depths from the Final Alpha Area EE/CA Report (TTFW, 2003) and Final Bravo Area EE/CA Report (TTFW, 2004).

Grid corner survey control points for the GPO test plot were established by an Alabama licensed professional land surveyor. The locations of all seed items have been surveyed by a professional land surveyor at the time of burial to document their horizontal and vertical positions as well as depth below ground surface. The southwest grid corner has been designated as the origin point (0, 0) for a local coordinate system in feet, and the local coordinates for all buried items calculated and tabulated. Due to dense canopy cover in the McClellan MRSs, GPS instrumentation is generally not usable; and it is anticipated that GPO data will generally be collected and positioned using standard tape measure, cone, and fiducial methodologies. Alternate positioning systems, such as robotic total stations, may also be used provided that they can demonstrate acceptable data quality at the GPO.

The Geophysical Contractor will perform equipment detection and positioning tests (i.e., wheel mode and fiducials) at the FCA over known target items, location, and site conditions prior to first entering the GPO to assist in developing an initial mV threshold for targeting items in the GPO. The GeoQCS will process one geophysical team at a time through the GPO test plot.

The detection performance assessment for the geophysical detection system process will be evaluated based on the geophysical survey contractor's ability to accurately detect at least 95 percent of the targets in two dimensions (x, y), within a Critical Radius (Rcrit) of 2.5 ft.

Each geophysical mapping team will be evaluated based on the following criteria:

- If a targeted anomaly position is greater than 2.5 ft from the ground truth location of the target, that target will be recorded as a "no-go." Ninety-five percent of the ground truth targets must be "go" to pass.
- If a team fails to achieve the minimum requirement, retraining may be necessary, and the geophysical team may be allowed to retake the GPO.

- No-finds or false-positives will be recorded, but will not be part of the scoring procedure.
- Only those targets that lie within in the GPO grid will be scored or become part of the evaluation process.
- Anomalies that may be present, but were not seeded in the GPO grid by the QC staff, will not be part of the scoring process.
- The team will successfully enter and document the survey collection and data acquisition parameters on the team's PDA.
- A GPO report will be generated that will contain the following information:
- As-built drawing of the GPO plot.
- Pictures of the seed items during GPO installation.
- Summary of each team's procedures and GPO results (including geophysical maps and target lists).

Each geophysical reacquisition team will be evaluated based on the following criteria:

- If a reacquired anomaly target position is greater than 2.5 ft from the ground truth location of the target, that target will be recorded as a "no-go." Ninety-five percent of the ground truth targets must be "go" to pass.
- Targeting and re-acquisition parameters (anomaly strength, location, daughter targets) will be successfully documented using the team PDAs.
- If a team fails to achieve the minimum requirement, retraining may be necessary, and the geophysical team may be allowed to retake the GPO.
- **At the start of the project, reacquisition demonstrations and certifications will be done in the GPO. As the project progresses, GeoQCS may elect to certify reacquisition teams in the field area rather than the GPO. Repeated use of the GPO for reacquisition demonstrations using actual field techniques (placement of pin flags and spray paint) will eventually degrade the validity of GPO demonstrations. In addition, reacquisition in the field areas is often significantly more challenging than the relatively discrete target locations in the GPO and may provide a better assessment of the skill and qualifications of the field team. GeoQCS will communicate with MES for concurrence before certifying a reacquisition team in the field.**

Geophysical mapping operations may commence "at risk" in advance of the GPO report, pending approval of the GPO results by MES, CCMDA and ADEM. Intrusive findings will be continually reviewed by the GeoQCS during the duration of the project to verify that the depth of seed placement (in the GPO or blind seed items) as well as target mV thresholds are representative of site conditions. The GPO Report is not a static document - it will be updated or amended periodically as new information or results are added to it.

10.7.3.1.3 Preparatory Phase Inspection

The Preparatory Phase of the geophysical QC inspection checklist will be used during the pre-operational training step of project geophysical operations and will be performed by the QC Team. This QC checklist will be used by the GeoQCS (or designee) to document that all pre-operational actions (delineated in the geophysical investigative section of the work plan) have been met and that each field team is properly prepared to conduct geophysical operations. Punch list items of deficiencies will be documented on the checklist and reported to the MES PM and geophysical contractor for immediate attention. Completed QC checklists and QC surveillances will be uploaded onto the FTP site on a regular basis. Note that these inspection checklists may be customized to fit a specific feature of work and/or site conditions.

Work plans and operating procedures will be reviewed by the MES PM to ensure they describe pre-qualifying requirements or conditions, equipment and materials, appropriate sequence, methodology, and QC provisions. The QC staff will verify the following:

- All plans and submittals have been prepared and approved, and are available to field personnel.
- Appropriate field equipment is available, functional, and properly calibrated.
- Responsibilities have been assigned and communicated.
- The job hazards in Appendix C, Accident Prevention Plan (PWP 2007), have been communicated and the necessary safety measures are in place.
- Field personnel have the necessary knowledge, expertise, and information to perform their duties.
- Field personnel have demonstrated acceptable performance in the GPO, if required, prior to starting in the production areas.
- Arrangements for support services have been made and the prerequisite site work has been completed.
- Discrepancies between existing conditions and approved plans/procedures will be resolved and corrective actions taken for unsatisfactory and nonconforming conditions identified during the preparatory phase inspection. This will be verified by the PM, prior to granting approval for work to commence. Preparatory phase inspection results will be documented in the preparatory inspection checklist and/or summarized in a Daily Quality Control Report/Contractor Production Report.

10.7.3.1.4 Initial Phase Inspection

An initial phase inspection will be performed by the QC Team the first time selected DFWs are performed. This inspection will:

- Check the preliminary work for compliance with procedures and contract specifications.
- Verify inspection and testing.
- Establish the acceptable level of workmanship.
- Check and upgrade safety compliance.
- Review the Preparatory Phase inspection to ensure that any required changes have been incorporated into site activities.
- Check for omissions and resolve differences in interpretation.
- The MES PM and QC staff will ensure discrepancies between site practices and approved specifications that have been identified are resolved before granting approval to proceed. The initial phase inspection results will be documented in the Initial Inspection Checklist and summarized in the Daily Quality Control Report/Contractor Production Report.

