ORDNANCE AND EXPLOSIVES REMOVAL ACTION

FINAL WORK PLAN

FORMER CAMP CROFT
(ORDNANCE OPERABLE UNITS 3, 11C, AND 11D)
SPARTANBURG, SOUTH CAROLINA

Project: I04SC001603

Contract: DACA87-00-D-0034
Task Order: 0014

Prepared for:

US Army Engineering and Support Center, Huntsville
and
US Army Corps of Engineers, Charleston District

by:

ZAPATAENGINEERING, P.A.
1100 Kenilworth Avenue
Charlotte, NC 28204

March 2004

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CHARLESTON DISTRICT

by:

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1100 KENILWORTH AVENUE
CHARLOTTE, NORTH CAROLINA 28204
PHONE: (704) 358-8240

Signed: ___________________________
Michael Winningham
Project Manager

Signed: __________________________
Suzy Cantor-McKinney
V.P., OE Programs

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ABBREVIATIONS AND ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
AR	Army Regulation
ARAR	Applicable or relevant and appropriate requirements
ARPA	Archeological Resources Protection Act
ATF	Alcohol, Tobacco, and Firearms
ATFP	Alcohol, Tobacco, and Firearms Pamphlet
B.P. Barber	B.P. Barber and Associates
BEI	Biological Exposure Index
BIP	Blow-in-Place
CAA	Clean Air Act
CDROM	Compact Disk – Read Only Memory
CEHNC	US Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESAC	US Army Corps of Engineer, Charleston District
CFR	Code of Federal Regulations
CO	Contracting Officer
CWM	Chemical Warfare Materiel
CX	Center of Expertise
DA	Department of Army
DCAA	Defense Contract Audit Agency
DERP	Defense Environmental Restoration Program
DGM	Digital Geophysical Mapping
DID	Data Item Description
DoD	Department of Defense
DoT	Department of Transportation
DWEL	Drinking Water Equivalent Level
EE/CA	Engineering Evaluation/Cost Analysis
EHS	Extremely Hazardous Substances
EM	Engineer Manual
EMR	Electro-Magnetic Radiation
EOR	Explosive Ordnance Reconnaissance
EPA	Environmental Protection Agency
ER	Engineer Regulation
EZ	Exclusion Zone
FUDS	Formerly Used Defense Sites
GIP	Geophysical Investigation Plan
GPL	General Physics Laboratory
GPO	Geophysical Prove-out
GPR	Ground Penetrating Radar
GPS	Global Positioning System
FAR	Federal Acquisition Regulation
FUDS	Formerly Used Defense Sites
HE	High Explosive

HERO	Hazard of Electromagnetic Radiation to Ordnance
HTRW	Hazardous, Toxic, and Radioactive Waste
HTW	Hazardous and Toxic Waste
IDLH	Immediately Dangerous to Life and Health
IDW	Investigative Derived Waste
IRTC	Infantry Replacement Training Center
LCPM	Life Cycle Project Manager
LDD	Loss, Damage or Destruction
MAG	Magnetic Field
MK	Mark
mm	Millimeters
MOFB	Miniature Open Front Barricade
MPM	Most-Probable Munition
MSD	Minimum Separation Distance
NAAQS	National Ambient Air Quality Standards
NAEVA	NAEVA Geophysics, Inc.
NAGPRA	Native American Graves Protection and Repatriation Act
NCP	National Contingency Plan
NEW	Net Explosive Weight
NIOSH	National Institute for Occupational Safety and Health
NLT	No later than
NPDES	National Pollutant Discharge Elimination System
nT	nanoTeslas
OE	Ordnance and Explosives
OOU	Ordnance Operable Unit
OSHA	Occupational Safety and Health Administration
PAO	Public Affairs Officer
PC	Personal Computer
PLS	Professional Land Surveyor
PMP	Project Management Plan
POC	Point of Contact
PPE	Personal Protection Equipment
QC	Quality Control
QCP	Quality Control Plan
QCS	Quality Control Specialist
RCRA	Resource Conservation and Recovery Act
RF	Radio Frequency
ROE	Rights-of-Entry
SARA	Superfund Amendments and Reauthorization Act of 1986
SDA	Safe Disposal Area
SHP	Safety and Health Program
SSEPP	Site Specific Environmental Protection Plan
SSFR	Site Specific Final Report
SSHP	Site Safety and Health Plan
SOW	Scope of Work
SUXOS	Senior Unexploded Ordnance Supervisor

TAT	Turn-around-time
TBC	To Be Considered
TCLP	Toxicity Characteristics Leaching Procedure
TEU	Technical Escort Unit
TLV	Threshold Limit Values
TM	Technical Manual
TSDF	Treatment, Storage, and Disposal Facility
TSSDS	Tri-Service Spatial Data Standards
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
UTM	Universal Transverse Mercator
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXO QC/SO	Unexploded Ordnance Quality Control/Safety Officer
WP	White Phosphorous

REVISED PAGES

Date	Original Paragraph/Page Number	Revised Paragraph/Page Number	Modification Rationale
July 21, 2004	Pages 5-1 thru 5-18	Pages 5-1 thru 5-18	Required changes to GPO plan
July 21, 2004	Table of Contents	Page ii	Section 5.0 revised
September 2004	Table of Contents	Page iv	Added Appendices I and J

INSERTED PAGES

Date	Inserted Page Number(s)	Modification Rationale
September 2004	I-1 thru I-3	Appendix I established for new added grids
September 2004	J-1 thru J-5	Appendix J added for new equipment

1.0 INTRODUCTION

1.1 GENERAL

1.1.1 ZAPATAENGINEERING, under contract DACA87-00-D-0034, Task Order 0014 with the US Army Engineering and Support Center, Huntsville (CEHNC), has been tasked to perform an ordnance and explosives (OE) removal action at three ordnance operable units (OOU) on property that was part of the Former Camp Croft, Spartanburg, South Carolina. The work required falls under the Defense Environmental Restoration Program (DERP) – Formerly Used Defense Sites (FUDS) program. The Scope of Work (SOW) is provided in Appendix A.

1.1.2 OE are a safety hazard and constitute an imminent and substantial endangerment to site personnel and the public. During this removal action, it is the Government's intent that ZAPATAENGINEERING destroy, by detonation on-site, all OE encountered. This action will be performed in a manner consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 104 and the National Contingency Plan (NCP), Section 300.400. No Federal, State, or local permits are required for any action taken on this site. OE found during execution of the SOW fall under the applicable provisions of 29 Code of Federal Regulations (CFR) 1910.120, Hazardous Waste Operations and Emergency Response.

1.2 SITE LOCATION

The Former Camp Croft was located five miles southeast of Spartanburg, South Carolina. The OOUs 3, 11C, and 11D encompass a total of approximately 48 acres and are comprised of the Wedgewood Subdivision, a private residential area and nearby land. OOU 3 areas of concern include approximately 24 acres. OOU 11C contains approximately 9.48 acres. OOU 11D contains approximately 11.2 acres. An overall site map of Camp Croft and the projects sites can be seen in Figure B-1 in Appendix B.

1.3 SITE HISTORY

1.3.1 On November 4, 1940, the War Department announced that a new training center would be located in Spartanburg County, South Carolina. Camp Croft Infantry Replacement Training Center (IRTC) was officially activated on January 10, 1941, with housing for 20,000 trainees and support personnel. Camp Croft IRTC consisted of two general areas: a series of firing ranges and a troop housing area with attached administrative headquarters. Camp Croft IRTC served as one of the Army's principal IRTCs; approximately 250,000 soldiers were trained. Camp Croft was also a prisoner of war camp during World War II. The installation was declared surplus to the Army's needs in November 1946 and excessed to the War Assets Administration in 1947.

1.3.2 The Former Camp Croft was used for a variety of different purposes. It had at least eleven live ammunition-training ranges used for small arms ammunition, anti-tank rockets, anti-aircraft artillery, 60-millimeter (mm) infantry mortars, and 81 mm infantry mortars. The training range impact areas comprised a total of 16,929 acres. The camp also had a grenade court (approximately 175 acres), although no historical evidence was located to document or confirm present day ordnance at the grenade court.

1.3.3 OOU 3 is located in the former cantonment area, north of the current Camp Croft State Park (Figure B-2 in Appendix B). Practice grenades, ordnance related scrap, and 2.36-inch rocket fragments that may have been overshot from another local firing range were found in OOU 3 during the Phase I Engineering Evaluation/Cost Analysis (EE/CA) investigation conducted in 1997. During a removal action conducted in March 1997, seven Mark (MK) II fragmentation grenades were recovered, as well as numerous practice hand grenades and grenade parts, suggesting that this area may have been a former hand grenade practice area. The previous work areas and specific work completed by UXB are identified in the Final Removal Report dated April 2001, stated that three (3) small pits in Grid 17 and one (1) small pit in Grid 40 remain to be cleared (overall grids were previously mapped using digital geophysical methods and intrusively excavated). Twelve (12) M15 white phosphorous grenades were excavated from one (1) of the pits in Grid 17 and 150 pounds of smoke canisters were excavated from the pit in Grid 40; however, additional excavation activities were halted to reevaluate safety measures and develop proper procedures to be implemented prior to continuing with the excavations.

1.3.4 OOU 11C is located west of Cedar Springs Drive, due northwest of OOU3 (Figure B-3 in Appendix B). OOU 11C is privately owned and is an undeveloped, moderately wooded property. M9 rifle grenade fragments have been found at depths of 13 inches below ground surface. OOU 11C is in a residential area adjacent to Kelsey Creek where other ordnance items, including MK II hand grenades, have been found.

1.3.5 OOU 11D is located between Keltner Avenue and East Croft Circle, north of OOU3 (Figure B-4 in Appendix B). The area is privately owned and developed for use as a golf course. The area is a suspected former grenade range. Some of the outlining area around OOU 11D is wooded and may require some brush clearing. Practice grenades at depths of three inches have been recovered in OOU 11D.

1.3.6 The current land usage is 7,088 acres for Camp Croft State Park, 4,936 acres for farming, 256 acres for private industry, and 6,764 acres for residential.

1.4 TOPOGRAPHY

1.4.1 OOU 3, 11C, and 11D are situated on mixed-use areas. The topography of these areas varies from densely wooded to open areas. All of the lots are wooded. The degree to which the lots are wooded varies from each land parcel.

1.4.2 The ground slope at the Former Camp Croft varies from gently rolling and relatively level among the residential lots to fairly steep slopes.

1.5 CLIMATE

The Spartanburg County climate is considered temperate, and rainfall is well distributed throughout the year. The prevailing winds are primarily from the southwest but are from the northeast in late summer and early fall. Average wind velocity is about eight miles per hour. Up until 1968, the average relative humidity per year was approximately 70 percent, with from 1/10 inch of rain (about 76 days/year) up to one inch or more (approximately 14 days/year). The highest rainfall recorded is 73.93 inches in 1929. Warm weather generally lasts from May into September with few breaks in the heat during mid-summer. Most summers have one or more days when the temperature exceeds 100 degrees Fahrenheit. About 23 percent of the rainfall occurs in fall. Winters are mild and relatively short with nearly 60 days at freezing temperatures.

2.0 TECHNICAL MANAGEMENT PLAN

2.1 GENERAL

ZAPATAENGINEERING will perform OE removal actions in accordance with this Work Plan. The work performed under this Work Plan will conform to the following regulations and directions:

- ZAPATAENGINEERING Safety and Health Program (SHP);
- 27 CFR 55, Commerce in Explosives;
- Bureau of Alcohol, Tobacco, and Firearms Pamphlet (ATFP) 5400.7, Alcohol, Tobacco, and Firearms Explosives Laws and Regulations;
- National Institute for Occupational Safety and Health (NIOSH)/Occupational Safety and Health Administration (OSHA)/US Coast Guard (USCG)/Environmental Protection Agency (EPA) Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities;
- American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents, and Biological Exposure Index (BEIs);
- Applicable sections of OSHA, 29 CFR 1910, General Industry Standards;
- Applicable sections of OSHA, 29 CFR 1926, Construction Standards;
- Applicable sections of EPA, 40 CFR 260 to 299, Protection of Environment;
- Applicable sections of Department of Transportation (DoT), 49 CFR 100 to 199, Transportation;
- CEHNC Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual;
- CEHNC Engineer Regulation (ER) 385-1-92, Safety and Occupational Health Document Requirements for Hazardous Waste Remedial Actions;
- Department of Defense (DoD) 6055.9-STD, DoD Ammunition and Explosives Safety Standards;
- DoD 4160.21-M, Defense Reutilization and Marketing Manual;
- Department of Army (DA) Pamphlet 385-64, Ammunition and Explosives Safety Standards;
- Army Regulation (AR) 385-64, Ammunition and Explosives Safety Standards;
- AR 200-1, Environmental Protection and Enhancement;
- AR 385-10, The Army Safety Program;
- AR 385-16, System Safety Engineering and Management;
- AR 385-40 w/CEHNC supplement, Accident Reporting and Records;
- Technical Manual (TM) 9-1300-200, Ammunition General;
- TM 9-1300-214, Military Explosives; and
- TM 60 Series Publications.

2.2 DISCOVERY OF CHEMICAL WARFARE MATERIEL

A review of the available documentation provides no evidence to suggest that Chemical Warfare Materiel (CWM) were deployed or stored at Camp Croft. During the time the camp was active, it was an acceptable practice to bury expended training residue. Because of these practices, unexploded ordnance (UXO) personnel will remain vigilant for possible riot control and other hazardous materials. In the unlikely event that CWM is encountered during operations, work will immediately halt, personnel will withdraw upwind from the area, and the CEHNC Safety Specialist will be notified. Site personnel will stand-by for follow-on instructions from the CEHNC Contracting Officer (CO).

2.3 OFF-SITE DISPOSAL AND DISCOVERY OF UNIDENTIFIED UNEXPLODED ORDNANCE

2.3.1 Off-site Disposal

It is planned that UXO disposals will be completed on-site. If a scenario is encountered that prevents the destruction of UXO on-site, the CEHNC Safety Specialist will be notified. Site personnel will stand-by for follow-on instructions from the CO.

2.3.2 Unidentified Unexploded Ordnance

If unidentifiable UXO is discovered, the default separation distance specified in C9.8.4 of DOD 6055.9 (Revision 3-September 2003) will be used to establish the exclusion zone. Unidentified UXO will not be disposed of until the munitions filler can be determined. The appropriate disposal procedures/disposition will be determined using guidance from the on-site CEHNC Safety Specialist.

2.4 TECHNICAL SCOPE

The specifics of the technical scope of the project such as grid sizes, grid layout, and software to be used in sampling or removals are found in Section 6.0, Geophysical Investigation Plan and Section 7.0, Location Surveys and Mapping Plan. The initial task order award will be for the intrusive excavation of several previously identified pits located within Grids 17 and 40 of OOU 3 followed by re-mapping of Grids 17 (1.082 acres), 40 (0.854 acres), and 35P4 (0.657 acres) using digital geophysical methods for Quality Control (QC) purposes and to verify removal activities were completed within the pits and grids prior to the Government's Quality Assurance (QA) activities. Refer to Figure B-1 for a map indicating the location of Grids 17, 40, and 35P4 of OOU 3. If additional anomalies are identified after geophysical mapping, the anomalies are to be intrusively investigated prior to turning the grids over to the Government for QA procedures. Table 2-1 details the specific activities for this project.

TABLE 2-1 INVESTIGATION ACTION ACTIVITIES

Area	Objectives	Size (acres)	Depth (feet)
OOU 3 – Grid 17	Locate, identify, and dispose of all UXO.	1.082	Clearance to depth
OOU 3 – Grid 40	Locate, identify, and dispose of all UXO.	0.854	Clearance to depth
OOU 3 – Grid 35P4	Locate, identify, and dispose of all UXO.	0.657	Clearance to depth
OOU 3 – Grids 23P-33P, 29-1P, 35P1-35P3, 37P, 40P-42P, GC-1, and GC-2	Locate, identify, and dispose of all UXO.	24	Clearance to depth
OOU 11 – Area C	Locate, identify, and dispose of all UXO.	9.48	Clearance to depth
OOU 11 – Area D	Locate, identify, and dispose of all UXO.	11.2	Clearance to depth
Created By: KJ Reviewed By: MW			

2.5 CHANGES IN SITE CONDITIONS

In the event that site conditions (e.g., geology, topography, terrain, soil, etc.) change, which adversely affect safety or the ability of selected geophysical equipment to detect subsurface anomalies, work will immediately halt, and the CEHNC Safety Specialist will be notified. Site personnel will stand-by for follow-on instructions from the CO.