10.7.3.2 QC Step 2, Follow-up QC Inspection

Follow-up QC inspections and/or surveillance will be performed on specific DFWs periodically during operations. This inspection ensures continued compliance and workmanship quality. Inspection and/or surveillance points and sampling frequency for each selected DFW are shown in Table 10-3. The QC staff will monitor the practices and operations and verify continued compliance with approved project plans.

Sampling frequencies in Table 10-3 are at a normal state and may be tightened or relaxed based on a variety of factors such as team performance, project duration, geophysical and intrusive investigative results, etc. If different QC Sampling frequencies are required than those described below, approval of different QC sampling frequencies must first be approved by CCMDA, MES, and ADEM before being implemented.

A Deficiency Notice Report (DNR) will be completed and issued if nonconforming or deficient practices or results are detected. A Stop Work Order may also be issued depending on the severity or recurrence of the defect. Items that have been "red flagged" will be investigated using a root cause analysis by the QC staff; the results of which will be used to design the most appropriate corrective action. Discrepancies between site practices and the approved plans/procedures will be resolved and corrective actions for unsatisfactory and nonconforming conditions or practices will be verified by the QC staff prior to granting approval to continue work. Follow-up phase inspection results will be documented in the MES QC Surveillance Report.

10.7.3.3 QC Step 3, Geophysical Data Reprocessing

Using the geophysical data collected by the geophysical contractor, the GeoQCS will initially reprocess the geophysical data and generate a geophysical target map and a target list for the first five grids (or data sets) collected by each geophysical field team (at least one data set for each team must include a seed item). These QC maps and target lists will then be compared with the geophysical target map and target list generated by the geophysical data processor. If discrepancies between the maps and target lists exist, the GeoQCS and the Geophysical Data Processor will compare processing techniques. This initial duplicative process will ensure that geophysical interpretation techniques are correct and will, potentially improve whenever differences arise in an effort to exceed performance standards.

Once all the geophysical data for a UoP has been collected, the GeoQCS will then randomly select and reprocess the data from one of the grids that make up the UoP. This grid will be reprocessed by the GeoQCS who will select targets and compare those targets to the original anomalies identified by the Geophysics Contractor. If the GeoQCS finds targets that have not previously been selected, then a root-cause analysis will be conducted. Following that analysis, QC staff will analyze potential solutions (corrective actions) to determine which remedy (if required) is most effective in adjusting the process.

It is understood that minor discrepancies in target selection will exist due to the very interpretative nature of geophysical target selection; however, should major discrepancies occur, or seed items be missed, the GeoQCS will immediately notify the geophysical Project Manager, Site Operations Manager, UXOQCS and MES PM. Upon notification, a root cause analysis will be conducted by the QC Team. It is anticipated that the root cause analysis will be used to pinpoint exactly when and where the problem occurred. Work that has been conducted up to the point where the problem occurred will be accepted. Once corrective actions have been taken, if necessary, work should only be redone starting at the point where the problem occurred.

10.7.3.4 QC Step 4, Blind QC Seeds

QC seed items will be placed by the QC team throughout the site at a minimum density of one seed item per UoP to monitor the Aggressive Surface/Near Surface Clearance Operations. A subsequent set of QC seeds will also be installed at a minimum density of one seed item per UoP to monitor the One Foot and Clearance to Depth Operations.

The blind QC seeds are used to evaluate the overall quality of the clearance operations. Geophysical detection of the blind seeds confirms that the mapping team covered the area and the data was appropriately processed and targeted. Recovery of the blind seeds confirms that these items were appropriately reacquired and that the intrusive team cleared the anomaly and properly documented their findings. The QC criteria is to recover 100% of the blind seeds. Upon finding a failure (i.e., missed seed item), the QC staff will issue a DNR and conduct a root cause analysis to determine the extent of the failure and why it occurred. All the factors will be

evaluated and corrective action will be based on the root cause analysis. Rework (if required) will be done from the point at which the problem occurred, as identified through the root cause analysis. Additional details on the blind seeding program in discussed in Sections 10.7.4.3 and 10.7.4.4.

Table 10-3. Definable Features of Work – QC Inspection Points/Frequency

Definable Feature of Work	Inspection/ Surveillance Point	Attribute	QC Action	Sampling Frequency	Red Flag Criteria
Prepare Plans and Reports	Review Draft/Draft/Draft Final/Final	Quality and implementation of technical approach, clarity of text, addressing of all scope items, and compliance with guidance and procedures	Internal review of document attributes and resolution of comments	Document submissions	Rejection or non-concurrence of plan, excessive comments, or critical technical comments
GPO Establishment	Seed item installation	Survey accuracy and mV response of items before and after placement	Internal technical review	All items in GPO GeoQCS	Seed item can not be detected
GPO Certification (Geophysical and UXO Teams)	Target Detection	Detect seed targets within GPO	Review GPO data	Every GPO GeoQCS	Pass = 95% of GPO targets are detected and located within the 2.5 ft RCrit.
	Target Positioning	Meet positioning criteria	Review GPO data	Every GPO GeoQCS	Pass = 95% of GPO targets are detected and located within the 2.5 ft RCrit
	False Alarm Rate	False alarm targets (anomalies identified other than seed items)	Review GPO FAR data	Every GPO GeoQCS	Metric to be established based on GPO results however, individual site conditions and geology are to be taken into account
UXO surface sweep prior to vegetation removal	Removal of surface MEC / MEC scrap / Non-MEC scrap prior to vegetation removal	Quality of surface sweep	Three-Phase QC Inspection	**Daily** during surface sweep operations UXOQCS	Missing MEC item
Brush Clearing	Throughout	Accommodate geophysical survey	Three-Phase QC Inspection	**Weekly** as grids are cleared GeoQCS and UXOQCS	Vegetation cut to acceptable levels as deemed appropriate by the GeoQCS and UXOQCS.
UXO Surface and Near Surface Clearance after vegetation is removed	Removal of MEC and Seeded items	Quality of surface clearance operation	Three-Phase QC Inspection, place seed items (minimum of one per UoP)	Results reviewed as grids are completed UXOQCS	Missing a MEC item or QC surface seed
Surveying	MRS Border and corner stake positioning	Meet positioning criteria	Three-Phase QC Inspection based on contractor's SOPs	As datasets are received GeoQCS	Verify that internal QC procedures are being followed and that tie lines/points are being recorded (including the amount of deviation)
UXO Surveyor Support	Border and corner stake placement	Check for subsurface anomalies/off-set procedures	Three-Phase QC Inspection	**Weekly** during survey operations UXOQCS	Not avoiding anomalies when placing stakes/pins

Definable Feature of Work	Inspection/ Surveillance Point	Attribute	QC Action	Sampling Frequency	Red Flag Criteria
Geophysical Investigation / Confirmation Remapping	Daily Instrument Static, Latency check	Instrument response to known standards and velocity	Review QC data **and/or observe equipment start-up, pre-survey procedures, and field operations**	Daily GeoQCS	Within ±20% of initial FCA mV responses and linear positions
	Positioning	Position within RCrit of target	Review positional data	Geophysical data to be re-analyzed during QC Step III. A minimum of one grid will be sampled per UoP. If possible, the grid to be re-analyzed will contain a seed item. GeoQCS	Positioning of seed items found to be within RCrit (2.5 ft) of known location
	Anomaly Selection	Anomalies chosen by data interpreter	Identify target anomalies	Geophysical data to be re-analyzed during QC Step III. A minimum of one grid will be sampled per UoP. If possible, the grid to be re-analyzed will contain a seed item. GeoQCS	One anomaly selection difference at or above the minimum mV response threshold established at the FCA and GPO will cause a root cause analysis and possible failure of the UoP – which would then require reprocessing
	Linear Data Density	Distance between linear data points	Measure linear data density	Geophysical data to be re-analyzed during QC Step III. A minimum of one grid will be sampled per UoP. GeoQCS	Minimum linear data density of 2 data points per ft

Definable Feature of Work	Inspection/ Surveillance Point	Attribute	QC Action	Sampling Frequency	Red Flag Criteria
Geophysical Investigation / Confirmation Remapping (continued)	**Line Spacing**	**Distance between DGM survey lines**	**Measure line spacing**	**Geophysical data to be re-analyzed during QC Step III. A minimum of one grid will be sampled per UoP. GeoQCS**	**Line spacing exceeds 2.5 feet in local coordinates**
	Blind Seeds	Identify blind seed items	Place blind seed items (minimum of one per UoP)	Seed items placed in 100% of UoPs GeoQCS	Detect and Target 100% of the seed items
	Anomaly Reacquisition	Reacquire anomaly within 2.5 ft RCrit	Review reacquisition data	Data to be reviewed as UoPs are completed. GeoQCS	95% of all items within 2.5 ft Rcrit
Intrusive Investigation **Clearance to Depth of Detection**	Daily Instrument FCA test	Instrument response to known standards	Three-Phase QC Inspection	Daily Check UXOQCS	Within ±20% of initial FCA mV responses and linear positions
	Excavations within a UoP	Target anomaly presence/absence	Interrogate and sample (minimum) % of completed excavations per UoP per Table 10.4	As UoPs are completed (QC Step V) UXOQCS	The finding of a metallic item that has a mV response above that which was established at the FCA and GPO within a 2.5 ft radius of the original target location
	Investigate the non-DGM areas in grid, including data gaps 2 ft around tree clusters and single tree gaps with any dimension >+5 feet	Verify that trees are investigated and appropriately marked **and that all non-DGM data gaps are initialed on the grid map by the team leader as having been cleared.**	Three-Phase QC Inspection	During post investigation QC hole checks UXOQCS	Missing a MEC item, QC seed or a Non-MEC metallic item of critical weight and mass **in a non-DGM area**
	False Positives	**Dig Result**	**Review dig results and calculate false positive rate**	**Dig results to be analyzed for mV comparison and false positives. A minimum of one grid will be reviewed per UoP. GeoQCS**	**False positive rate >= 15%**

	Seeded items	Excavate blind seed items	Verify blind seed items have been excavated	Verification that seed items have been located and removed will be checked as UoPs are completed GeoQCS	Recover 100% of the seed items
Intrusive Investigation 1-Foot Mag and Dig	**Daily Instrument FCA test**	**Instrument response to known standards**	**Three-Phase QC Inspection**	**Daily Check UXOQCS**	**All FCA items detected**
	Area within a UoP	**Anomaly presence/absence**	**Sweep, Interrogate and sample (minimum) % area per UoP per Table 10.4**	**As UoPs are completed (QC Step V) UXOQCS**	**Missing a MEC item, QC seed or a Non-MEC metallic item of critical weight and mass**
	Seeded items	**Excavate blind seed items**	**Verify blind seed items have been excavated**	**Verification that seed items have been located and removed will be checked as UoPs are completed UXOQCS**	**Recover 100% of the seed items**
MEC-Related Scrap Inspection/ Certification	MEC-related scrap inspection and certification	Prior to disposal	Three-Phase QC Inspection	Daily UXOQCS	No MEC or energetic material
Data Management	Intrusive investigation data	Verify that intrusive investigation data sets are complete for each of the targets prosecuted.	Three-Phase QC Inspection	**Daily** GeoQCS	Data sets are complete and accurate
	Intrusive data recording and data transfer with PDA (if used)	Verify that intrusive investigation data files are present and completed for each of the targets prosecuted.	Three-Phase QC Inspection	**Daily** Database Data Manager.	Successful data transfer
	Data backup and storage	Verify files to be backed-up are present on backup media/FTP site.	Three-Phase QC Inspection	**Daily/Weekly** Data Manager.	Data to be placed onto FTP site and /or backed up on separate medium (CD/DVD)
Backfill and Site Restoration	Each grid as they are completed	Flagged anomalies and excavations	Verify holes are properly backfilled and flags removed	As grids are completed UXOQCS	100% of flags removed and holes backfilled