2.6 PROJECT TEAM

Figure 2-1 presents an organizational chart depicting the various organizations and key personnel involved in this project.

2.6.1 US Army Corps of Engineers, Charleston District

The US Army Corps of Engineers (USACE), Charleston District (CESAC) is the sponsor of the removal action. CESAC responsibilities include coordination for site access, review of project work plans and documents, communication with the news media and public, and coordination with state and local regulatory agencies.

2.6.2 US Army Engineering and Support Center, Huntsville

The CEHNC is the implementing agency for this project and has approval authority for project execution. The CEHNC responsibilities include providing expertise for OE-related activities, procuring OE Contractor services and directing the OE Contractor, controlling the budget and schedule, and coordinating document reviews.

2.6.3 ZAPATAENGINEERING, P.A.

ZAPATAENGINEERING is the prime contractor to CEHNC and will provide all engineering support and OE services for the removal action. ZAPATAENGINEERING is responsible for performance of the activities detailed in the SOW (Appendix A), including the development of the Work Plan and monitoring of the project budget and schedule.

2.6.3.1 Project Manager

Mr. Michael Winningham, the Project Manager, is responsible for all aspects of the project including ensuring the quality of all products and services provided as part of this SOW. He will ensure that all deliverables satisfy project requirements and are conducted in accordance with applicable Data Item Descriptions (DIDs) and the ZAPATAENGINEERING Quality Manual. Mr. Winningham, as the Project Manager, is responsible for the following:

- Project execution;
- Implement, document, and maintain the QC plan;
- Respond to QC audits;
- Coordinate improvements to the QC plan based on suitability reviews;
- Obtain and communicate client requirements to the appropriate personnel;
- Ensure that qualified, skilled, and trained personnel and other resources are available for project execution;
- Ensure that products and services satisfy client requirements including quality, safety, cost, schedule, performance, reliability, durability, accuracy, and maintainability; and
- Ensure that personnel comply with applicable standards, regulations, specifications, and documentation procedures.

2.6.3.2 Unexploded Ordnance Quality Control/Safety Officer (UXO QC/SO)

The UXO QC/SO is responsible for the following:

- Contribute to the QC plan;
- Implement the QC plan in the field; and
- Conduct QC audits.

2.6.3.3 Senior UXO Supervisor (ZAPATAENGINEERING)

The Senior UXO Supervisor is responsible for the day-to-day on-site management of UXO services. His responsibilities include direction of all UXO site operations and coordination with the ZAPATAENGINEERING QC/SO and Project Manager.

2.6.3.4 Senior Geophysicist

The Senior Geophysicist is responsible for the following:

- Ensure the collection of quality geophysical data.

2.6.3.5 Staff Engineers and Scientists

Staff engineers and scientists are responsible for the following:

- Implement, document, and maintain the QC plan;
- Respond in coordination with the Project Manager to QC audits;
- Ensure that products and services satisfy client requirements including quality, safety, performance, reliability, durability, accuracy, and maintainability; and
- Ensure that products and services comply with applicable standards, regulations, specifications, and documentation procedures.

2.6.3.6 Removal Action Work Plan Preparers

The following personnel developed this Removal Action Work Plan:

- Michael Winningham, Project Manager;
- David Smith, Senior Geophysicist;
- David Wolf, Project Scientist; and
- Suzy Cantor-McKinney, Quality Control.

2.6.4 NAEVA Geophysics, Inc.

2.6.4.1 NAEVA Geophysics, Inc. (NAEVA), under contract to ZAPATAENGINEERING, will collect and process geophysical data from geophysical surveys at the project sites. ZAPATAENGINEERING'S Senior Geophysicist will oversee the prove-out and data collection.

2.6.4.2 A geophysical prove-out plot will be prepared within the Former Camp Croft project site. ZAPATAENGINEERING will bury representative inert ordnance items to serve as targets to evaluate the performance capabilities of the geophysical and position location equipment proposed for use at all referenced sites.

2.6.4.3 Upon conclusion of the geophysical investigation, NAEVA will relocate the anomalies for subsequent OE sampling of the grids.

2.6.5 B.P. Barber & Associates, Inc.

B.P. Barber & Associates, Inc., under subcontract with ZAPATAENGINEERING, will survey corner points of all sampling grids within the project site. Survey data will be incorporated into the base map, including control monuments and grid plots.

2.6.6 Blackwell's Grading

Blackwell's Grading will conduct brush-clearing operations in OOU 11C, OOU 11D, and OOU 3 as required to conduct safe OE removal activities.

2.6.7 ERDC - Vicksburg

The government laboratory, ERDC – Vicksburg, will perform analytical confirmatory testing for white phosphorus. Adherence to ERDC – Vicksburg's Quality Assurance and Quality Control Program is accomplished by the assignment of an experienced employee. This person is responsible for all phases of ERDC – Vicksburg's involvement in the project, including pre-project planning, sample bottle preparation, computer entry, analytical and QC data approval, final review of the analytical report, and discussions of results with CEHNC and ZAPATAENGINEERING. The Point of Contact (POC) for ERDC – Vicksburg is Mr. Richard Karn, who can be reached at (601) 634-3863. All samples should be sent to the below address and chain of contact person.

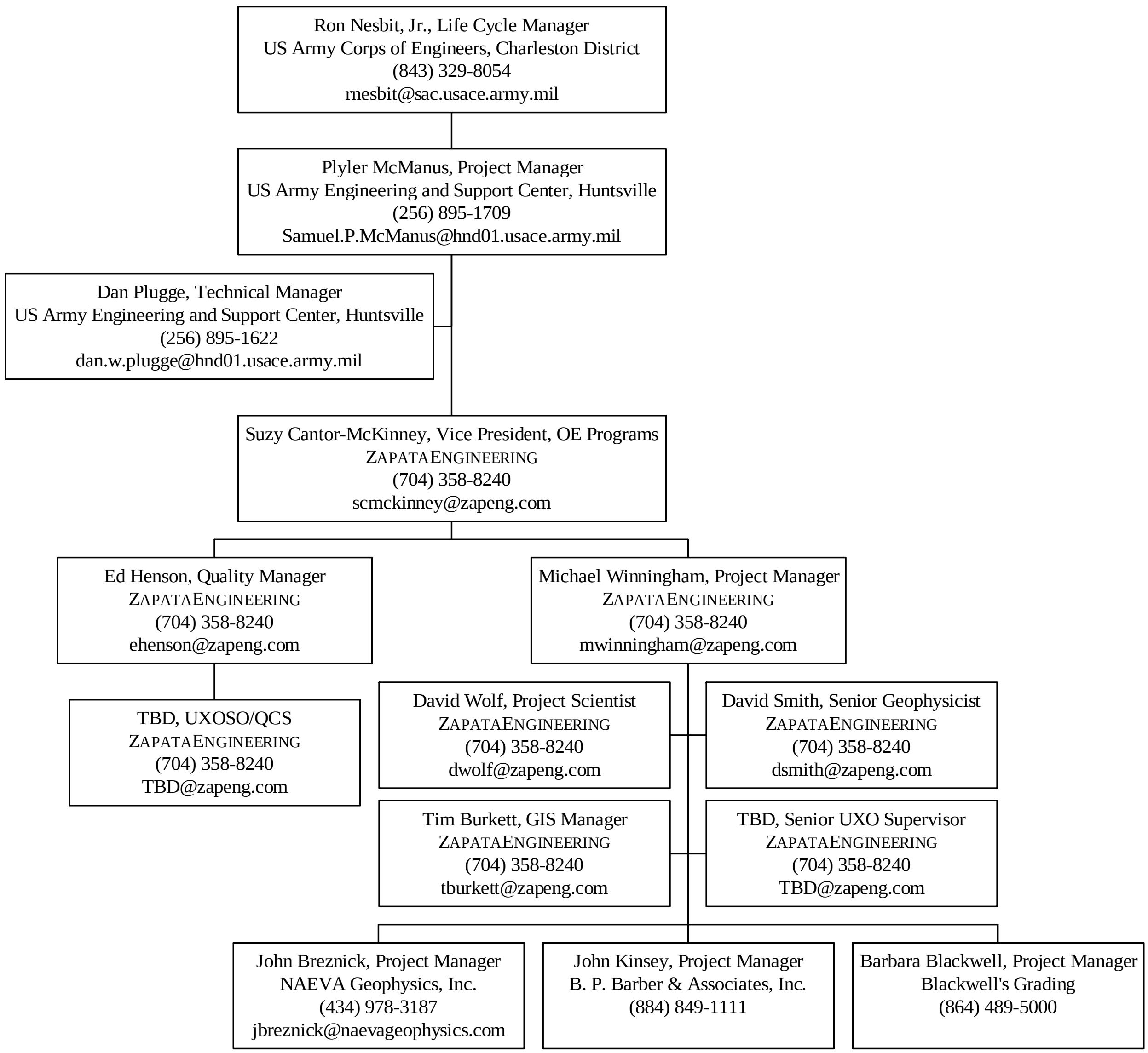
USACE ERDC - Vicksburg
Attn: Linda Stevenson, EP-C
3903 Halls Ferry Road
Vicksburg, MS 39180-6199

2.6.8 ERDC – CRREL

The government Quality Assurance (QA) laboratory, ERDC – CRREL, will perform analytical QA split samples for this project. Adherence to ERDC – CRREL's Quality Assurance and Quality Control Program is accomplished by the assignment of an experienced employee. This person is responsible for all phases of ERDC – CRREL's involvement in the project, including pre-project planning, sample bottle preparation, computer entry, analytical and QC data approval, final review of the analytical report, and discussions of results with CEHNC. The Point of Contact (POC) for ERDC – CRREL is Ms. Marianne E. Walsh, who can be reached at (603) 646-4666.

CRREL
ATTN: Marianne E. Walsh
72 Lyme Road
Hanover, NH 03755-1290
(603) 646-4666

FIGURE 2-1 ORGANIZATIONAL CHART



2.7 PRELIMINARY ACTIVITIES

2.7.1 Project Initiation and Planning

2.7.1.1 The purpose of this section is to describe the ZAPATAENGINEERING approach to field organization and management of the Camp Croft field effort. Working closely with CEHNC will be key to a successful project. Frequent communication and transfer of comprehensive information will enable the management team and the Corps of Engineers to establish requirements up front in the process and work together to solve problems.

2.7.1.2 ZAPATAENGINEERING will establish a field office off Dairy Ridge Road, adjacent to the existing earthen magazines. The office will be established in coordination with the Croft State Natural Area Supervisor. The trailer will be located outside the potential exclusion zones. Earthen magazines will be used for equipment storage.

2.7.1.3 ZAPATAENGINEERING is the prime contractor on this project. ZAPATAENGINEERING will provide any and all supplies, equipment, and personnel necessary to perform the UXO clearance as defined in the Scope of Work. The Senior UXO Supervisor (SUXOS) will be the field point of contact. This person will direct day-to-day site activities.

2.7.1.4 The SUXOS will be responsible for establishing the field office under the direction of the Project Manager. The field office will be the base of operations for ZAPATAENGINEERING during field activities. Activities related to setting up a field office include:

- Equipment rentals – This includes:
    - The rental of vehicles to transport individuals to the site and transport personnel and or equipment on the site.
    - Any equipment that may be required to operate the site.
    - Generators, brush clearing equipment, or other construction equipment.
- Permitting (construction, dig permits, explosive storage permits, etc.) Camp Croft is a FUDS project, and as such, permits will not be required.
- Shipping and Mail – The local post office and applicable shipping locations will be identified, prior to starting work at the site.

2.7.2 Field Equipment and Support

2.7.2.1 ZAPATAENGINEERING has a well-stocked inventory of field equipment available to its personnel. The major components of the ZAPATAENGINEERING team, field-testing and UXO clearance equipment are summarized in Chapter 9.0 (Property Management Plan).

2.7.2.2 Whenever it is expedient and cost effective, ZAPATAENGINEERING will transport equipment and materials to a project site with company-owned vehicles. Transportation can be augmented with commercial carriers.

2.7.3 General Office Administration

Office Hours/Holidays. The field staff normally work four 10-hour days, Monday through Thursday (not to exceed 40 hours per week), except for ZAPATAENGINEERING observed holidays. The work hours of the staff may be adjusted by the PM (such as working five 8-hour days) to better support the field operations.

2.8 LOCATION, SURVEYING AND MAPPING

Refer to Location Surveys and Mapping Plan (Chapter 7.0) for detailed information.

2.9 SITE PREPARATION

2.9.1 Site preparation consists of the following actions:

- Establishment of Geophysical Test Area.
- Establishment of work area boundaries (Survey).
- Establishment of grids.
- Tree and Brush removal.

2.9.2 Geophysical Test Area (Geophysical Prove-out)

A geophysical test grid will be constructed to test the effectiveness of various geophysical instruments to detect and record the location of subsurface metallic objects at Camp Croft.

2.9.3 Placement of Grids

Refer to Chapter 7.0, Location Surveys and Mapping Plan, for a discussion of the placement and layout of the grids.

2.9.4 Tree Removal/Replacement

2.9.4.1 Trees will be removed only with written authorization from the property owner and only as required to accomplish the tasks in the Statement of Work (Appendix A). Situations requiring removal could include a UXO imbedded in the tree, caught or suspended in the roots or branches, or to gain access to a UXO. In this case, trees will be removed by hand using chain saws. The tree will be sectioned, if necessary, to remove it from the immediate area, so it does not interfere with the OE removal action. If possible the tree will be trimmed or pruned back instead of removed. The CEHNC Safety Representative will be informed and presented the owner's authorization certificate prior to any action that would result in damage to any tree that is part of a landscaped yard or park area.

2.9.4.2 If the tree that must be removed is part of a landscaped yard or park area, every effort will be made to replace the tree with one of the same type and comparable size. In the event that the same type of tree is not available, one acceptable to the owner of the property will be substituted.

2.9.5 Brush Clearing/Replacement

2.9.5.1 Selected brush removal will be conducted as required, using mechanical equipment or manually, as conditions dictate. Cut brush will be removed only from the immediate work area so as to not interfere with the OE removal action. Selected brush removal may be required to gain access to an anomaly or discovered UXO. The CEHNC onsite Safety Representative will be informed prior to any action that would result in damage to any planted bush or shrub. If possible, brush that is planted in a landscaped yard or park area will be pruned instead of removed to allow access to the UXO.

2.9.5.2 In the event that a bush from a landscaped yard or park area must be removed, every effort will be made to replace it with the same type and size of bush. If the same type of plant is not available, one acceptable to the owner of the property will be substituted.

2.9.5.3 The condition of the area shall be photo-documented by the SUXOS prior to the start of work and the area will be restored to a comparable condition upon completion of the clearance.

2.9.6 Grass/Sod Removal/Replacement

2.9.6.1 Grass or sod removal will be done with as much care as possible by the UXO team so that the sod may be placed back in place after anomaly excavation and identification/UXO disposal operations are completed.

2.9.6.2 Where sod replacement is not possible, the area will be reseeded after excavation and/or UXO disposal operations are complete.

2.10 OE REMOVAL

2.10.1 General

Upon the completion of the site preparation (as described in paragraph 2.9), the removal action will commence with geophysical mapping, and OE removal activities.

2.10.2 Surface Clearance

2.10.2.1 Surface clearance operations will be conducted in support of brush clearing and geophysical operations. The surface clearance team will carefully identify and mark anomalies identified during the surface clearance using standard sweep line techniques. The sweep line will sweep the grid in alternating north and south oriented lanes, identifying potential OE items and recovering OE-related scrap. All surface clearance operations will be performed under the general supervision of the on-site SUXOS. The UXO Technician II, working under the direct supervision of the UXO Technician III, will identify and mark the target anomalies with crossed pin flags or stakes with flagging tape.