10.7.3.5 QC Step 5, Excavation Sampling Inspection

Step 5 of the QC process is an inspection of the intrusive investigation. This QC step utilizes MIL-STD-1916 Verification Level III as the base (or minimum) number of targets that are to be sampled. The minimum QC sample size for a UoP is summarized in Table 10-4 (below) as a function of the sample population size. Sample populations shown in Table 10-4 can vary depending on whether the level of QC is at a normal, elevated or relaxed state. This State of QC (tightened, normal or relaxed) is dependent upon whether a UoP has previously failed this QC step in the past. If so, the project team consisting of the CCMDA, MES, and ADEM may choose to elevate the minimum State of QC to a tightened level of QC until such time as all involved are comfortable with returning the State of QC back to its original level. Conversely, the project team may choose to lower the State of QC if no discrepancies have been found over a lengthy period of time. QC sample populations are chosen at random from the total population.

Table 10-4. Excavation QC Minimum Sample Populations.

State of QC	% of targets in the UoP that are to be checked by the QC Team*
Tightened	35%
Normal	25%
Relaxed	15%

*** For QC of sweep (mag and dig) operations, the applicable % of area will be QC checked**

The Excavation Sampling Inspection will verify that the geophysical target anomaly locations have been thoroughly investigated and are "electronically" cleared. The size of the minimum QC sample population is dictated by Table 10-4 above and also in accordance with MIL-STD-1916 (VL III). Below are two scenarios that illustrate how Table 10-4 and MIL-STD 1916 (VL III) are to be used together.

- Scenario 1: The level of QC has been set to "Normal". The geophysical data was collected and a total of 60 targets were found in this UoP. According to Table 10-4 above, 25% of these targets would need to be checked by the QC Team (i.e., 15 targets). However, using MIL-STD-1916 (VL III) the QC sample population is 32. The larger of the two (15 or 32) is 32 targets and as such, 32 targets now become the minimum QC sample population for this 1st scenario.
- Scenario 2: Using the same level of QC (Normal) but changing the number of targets in the UoP from 60 to 400, MIL-STD-1916 (VL III) would dictate that 32 targets would need to be checked; however Table-10-4 (above) dictates that 25% (100 targets) would need to be checked. The larger of the two (32 or 100) is 100 targets and as such, 100 targets now become the minimum QC sample population for this 2nd scenario.

The QC Team will reacquire, at a minimum, each of the randomly selected targets that comprise the minimum QC sample population with an EM61-MK2. During the excavation phase, once the UXO team has excavated a target and has successfully removed the object(s) the UXO team member will leave the excavation hole open and will leave the pin-flag (with the anomaly ID) at the hole. The QC Team will then re-analyze the excavation with their EM61-MK2. Should discrepancies exist, they will be documented in the UXOQC logbook and reported in the DQCR. The criticality of these discrepancies will be based specifically on what was found and the results of a root-cause analysis. The results of this root cause analysis will be used to implement corrective actions and also to determine the extent of the area that has been potentially impacted by this error should rework become necessary. Critical discrepancies

would include location of metallic items that have an mV signature above the mV threshold that was established at the GPO. To clarify, MEC or any metallic object having a size and mV response similar to an item that should have been removed but instead was found by the QC Team during post excavation inspections will be considered Critical discrepancies. The finding of a critical discrepancy would then trigger a root cause analysis, the results of which could possibly make the UoP a critical non-conforming unit. If a critical nonconforming UoP is encountered, 100% of the targets in that UoP will be re-investigated by the UXO teams and the State of QC will then be elevated to a Tightened State (See Table 10-4) for the re-QC of this and subsequent UoPs. The State of QC will then remain at a Tightened Level until the situation is considered corrected by the UXO Contractor and MES allows the State of QC to return to normal. QC Step V will not be performed after the grids have been remapped.

10.7.3.6 QC Step 6, Target Data Comparison To Excavation Results

Upon completion of all excavations in the UoP, the GeoQCS will compare target mV readings with excavation results. This quality control procedure is intended to check that the target that was excavated by the UXO team(s) corresponds to the mV response for that specific target location as shown in the geophysical data. In other words, a 50 mV geophysical target should not produce two nails during the intrusive investigation. Should this type of discrepancy between the mV response and the excavation results occur, the GeoQCS will conduct a root cause analysis. The results of this root cause analysis will be used to implement corrective actions and also to determine the extent of the area that is impacted by this error should rework become necessary.

10.7.4 UoP Pass/Fail Criteria

10.7.4.1 Geophysical Operations

The geophysical survey is expected to detect and locate a variety of MEC items at various depths. Use of the USACE, Huntsville, Data Item Description MR-005-05 which specifies that items should be located to their maximum depth of detection using the 11X diameter rule will be used as a “rule of thumb” for pass/failure criteria. As discussed in EM 1110-1-4009 (June 2007) the 11X diameter “rule of thumb” has site-specific and item-specific limitations which need to be taken into account. Therefore, failure criteria for geophysical operations will be an anomaly that has not been targeted for excavation that has an mV threshold above that which was established at the FCA and GPO to define a target. Furthermore, final pass/failure decision of the UoP will be made on a case by case basis using the root cause analysis to examine the exact nature and extent of the error (should one occur). Rework (if required) will be done from the point at which the problem occurred onward, as identified through the root cause analysis.