2.10.2.2 The UXO Technician III will record identification data, including nomenclature, offset, and weight on a field copy of the grid sheet. As a final check to ensure that the anomaly has been removed or destroyed, the UXO Technician III will visually check the anomaly locations at the end of the day to confirm the anomaly removal. The UXO Team will detonate in place any UXO or OE items containing explosives that are encountered during the surface clearance operations. All disposal operations will be performed under the direct supervision of the on-site SUXOS and the UXO Safety Officer.

2.10.3 Geophysical Survey

Refer to Geophysical Plan (Chapter 6.0) for a detailed description of any geophysical survey to be performed for this operation.

2.10.4 Anomaly Acquisition

2.10.4.1 The acquisition of anomalies will be accomplished by the Geophysical Teams operation using the same geophysical equipment utilized during geophysical mapping. Target anomalies identified on dig sheets will be flagged for excavation. In areas, which cannot be geophysically mapped, the search for anomalies will be accomplished by using magnetometers in a "Mag & Flag" type of operation. The decision whether to use a Mag & Flag or Mag & Dig operation will be made by the SUXOS on site depending on the condition of the grids. In the event of heavily contaminated areas or grids, the individual grids may need to be swept more than once. If the grid is to be swept more than once, operators may vary the instrument sensitivity settings to remove the larger anomalies first, increasing sensitivity in successive sweeps until the SOW objective for the grid is met.

2.10.4.2 Mag & Flag and Mag & Dig Procedures. A Mag & Flag and a Mag & Dig operations are conducted very similarly. In both procedures, the grid is divided into lanes approximately three to five feet wide. Actual width of the lanes is dependant upon the type of instrument and the individual grid. Grids where there is a high concentration of anomalies or have heavy brush or steep grades, lanes are usually narrower than grids with clear ground surface and relatively flat terrain.

2.10.4.3 For Mag & Flag operations, instrument operators line up along one side of the grid, one operator per lane, and advance to the opposite side of the grid. The instrument will be used to check the lane for anomalies and a pin flag placed next to the highest reading from the instrument at each anomaly. Operators are usually staggered slightly so that the instruments do not interfere with each other. After the grid has been completely swept by the team, UXO technicians go back and excavate each of the anomalies marked by the pin flags as described in paragraph 2.10.6.

2.10.4.4 For Mag & Dig operations, instrument operators line up as in mag & flag operations. Usually there are teams consisting of one instrument operator and one or two excavators. As the operator proceeds along the lane, he uses the instrument to check for anomalies. As each anomaly is discovered, it is excavated and identified. This continues until the lane is completed and repeated in the next lane until the grid has been cleared.

2.10.5 Anomaly Reacquisition

Prior to excavation of targets, a two-person team will mark anomaly locations in the field. Utilizing the identical surveying system as was used for the collection of data, the team will reestablish the coordinate location of each anomaly as listed on the dig sheet and mark them using pin flags labeled with the appropriate target identifier. The location of each anomaly will then be refined using the same geophysical instrument as was used for the original survey. The team will collect and carefully monitor continuous geophysical readings and slowly maneuver the instrument over the anomaly until the peak response is located. Pin flags will then be adjusted to the location of peak response. The locations of all target peak locations will also be marked with spray paint in case any pin flags are disturbed prior to the start of excavation. The reacquisition team will document the coordinates of all adjusted anomaly locations and their peak response values as well as any targets that cannot be reacquired.

2.10.6 Anomaly Excavation

2.10.6.1 Prior to any intrusive operation, the exclusion zone must be clear of all non-UXO qualified personnel. ZAPATAENGINEERING will coordinate the Removal Action activities and excavations with homeowner's and golf course management. Non-UXO qualified personnel will not be allowed back into the exclusion zone until all intrusive activities within that zone are complete. NOTE: Due to the close proximity of homes, it is possible for a home to be within the exclusion zones of intrusive operations taking place on several housing lots. Every effort will be made to minimize the disruption to residents of the community consistent with safety concerns. Once established, the exclusion zone will remain in effect until all intrusive and disposal activities within the zone boundaries have been completed. Once activities within the zone have been concluded, the SUXOS will direct closure of the zone, opening the area to normal activities.

2.10.6.2 Grid 35P4, OOU 11C, and OOU 11D - The UXO Team will excavate down to each anomaly and perform Explosive Ordnance Reconnaissance (EOR) procedures, assessing all suspect OE to determine their condition and potential hazards. Depths of initial excavations will not exceed four feet.

- Qualified UXO personnel will perform excavations so that identification procedures can be conducted. If the anomaly cannot be uncovered within the specified depth, the UXO Team will conspicuously mark the site with yellow flagging material and continue. The on-site CEHNC Safety Specialist will determine if deeper excavation is required.
- Engineering controls described in Section 2.10.7 will be utilized during intrusive operation within Grid 17.
- If the subsurface contact proves to be non-UXO, it will be removed and the hole rechecked with the agreed-to geophysical instrument. If the hole is "clean," it will be refilled and tamped and recovered with the removed grid cover. If the contact is a UXO, it will be marked with a red pin flag for disposal as required.
- Each UXO will have its condition determined by qualified UXO personnel. UXO whose condition cannot be positively determined or is determined to be unsafe to move will be "blown-in-place". UXO which are deemed safe to move will be disposed of in accordance with directions in paragraph 2.11. Once the UXO is gone (removed or detonated) the hole will be rechecked with a geophysical instrument to ensure it is clear of anomalies.
- All access/excavation/detonation holes will be backfilled. Reseeding/sodding with indigenous grass will occur as directed in the SOW. If possible, UXO personnel will replace the sod 'plug' that was initially removed at the start of the excavation.

2.10.6.3 Grid 17 and Grid 40 - The UXO Team will excavate down to each anomaly and perform Explosive Ordnance Reconnaissance (EOR) procedures, assessing all suspect OE to determine their condition and potential hazards.

2.10.6.4 ZAPATAENGINEERING will conduct a clearance to depth in three small pits in Grid 17 and one pit in Grid 40. We assume a clearance effort of one week per pit for UXO operations. In the event that clearance depths of the pits exceed four feet, ZAPATAENGINEERING will develop safety measures in compliance with OSHA, CEHNC EM 385-1-1, and other pertinent regulations.

2.10.6.5 The Most Probable Munition (MPM) fragmentation distance for the M15 White Phosphorus grenade is 517 feet, which will require the local residents to be evacuated as well as use of engineering controls. Engineering controls will consist of a portable canopy with adjustable legs, which will be positioned over the pit(s). For additional safety, the canopy will be covered with a fire resistant tarp (top and both sides, with the ends being open). The Croft Fire Department will stand ready to assist just outside of the fragmentation distance during intrusive operations (at no cost). As necessary, homes nearest the pits will be wetted down with a controlled spray by the local fire department. Residents within the fragmentation arc will be evacuated.

2.10.6.6 Based on aerial photographs, it appears that two residential homes are within the immediate vicinity of Grid 17. The CEHNC Guide for Selection and Siting of Barricades for Selected Unexploded Ordnance (HNC-ED-CS-S-96-8 R1 dtd Sep 97) will be used to determine the best methodology and calculations for providing a level of property protection to the nearby and surrounding residences. A barricade made of sufficient thickness (e.g., 0.09" of steel or 0.22" of aluminum), sized and sited in accordance with HNC-ED-CS-S-96-8 was determined to be the best method of defeating the fragmentation of the M15 WP grenade. Either a plate barricade design or a shed structure design will be used to mitigate the fragmentation hazard associated with Grid 17. Costs and practicability will be the determining factor on which design is used.

2.10.7 Barricade Siting

2.10.7.1 **Plate Barricade Design** - Barricades will be placed between the excavation and the structures and no closer than one foot of the pit area being excavated. A total of five barricades will be used during the excavation of the pits. Three barricades will be placed on the southern end of the pit and two barricades will be placed on the western edge of the pit in Grid 17. A minimum of one inch will be overlapped between barricades. This will provide an 11' 8" x 10' on the southern side and a 7' 10" x 10' on the western side. In the event that landscape exceeds a slope pitch of 10%, barricades will be leveled and stabilized using local engineered solutions such as sandbags and blocking materials. Barricades will be manufactured to allow movement by the excavation equipment.