10.7.4.2 Intrusive Operations

If the QC Team finds a metallic item that has an mV response above that which was established at the FCA and GPO to define a target and this target is generally within in the 11X the diameter rule (as stated in Section 10.7.4.1), this would be cause for a UoP failure. Upon finding a failure the QC staff will conduct a root cause analysis to determine the extent of the failure and why it occurred. All the factors will be evaluated and corrective action will be based on the root cause analysis. Rework (if required) will be completed from the point at which the problem occurred, as identified through the root cause analysis, forward.

10.7.4.3 QC Seed Items for Aggressive Surface/Near Surface Clearance Operations

The MES QC team will randomly distribute metallic seed items at a minimum of one per UoP. **Seed items for this task will include inert munitions items**. QC seed items will be painted orange and affixed with waterproof ID tags stating SURFACE SEED and the seed number so

that when recovered they are easily identified as seed items. Care will be taken during the placement of these items so that their location is hidden. The location of the seed items will be recorded by the QC team in a PDA to help track the recovery of all seed items. Any grid turned over as complete with a surface seed still in place, would be cause for a UoP failure. Upon finding a failure the QC staff will conduct a root cause analysis to determine the extent of the failure and why it occurred. All the factors will be evaluated and corrective action will be based on the root cause analysis. Rework (if required) will be completed from the point at which the problem occurred, as identified through the root cause analysis, forward.

10.7.4.4 QC Seed Items for Clearance to One Foot and Clearance to Depth Operations

In addition to the UoP failure criteria for geophysical and intrusive operations as described above, the MES QC team will heavily seed the areas to be investigated with metallic objects. Blind QC seed items will be placed by the UXOQCS and GeoQCS (or designees) throughout the site at a density of a minimum of one seed item per UoP. QC seed items will be painted orange and affixed with waterproof ID tags stating GEO SEED and the seed number so that when excavated they are easily identified as seed items. Care will be taken during the placement of these items so that their location is very well hidden. The location of the seed items will either be surveyed in by a licensed surveyor or their location will be measured from corner stakes using tape measures. Once the geophysical data has been collected and target lists have been generated, the GeoQCS will use the GIS to compare the seed item locations to the geophysical target locations. A seed item will be counted as having been found if the geophysical data position of the seed item is within a 2.5 ft radius of its actual location. This seed item test is intended to verify that both the geophysical and intrusive investigation are working properly. Upon finding a failure (i.e., missed seed item), the QC staff will conduct a root cause analysis to determine the extent of the failure and why it occurred. All the factors will be evaluated and corrective action will be based on the root cause analysis. Rework (if required) will be done from the point at which the problem occurred, as identified through the root cause analysis.

10.7.5 Additional Inspections

At the discretion of MES, additional inspections may be implemented on the same DFW. Such instances may be:

- Unsatisfactory work, as determined by MES.
- Change in key personnel or resumption of work after a substantial (2 weeks or more) period of inactivity.
- Changes to the project scope of work/specifications.

10.7.6 Geophysical Confirmation Remapping

After a UoP has successfully passed the six-step UoP certification process, it is then eligible for geophysical confirmation remapping and intrusive investigation of any targeted anomalies. This inspection is the digital geophysical remapping of grids (or portions of grids) within a UoP (or may include multiple UoPs). It is anticipated that selection of the areas to be geophysically remapped will be selected based on intrusive investigation results and target densities. The amount of area that is to be remapped is at the discretion of the project team, consisting of the CCMDA, MES and ADEM; however, the amount of area is anticipated to be on the order of approximately 10% of MRS-6.

10.7.7 Safety Inspections

Both the SHSM and the contractor UXOSO will perform periodic safety inspections throughout the project. The inspections will evaluate site operations, which will be reported on the Daily Quality Control Report/Contractor Production Report.

The contractor UXOSO will be adequately experienced and trained to identify and correct any deficiencies in site operations. Any deficiency and correlating correction will be duly noted in the Daily Quality Control Report/Contractor Production Report. The information will include the area of deficiency, type of deficiency, corrective action to be taken or which has been taken, the responsible party for corrective action, date of follow-up inspection(s), and signature of the investigating person(s).

All on-site inspections will be considered a matter of record for the project. The inspections will be filed in MES QC files, submitted in the specified reports and uploaded onto the project portal site. Summary tables will also be presented to facilitate contract reporting as required.

10.7.8 Surveillance of Contractor Activities

The Site Operations Manager will be responsible for oversight of all surveillance activities performed by contractors. Discrepancies associated with contractor work will be communicated to the contractor for resolution. The Site Operations Manager and his staff have the authority to act directly with contractor representatives on routine QC activities.

10.7.9 Quality Control Meetings

After the start of field work at McClellan, the UXOQCS will conduct QC meetings on a biweekly basis with the Geophysical Contractor, ADEM, and the CCMDA. At a minimum, the following shall be accomplished at each meeting:

- A review of the minutes of the previous meeting.
- A review of the current schedule.
- Rework items identified since the last meeting.
- Rework items completed since the last meeting.
- A review of the status of submittals.
- A review of the work to be accomplished in the next two weeks and the documentation required.
- Site Resolution of any QC and production problems.
- Discussion of outstanding deficiencies and/or nonconformance issues.
- Changes in procedure.

QC meeting minutes will be forwarded to all appropriate parties within 2 days of the meeting. The minutes will document the parties present and their affiliations, the topics of discussion, action items identified and responsible party, as well as other QC-related issues.

10.8 Deficiency Management

MES and the Geophysics Contractor's Quality Improvement Process comprise the internal systems that evaluate the quality program's effectiveness in ensuring and continually improving the quality of work. The primary goal of the Quality Improvement Process and the QC program as defined in this document is to prevent deficiencies or nonconformances and facilitate continual process improvement. To the extent that the first of these goals is not achieved, identified deficiencies or nonconformances will be corrected in a timely and cost-effective manner and with the intent of preventing their recurrence. This includes provisions for preventing quality problems and facilitating process improvements as well as identifying, documenting, and tracking deficiencies until corrective actions have been verified.

10.8.1 Deficiencies and Nonconformance

The UXOQCS will be notified of all deficiencies and nonconformance conditions identified during the course of the field activities to ensure that each of these occurrences is documented, reported, and tracked, and that corrective actions are taken and follow-up verification is conducted.

The UXOQCS will include the identified deficiencies and nonconforming conditions in the DQCR noting the items found to be deficient or nonconforming; the date; time and location; the person who identified the deficiency or nonconformance; and the status of the item to which the deficiency applies. If the deficiency has the potential to result in the need for rework or jeopardizes the quality of future work to the extent that rework may be required, the UXOQCS will stop work or recommend and implement immediate corrective action to address the deficiency.

When an item is identified as deficient or nonconforming, the UXOQCS will describe the item and/or condition in the DQCR, complete a deficiency notice (DN) or nonconformance report (NCR). The forms provide documentation on the status of the deficiency or nonconformance and include the documented history of the problem as corrective action proceeds. Copies of the DN and NCR forms are included in Appendix D, Forms. The UXOQCS will update the status of the deficiency when there is a change in status. Before the work activities of the day begin, the UXOQCS will note the deficiencies or nonconformances that require follow up verification that day. New or changed status will be entered into the DQCR at the end of each day. The DQCR will include a report on each nonconformance or deficiency that was completed and closed out for that day.

10.8.2 Root Cause Analysis

Both the DN and the NCR forms contain an area for the entry of information regarding the cause of the problem and the proposed resolution. The determination of the root cause of a deficiency or nonconformance is an integral part of the QC process. Root cause analysis will be made by the UXOQCS in conjunction with other appropriate site personnel such as the GeoQCS, the Site Operations Manager, and the Project Manager. Criteria considered in the analysis will include but not be limited to:

- Staff qualifications and training.
- Adequacy of procedures.
- Adequacy of equipment.
- Adequacy of QC measures.

Input will be obtained as necessary from field staff and technical advisors in order to identify the factors which led to the problem.

The root cause is always “upstream” from where the problem was detected. Two strategies that will be employed for determining the root cause of a deficiency or nonconformance for this project are: (a) tracing the problem back to the source, and (b) evaluation of the cause using basic questions such as who, what, when, where, why, and how. Why is probably the most beneficial question when attempting to arrive at a root cause. This question may need to be asked multiple times before the root cause is identified. For example, “*Why did A happen*?” Answer: “*Because of B.*” “*Why did B happen*?” Answer: “*Because of C.*” This process is carried on until the real cause is identified.

Root cause analysis is a process designed for use in investigating and categorizing the root causes of events with safety, quality, and production impacts. Root cause analysis is a tool designed to help identify not only what and how an event occurred, but also why it happened.

It is anticipated that the root cause analysis will be used to pinpoint exactly where the system failed. Work that has been conducted up to the point of system failure will be accepted, and once corrective actions have been taken, rework (if necessary) should only be redone from the point of system failure on.

10.8.3 Corrective Action

Following the root cause analysis, the UXOQCS will perform analysis of potential solutions (corrective actions) to determine which remedy is most effective in correcting the problem. This process will include all appropriate staff and will be documented via meeting notes and information listed in the proper sections on the DN or NCR. Potential remedies considered will include:

- Supplemental staff training.
- Changes of equipment or modification of equipment currently in use.
- Acquisition of supplemental equipment.
- Implementation of new procedures or modification of existing procedures.
- Changes in QC procedures.

Final approval of all remedies will be the responsibility of the MES PM and will be made with the concurrence of other stakeholders, as appropriate.

Successful implementation of corrective action will be documented by the UXOQCS in the appropriate areas of the DN or NCR. This documentation will be supported by changes to the inspection procedures or schedule as warranted (i.e., the UXOQCS will not certify that corrective action has been taken until inspection of the actions and the resulting changes in the program are complete).

All deficiencies and nonconformances must be corrected prior to the product being delivered to the customer. If the identified condition can be corrected quickly on the spot, if it is an isolated trivial issue, and a system is in place for preventing recurrence, the condition may be documented on the surveillance report as corrected on the spot without issuing a DN or NCR. For example, if while conducting review of UXO Intrusive forms it is determined that one form is missing the date, this is an isolated human error. The form can be corrected and the correction noted in the surveillance report. When the identified deficiency is determined to be other than trivial, or is not an isolated case, then the process must be carried further. If the deficiency is minor in nature and not problematic throughout the process, a DN will be issued. If the problem is such that overall quality of the product is affected and/or the problem is widespread, then an NCR will be issued. If the deficiency has the potential to result in a need for rework or jeopardizes the quality of future work to the extent that rework may be required, the UXOQCS will stop work or recommend and implement immediate corrective action to address the deficiency.

10.8.4 Completion of Inspection Punch List

Completion inspections conducted by the UXOQCS typically result in the development of a completion inspection “punch list” of items that do not conform to approved designs, plans, and specifications. During the course of each completion inspection the UXOQCS will document items of non-compliance in a punch list that will serve as input to the UXOQCS file for items requiring corrective action. The file will serve as the tracking system for the follow-up of open items and will identify when they are completed or closed out.

10.8.5 Notification

The MES Project Manager will be informed immediately of the identification and progress towards the resolution of deficiencies and nonconforming items and/or conditions. This is to be accomplished through the reporting requirements stated in implementing procedures and/or plans, through attendance at coordination meetings or direct contact.

10.8.6 Continual Improvement

Project staff at all levels will be encouraged to provide recommendations for improvements in established work processes and techniques. The intent will be to identify activities that are compliant but can be performed in a more efficient or cost-effective manner. Typical quality improvement recommendations include identifying an existing practice that should be improved (e.g., a bottleneck in production) and/or recommending an alternative practice that provides a benefit without compromising prescribed standards of quality. Project staff will bring their recommendations to the attention of project management or the QC staff through verbal or written means. However, deviations from established protocols will not be implemented without prior written approval by the Project Manager and concurrence of UXOQCS. Certain deviations may require ADEM approval. When a staff-initiated recommendation results in a tangible benefit to the project, public acknowledgement shall be given by the Project Manager and the staff personnel that initiated the recommendation. Field work variances will be noted on the Field Change Request Form (attached below).