2.10.7.2 **Shed Structure Design -** The shed will be of sufficient size to encompass the three pits within Grid 17 and still allow for safe excavation activities. The shed barricade will be a three-sided barricade with the open-end facing away from any nearby residents. The barricades will be leveled and stabilized using local engineered solutions such as sandbags and blocking materials. Barricades will be manufactured to allow movement by the excavation equipment.

2.10.8 Excavation

2.10.8.1 The pit will be excavated using a backhoe. If the backhoe cannot gain access to the backyard, the pits will be excavated by hand. The backhoe will be located outside of the engineering controls and the operator will extend the boom of the backhoe and excavate the pit in 12-inch lifts. Prior to removal of the 12-inch lifts of soil, the area will be magged to ensure OE is not within the area to be excavated. Excavation will commence at the point furthest from both houses and work towards them in a forward and to the right direction. Excavation will continue until there is no further evidence of UXO/OE or OE related scrap items. Spoils from each lift will be placed onto geotextile and manually searched by hand by the UXO Technicians for OE items. This process will be repeated for each lift until entire contents of the pit(s) have been excavated. Additionally a five-gallon bucket filled with water will be position adjacent to the excavation site in the event a smoking M15 grenade is encountered, which will be submerge into the water as quickly and gently as possible. Additionally acceptable-to-move M15 grenades will also be submerged in five-gallon buckets of water for transport to the disposal area. Grid 17 will be geophysically mapped as a Quality Control check per Task 7 of the SOW, and the anomalies will be reacquired. Spoils determined to contain white phosphorus will be disposed of as Investigated Derived Waste (IDW), per Task 14 of the SOW. Non-contaminated spoils will be returned to the pit at the conclusion of the removal action.

2.10.8.2 Recovered M15 WP grenades will be transferred to the Spartanburg Sheriff's Department Bomb Squad for disposal as has been done in the past. The submerged M15 WP grenades will be transferred to the Bomb Squad in five-gallon plastic buckets and they will transport it to their safe disposal area. The transfer will be documented on a DD Form 1348-A1 stating the quantity and to whom they were transferred to, and the date. This documentation will be included in the Final Report. In accordance with the calculation sheets a 517-foot minimal separation distance for all personnel will be maintained from the disposal site while demolition activities are being performed. The Spartanburg Sheriff's Bomb Squad will be responsible for evacuation and maintaining the safety zone. If require ZAPATAENGINEERING will support the Spartanburg Sheriff's Bomb Squad in maintaining perimeter security and other duties as assigned by the Bomb Squad.

2.10.8.3 The excavation will be backfilled with a mix of the soil that was removed for the pit and sand. The sand mix will establish the boundaries of the pits that were excavated. Once each section is excavated, the barricades will be repositioned prior to excavation of the next section of the pit. This process will position the excavator on or in areas free of UXO/OE items (outside of the pit area or in areas that have been previously cleared) thereby affording an additional level of safety. Additionally, in order to afford a level of protection to the equipment operator operating the excavator, the exposed areas of the excavator will be covered using "Lexan" (3.78") or the equivalent thickness of Plexiglas (approx 2.5").

2.10.8.1 Grid 40

The Project Team will conduct a subsurface OE Removal Action in one small pit within Grid 40 of OOU 3. The subsurface clearance will be conducted using an UXO team consisting of UXO Technicians. This site does not have a most-probable-munition (MPM) fragmentation distance as no UXO or OE-related scrap was recovered during the previous investigation. Only 105mm smoke canisters (Hexachlorathane Zinc) were recovered; therefore, engineering controls will not be required for this site and the pit will be excavated with an extended boom backhoe (preferred method) or excavated by hand if the backhoe cannot access the area. The spoils will be placed onto geotextile and visually searched by hand by the UXO Technicians for OE items. This process will be repeated until entire contents of the pit have been excavated. Grid 40 will be geophysically mapped as a Quality Control check per Task 7 of the SOW, and the anomalies will be reacquired. Non-contaminated spoils will be returned to the pit at the conclusion of the removal action. Any recovered 105mm smoke canisters will be package, transported, and disposed of by incineration utilizing Clean Harbors, Inc. in accordance with the Work Plan.

2.10.8.2 Grid 35P4

ZAPATAENGINEERING will not totally rely on the previous contractors data for completeness of the previous removal effort. As such, we will conduct a subsurface OE removal to a depth of detection on approximately 0.657 acres to ensure completeness of the previously conducted removal. Grid 35P4 will be geophysically mapped as a Quality Control check per Task 7 of the SOW, and the anomalies will be reacquired. The MPM fragmentation distance for a MKII grenade is 650 feet, which will be plotted onto a map to determine where the fragmentation distance would fall. Since this area is in a residential area, engineering controls (i.e., miniature open-front barricades) will be required. As this area has been cleared under a separate removal action, we estimate seven target items for removal.

2.11 UXO DISPOSITION

2.11.1 Section Outline

This section consists of the sections as outlined in Table 2-2:

TABLE 2-2 UXO DISPOSITION OUTLINE

Topic	Paragraph
General	2.11.2
Responsibilities	2.11.4
Overall Safety Precautions	2.11.5
Demolition Site Control	2.11.6
Safety	2.11.7
Transportation	2.11.8
Blow-in-Place Operations	2.11.9
Protective Works Plan	2.11.10
Demolition Procedures	2.11.11
Electrical Demolition Procedures	2.11.11.1
Non-electrical Demolition Procedures	2.11.11.5
Post Demolition/Disposal Procedures	2.11.11.8.3

2.11.2 General

2.11.2.1 During disposal of UXO and related material, safety is the primary concern. The most obvious requirements are to protect personnel, the general public, and the environment from fire, blast, noise, fragmentation, and toxic releases. Planned detonation of explosives requires more stringent safety distance requirements than those for ordnance in storage, and shall be conducted in accordance with the applicable sections of CEHNC Safety and Health Requirements Manual (EM 385-1-1), TM 60A-1-1-31, CEHNC Use of Sandbags for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions (HNC-ED-CS-S-98-7), OE Center of Expertise Interim Guidance Document 98-08, and DoD Ammunition and Explosives Safety Standards (DoD 6055.9-STD).

2.11.2.2 ZAPATAENGINEERING intends to utilize electrical demolition procedures for this removal action. This Work Plan, however, includes both electrical and non-electrical procedures. Non-electrical procedures are included to provide procedural guidance should circumstances arise where non-electrical firing procedures are the most prudent means of initiating a demolition shot.

2.11.2.3 All personnel directly or indirectly engaged in unexploded ordnance operations are thoroughly trained and capable of recognizing hazardous explosive exposures. All personnel are required to read, become familiar with, and adhere to the requirements contained in this work plan to assure that all general safety regulations and safe work practices are observed at all times. Absence of a written safety requirement does not indicate that safeguards are not required.

2.11.2.4 All ZAPATAENGINEERING personnel engaged in demolition range activities will utilize these procedures. However, situations may warrant additional safety measures, such as fire trucks, medical personnel, and protective clothing. The SUXOS has the overall responsibility to comply with the minimum requirements listed below and the authority to upgrade as the situation dictates.

2.11.2.5 The procedures outlined in this chapter provide instructions for the final disposal of unexploded ordnance, high explosive (HE) loaded components, propellants, and pyrotechnics.

2.11.2.6 Recovered UXO (does not apply to M15 Grenades) in the housing subdivision are to be destroyed as close to the discovery location as practicable. A series of disposal sites located in open (undeveloped) lots will be used. Location of these sites will be developed by coordination between the on site CEHNC representative and the SUXOS. Blown-in-place operations will only be done if the discovered UXO is considered unsafe to move. For the purpose of this project, the demolition range refers to the location of the disposal sites or where the blown-in-place (BIP) operations are conducted.

2.11.2.7 In the event that personal property (buildings, fenceline, etc.) is close enough to a discovered UXO that detonation could damage the property, the ZAPATAENGINEERING team will evaluate the UXO to see if it is acceptable to move. In the event that the UXO is acceptable to move, with approval of the CEHNC Safety Specialist, the item will be moved just far enough in the grid to preclude damage to the property. If the UXO is not safe to move, the ZAPATAENGINEERING team will inform the Corps of Engineers Safety Specialist to determine if a local EOD Unit needs to dispose of the item or can engineering controls reduce the potential for damage to the property. Engineering controls to be considered include trenching, tamp, sandbags, or other protective works.

2.11.3 Hazard of Electromagnetic Radiation to Ordnance (HERO) Evaluation.

2.11.3.1 Table 2-3 of Army Technical Manual (TM) 9-1375-213-12 provides minimum safe distances between mobile radio frequency (RF) transmitters and electric blasting operations. The RF transmitter of concern during this OE removal action is the cellular telephone. Since the cellular telephone operates at less than five watts, the minimum safe distance is five feet.

2.11.3.2 Since cellular telephones are normally operated at about five feet above the ground surface, no HERO hazard exists as long as personnel remain a minimum of five feet away from the ordnance.

2.11.4 Responsibilities

2.11.4.1 Senior UXO Supervisor

See para 2.6.3.3 above.

2.11.4.2 Demolition Supervisor

The on-site disposal shall be under the direct control of an experienced and trained UXO Supervisor charged with the responsibility for all demolition activities within the area. The Demolition Supervisor for this operation will be the UXO Tech III from one of the UXO Teams. The Demolition Supervisor is responsible for training all personnel regarding the nature of the materials handled, the hazards involved, and the precautions necessary, and shall be present during all on-site disposal operations. The Demolition Supervisor will also maintain custody of the blasting machine or fuze igniters. The Demolition Supervisor shall also coordinate making notifications with the SUXOS, as required, prior to all demolition.

2.11.4.3 Demolition Team Members

Individuals will report the completion of tasks to the Demolition Supervisor. The types of tasks, which may be required, are:

- Secure all access roads to the range area
- Visually check demolition site for any unauthorized personnel
- Check firing wire for continuity and shunt (if using an electrical firing system)
- Prepare designated shots
- Check continuity of detonators (if using an electrical firing system)
- Secure the detonators in a safe location
- Place charge in desired location

2.11.5 Overall Safety Precautions

2.11.5.1 Prior to conducting a disposal operation, the Demolition Supervisor will conduct a safety briefing to the members of the demolition team. This safety briefing will include, at a minimum: phases of the operation, review of explosive handling and Electro-Magnetic Radiation (EMR) precautions, location of safe area, emergency notification procedures, site specific characteristics, type of OE/UXO being destroyed, placement and quantity of counter charge, misfire procedures, post-detonation clean up of range, care and handling of explosive materials, personal hygiene, two person rule, potential trip/fall hazards, location of range vehicle, wind direction (toxic fumes), and the location of first aid kit and fire extinguisher. Range vehicle engine will be started prior to initiating priming procedures and kept running.

2.11.5.2 Telephone or radio communication will be established with emergency response personnel. No radio or cellular telephone transmissions will take place in the vicinity during the positioning or connecting of electrical initiating devices (refer to paragraph 2.11.11.1).

2.11.5.3 Additional overall safety precautions for demolition operations include:

- Operations will be conducted in accordance with Army Technical Manual (TM) 60A 1-1-31 (General Information on EOD Disposal Procedures).
- Demolition explosives will be stored in earth-covered magazines.
- During demolition operations, a designated emergency vehicle (in addition to the range vehicle) will remain in the area.
- Keep blasting caps in approved containers, located at least 7.62 meters (25.0 feet) from other explosives, until they are needed for priming.
- Always point the explosive end of blasting caps, detonators, and explosive devices away from the body and other personnel during handling. This will minimize injury should the item explode.
- Blasting caps used for initiation of explosive charges will not be buried.
- If explosive charges are to be covered or tamped with earth, charges will be fitted with detonating cord leads that protrude 1.8 meters (6 feet) from the earth.

- Blasting caps less than the equivalent of a commercial No. 8 cap will not be used unless used with commercial explosives and approved by the explosives manufacturer.
- Only those explosives or initiators needed to meet the requirement of the operation will be transported to the disposal site.
- Blasting machine or activating device will not be surrendered to the individual designated to fire the shot until the Demolition Supervisor is assured that the area is clear.
- An appropriate distance around the demolition site shall be cleared of dry grass, leaves, and other extraneous combustible materials.
- There will be a minimum wait time of 30 seconds (for electric operations) or five seconds (for non-electrical operations) between detonations.

2.11.6 Demolition Site Control

2.11.6.1 Control of the demolition site must be maintained during demolition operations. All personnel who are not essential to demolition operations must evacuate to a safe area. Access roads entering the blast area will be blocked during explosive disposal operations to ensure that unsuspecting individuals are not placed in jeopardy by the explosion. The Demolition Supervisor will assure the area is clear of unauthorized personnel and equipment prior to permitting attachment of the initiation devices to the priming charge.

2.11.6.2 An observer will be stationed at a location where there is a good view of the air and surface approaches to the demolition site. It shall be the responsibility of the observer to notify the Demolition Supervisor to suspend firing if any aircraft, vehicle, or personnel are sighted approaching the general demolition site.

2.11.6.3 A minimum of two UXO qualified personnel, one of which will be the Demolition Supervisor, will conduct demolition operations. An electrical firing system provides better control of the demolition activities, yet, on specific sites, based on the terrain, vegetation and other site parameters, the use of a non-electrical firing system may be acceptable. The Demolition Supervisor will decide which firing system is suitable for the specific task to be accomplished. Control of initiation devices will remain with the Demolition Supervisor until attachment to the firing circuit.

2.11.6.4 The Local Fire Department (Refer to Appendix C) will be informed of the location, date and time of detonation and of the materials to be detonated. In the event of an unplanned fire or explosion, ZAPATAENGINEERING personnel will attempt to put out the fire. If unable to do so, fire support services will be requested from the Fire Department and the area will be evacuated. ZAPATAENGINEERING personnel may support the Fire Department if requested.

2.11.6.5 Prevailing weather condition information will be obtained from a local source; this data will be logged before each on-site detonation. Demolition charges will not be primed or connected for electrical firing during the approach or presence of a thunderstorm. Other weather conditions (high winds, dust storms, snow storms, temperature inversions, low altitude clouds, or a cloud coverage of more than 50%) may adversely impact planned demolition operations. The Demolition Supervisor will take these conditions into consideration when determining whether or not to conduct demolition operations. If weather conditions preclude the disposal, ZAPATAENGINEERING will secure the UXO with sand bags and cover, properly mark, and guard until favorable conditions allow the disposal.

2.11.6.6 Personnel will remain at the site as long as the possibility of fire exists as the result of a demolition operation.

2.11.7 Safety

2.11.7.1 Minimum Separation Distance (MSD)

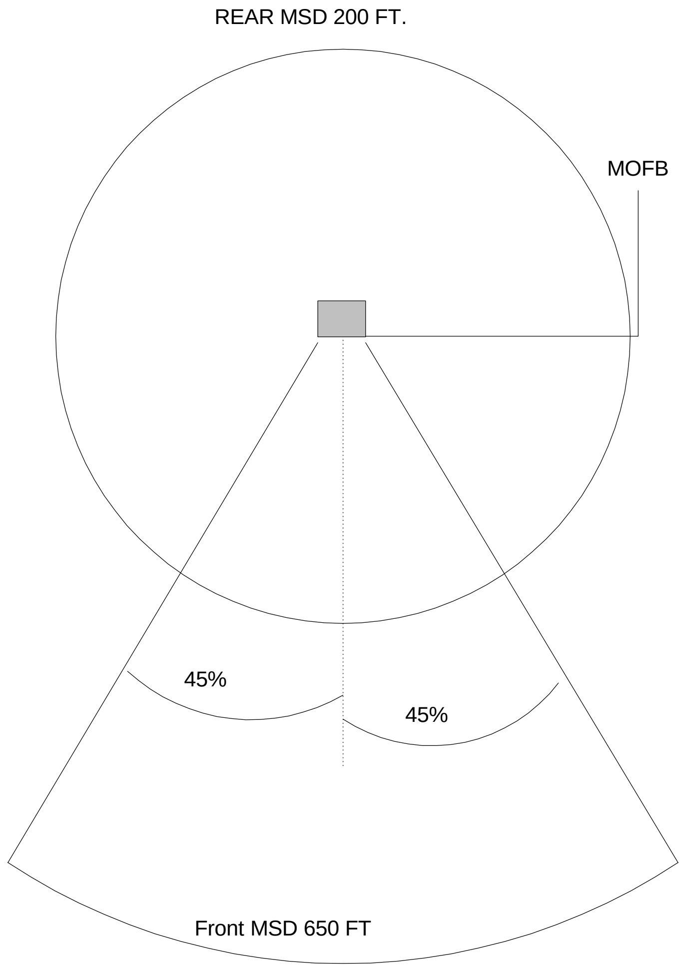
2.11.7.1.1 The MSD is based on the MPM for an area. Based on previous work in this general area and information provided on items observed on the surface, the MPM for the housing subdivision area Grid 35P4, OOU 11C, and OOU 11D is a MK II grenade. If an item larger than the designated MPM is found, the default public withdrawal distances in DOD 6055.9-STD, paragraph C9.8.4 will be used until an actual MSD calculation can be received from the CEHNC OE Center of Expertise. Anytime a UXO is found that may have a greater fragmentation distance or blast overpressure distance than the current MPM, the fragmentation and blast overpressure will be computed for that item in accordance with Interim Guidance Document 98-08. If the fragmentation distance is greater for the new item, it will become the MPM for the site and the MSD will be changed. If the blast overpressure is greater on the newly discovered item and if it is greater than 200 feet, the separation distance between teams will be changed to the greater distance.