10.9 Field Logbook

A field logbook will be assigned to personnel as required for documenting details of field activities during QC monitoring activities. The information in the log book is intended to serve as a memory aide in the preparation of the Daily Quality Control Report/Contractor Production Report and in addressing follow-up questions that may arise.

10.10 Quality Control Certification Statement

Each Daily QC and Contractor Production Report shall contain the following statement attested to by the QCM:

"I certify that the above report is complete and correct and that I, or my authorized representative, have inspected the work performed this day by MES (and each contractor) and have determined that all materials, equipment, and workmanship are in strict conformance with the plans and specifications except as may be noted above."

10.11 Quality Control Forms

The forms and checklists listed below are to be used at the discretion of the QC Staff and can be found in Appendix D (PWP 2007):

- Work Plan Signoff Sheet.
- Geophysical Investigation QC Check Sheet.
- Intrusive Investigation QC Check Sheet.
- General QC Surveillance.
- DN Report.
- NCR.
- DN/NCR Log.
- Field Change Request Form.
- Field Change Request Log.
- Daily QC Report.

11.0 ENVIRONMENTAL PROTECTION PLAN

The Environmental Protection Plan is contained in Chapter 11 of the PWP (2007).

12.0 INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) in the form of MEC scrap and non-MEC scrap will be generated during this remediation. Handling of this IDW is discussed in Section 2.5.5.1.

13.0 INTERIM HOLDING FACILITY SITING PLAN

NOT REQUIRED

14.0 RECOVERED CHEMICAL WARFARE MATERIALS PLAN

Recovered chemical warfare materiel (RCWM) was encountered during MEC remediation in Southern Alpha. Two intact bottles one with "H" etching later confirmed as sulfur mustard fill, and one with "DM" etching later confirmed as adamsite fill from a Chemical Agent Identification Set (CAIS) were recovered during intrusive operations. These items were all destroyed by the Army. A mustard vial was also found in the T-38 area of the Alpha MRA, this site has been designated as no further action with respect to MEC remediation. Additionally, a Livens smoke round was found in the Southern Alpha MRS and Livens rounds have been used for CWM in the past. If suspected RCWM is encountered during any phase of work, MES will immediately cease all operations, withdraw upwind from the work area, and notify the USACE Transition Force. If the USACE Transition Force is not onsite, it is the responsibility of MES to contact local law enforcement so that they may contact the EOD unit assigned to the area for response, the 723rd EOD Company stationed at Fort Gillem, Georgia. If the local EOD response unit determines that the item is RCWM, they will notify the 20th Support Command and 22nd Chemical Battalion Technical Escort Unit (TEU) through official Department of the Army channels. MES will maintain a security watch over the suspect item until relieved by competent authority. Once the RCWM item is eliminated, and the site stabilized, MES will direct the MEC removal operation, suspend operations until further notice, or begin demobilization.

15.0 REFERENCES

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Appendix A
Figures

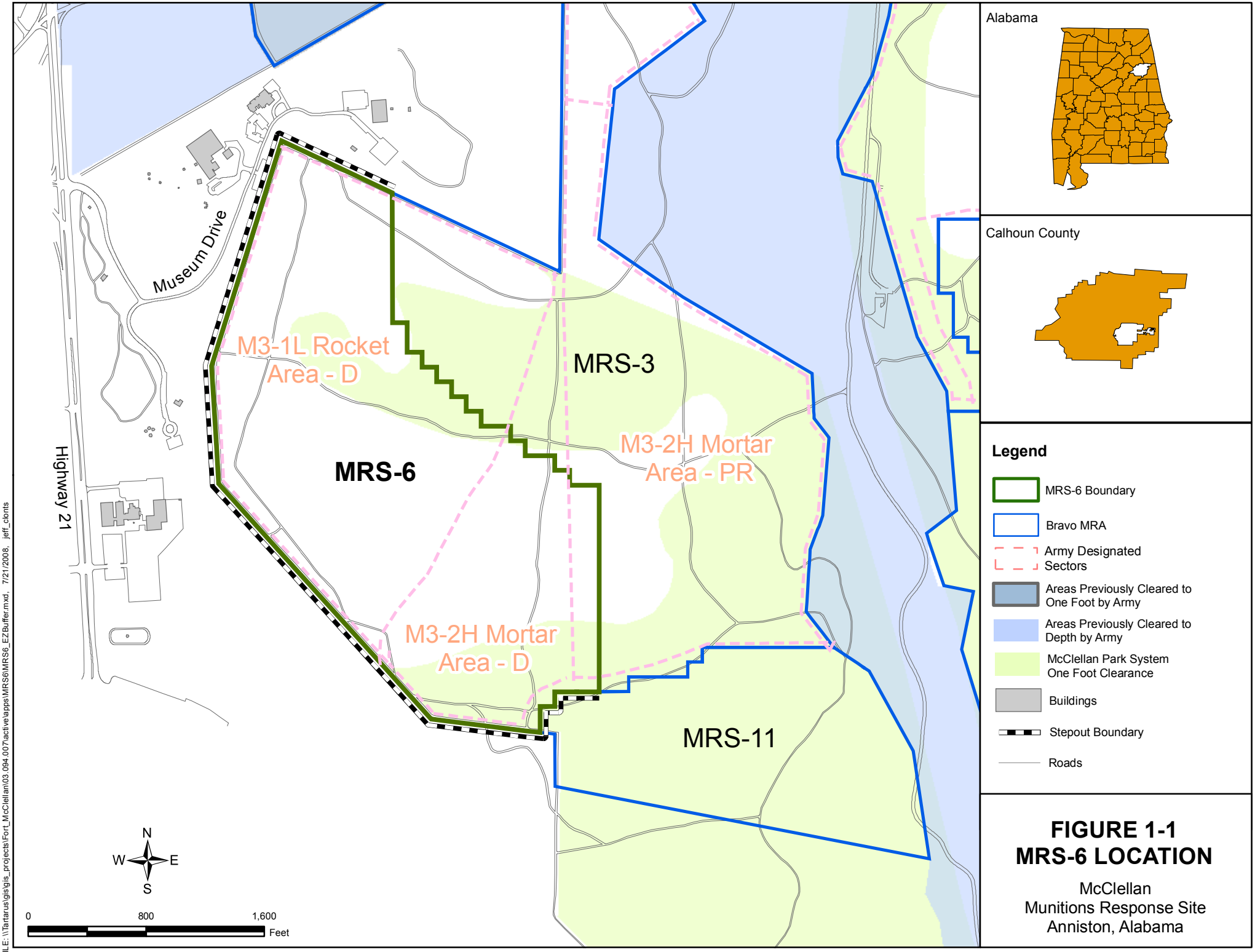

FIGURE 1-1
MRS-6 LOCATION

McClellan
Munitions Response Site
Anniston, Alabama

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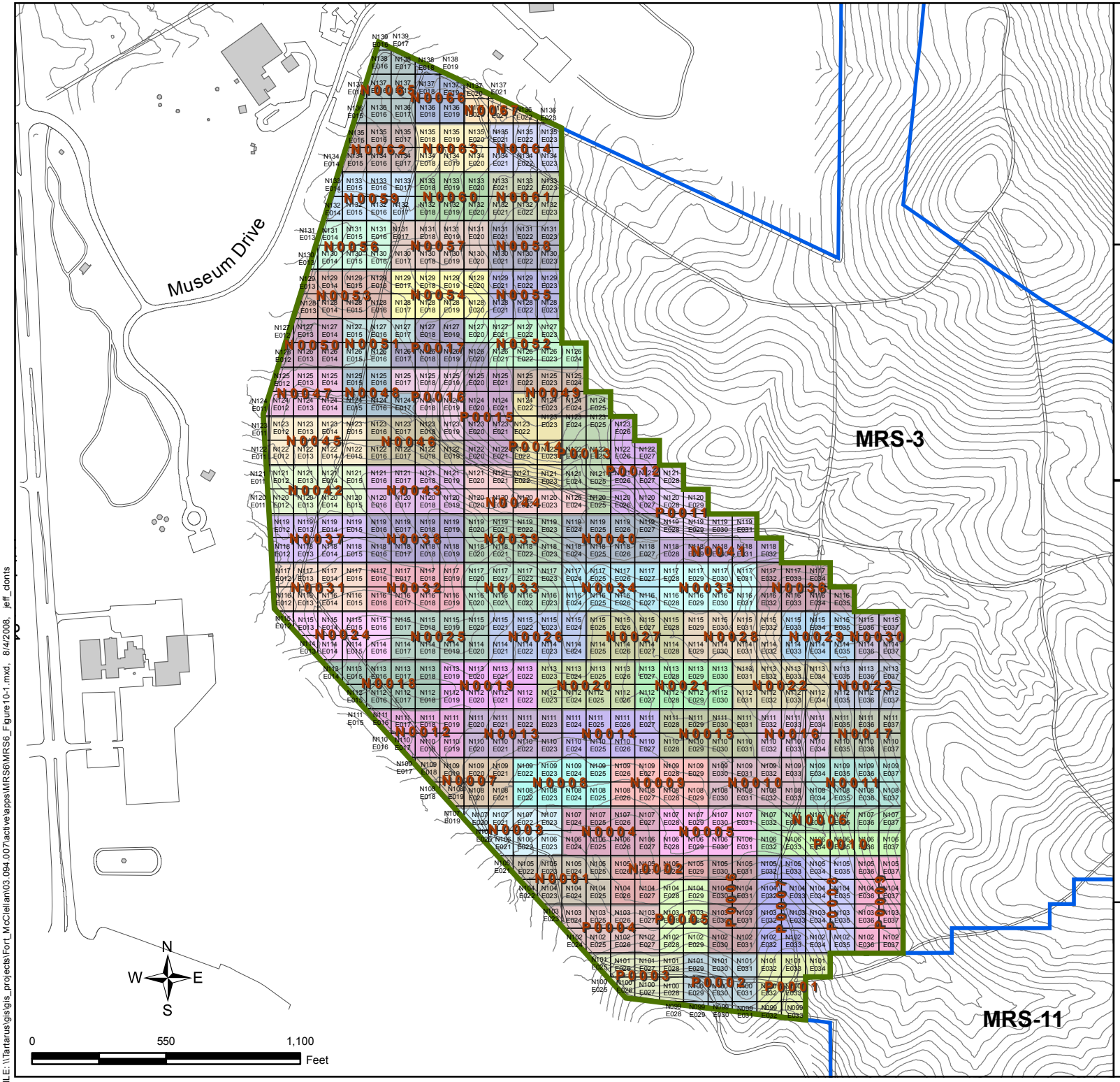
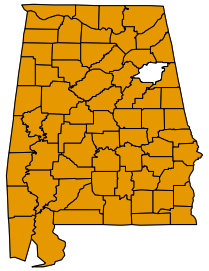
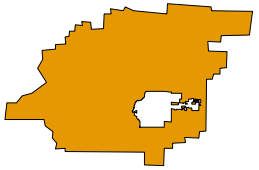


Alabama



Calhoun County



Legend

- MRS-6 Boundary
- Bravo MRA
- P0002 — UoP Designation
- Buildings
- Stepout Boundary
- Roads
- Contour Line (1' interval)

FIGURE 10-1
MRS-6
INITIAL UOP DESIGNATIONS

McClellan
Munitions Response Site
Anniston, Alabama

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Appendix B
Emergency Points of Contact
(See PWP 2007)

Appendix C
Accident Prevention Plan (APP)
(See PWP 2007)

Appendix D

Forms

(See PWP 2007)

Appendix E

SOPs

(See PWP 2007)