2.11.7.1.2 The MSD during excavation activities for this ordnance removal action in the housing subdivision is 650 feet, and is also used as the exclusion zone distance. Figure 2-2 is provided by the CEHNC PM as the maximum distance fragments may be projected by a MK II grenade. This MSD may be reduced by the use of the Miniature Open Front Barricade (MOFB). When the MOFB is in place, the MSD is 200 feet except for a 90% arc from the front opening (see Figure 2-2).

2.11.7.1.3 **Grid 17 –** A 517-foot MSD will be maintained from the perimeter of the three pits in Grid 17 while intrusive excavations are being performed. The exclusion zone shall be established in an outward radial pattern from the perimeter of the active search area. ZAPATAENGINEERING will be responsible for evacuation and maintaining the safety zone. The SUXOS shall maintain a schedule of active and pending intrusive work by grid. The 517-foot evacuation zone is based on the fragmentation distance of the MPM (M15 WP hand grenade). In the event a UXO is discovered that has a larger net explosive weight than a M15 WP hand grenade or is characteristic of munitions containing toxic or other hazardous material, the Government Safety Specialist shall be immediately notified, the item will be marked, and remain undisturbed until the evacuation safety zone is adjusted and additional evacuation is accomplished. No action may be taken on the item until authorization is received from CEHNC.

2.11.7.1.4 **Grid 40** - This site does not have a MPM fragmentation distance, as no UXO or OE-related scrap was recovered during the previous investigation. During the previous investigation, only 105mm smoke canisters (Hexachlorathane Zinc) were recovered; thus no engineering controls will be required for this site. In accordance with EM 1110-1-4009, Section 11-6.a. the minimal separation distance for unintentional detonations is 200 feet for the pit location.

FIGURE 2-2 MSD WHEN USING MOFB (NOT TO SCALE)



2.11.7.1.5 This MSD will encompass the area of activity, and it will control access and egress. Only ZAPATAENGINEERING personnel and the CEHNC Safety Specialist will be authorized access within the MSD during UXO and demolition operations. The SUXOS shall brief personnel on entering/exiting procedures and will establish and maintain the integrity of the area. All persons entering/exiting the work site will do so by the established lanes of the MSD.

2.11.7.2 Demolition Operations Fragmentation Distance

2.11.7.2.1 Minimum Separation Distances (MSD) are based upon the MSD calculations provided by CEHNC. The destruction of multiple UXO items shall not be performed.

2.11.7.2.2 For a BIP operation, if the ordnance item is unknown, every reasonable effort will be exhausted to identify the item in question and correctly identify the contents and quality of explosives. This effort may require technical research by the Government Safety Specialist to provide ordnance data available in the vast library at CEHNC or response from the active duty

EOD/Tech Escort unit. Any item known to or suspected of containing CWM shall not be destroyed. The Government Safety Specialist shall be immediately notified and he/she shall request the services of the US Army Tech Escort Unit. If after extensive research, the item cannot be positively identified by specific MK, Mod or Model but is known to possess only a conventional explosive payload, the default MSD's detailed in Chapter 9, paragraph C9.8.4, DoD 6055.9 – STD, 'DoD Ammunition and Explosives Safety Standards' will be used as the public withdrawal distances. If the ordnance item is known, directives *in Determination of Appropriate Safety Distances on Ordnance and Explosives (OE) Project Sites*, OE Center of Expertise (CX) Interim Guidance Document 98-08 will be used.

2.11.7.2.3 The MSD's provided in paragraph 2.11.7.1.2 and 2.11.7.1.3 are for open, unbarricaded shots. If there is a protective shelter with frontal and overhead protection, a shorter distance is possible. However, every effort should be made to adhere to the appropriate fragmentation range regardless of shelter or depth the shot is buried.

2.11.8 Transportation

2.11.8.1 Refer to Chapter 3.0, Explosives Management Plan, for procedures outlining the transportation of demolition material to the demolition site.

2.11.8.2 Transportation of acceptable to move OE to the demolition site will be done in a wooden box secured to the bed of the vehicle. The individual items will be placed in a bed of sand in the transport box and the box lid closed and secured. The vehicle will proceed directly to the disposal area and the UXO processed for disposal. (At no time will the transport vehicle leave the Former Camp Croft area when loaded with any UXO.)

2.11.9 Blow-in-Place Procedures

2.11.9.1 ZAPATAENGINEERING will notify the CEHNC Safety Specialist of its intent to blow-in-place. This notification will take place upon discovery of an item requiring blow-in-place procedures and at least 30 minutes prior to the expected time of detonation. Detonations will take place at the end of each workday.

2.11.9.2 Detonations will begin only after the Government Safety Specialist has been notified, all unnecessary personnel have left the area, road guards have been posted, the required local authorities have been notified, and protective works have been instituted. Prior to conducting the disposal procedures, the Demolition Supervisor will check the area and available drawings to determine if there are any underground utilities that may be affected by a detonation. Prior to detonation, all personnel will withdraw beyond the MSD.

2.11.9.3 ZAPATAENGINEERING will notify local property owners, located within the site-specific MSD of intrusive activities, to conduct an evacuation. Intrusive activities include but are not limited to: breaking of ground, uprooting trees/shrubs, mowing vegetation, and vehicle movement over un-cleared areas within potentially UXO contaminated soil. All personnel and livestock will be evacuated to a safe location outside the MSD (to be determined and/or adjusted by the SUXOS in concert with the Government Safety Specialist). At the discretion of CEHNC, arrangements may be made for local temporary accommodations for displaced residents. ZAPATAENGINEERING will determine minimum MSD's (as outlined in Section 2.11.7), and establish and control these boundaries as necessary. It may be necessary to augment

ZAPATAENGINEERING personnel with local law enforcement personnel to accomplish this task. Evacuees will only be permitted to re-enter the area after the demolition point has been inspected and the "all clear" has been given by the Demolition Supervisor.

2.11.10Protective Works Plan

2.11.10.1 ZAPATAENGINEERING will conduct demolition operations only after all personnel protective measures have been completed and reported to the Demolition Supervisor.

2.11.10.2 ZAPATAENGINEERING will take property protective measures including, but not limited to: sandbagging, tamping with earth, and barricading.

2.11.10.3 Sandbag enclosure for intentional detonations will be in accordance with CEHNC-ED-CS-S-98-7. The required sandbag thickness for known UXO items at this site is 12 inches for the walls and roof with a 6-inch standoff between the munition and the sandbags.

2.11.10.4 In the event that the UXO is located near a house (within 40 ft.) it is recommended that the windows of the house be boarded up to protect from breakage due to blast.

2.11.10.5 Dependant upon the total net explosive weight (NEW), if there is bedrock near the surface, consideration should be given to trenching between the UXO and the house to reduce the ground shock effects on the house. If trenching is required, the trench will be excavated in accordance with 60A 1-1-4 (Protection of Personnel and Property), Chapter 3, paragraph 3-6.b.

2.11.11Demolition Procedures

2.11.11.1 Electrical Safety Precautions

- Personnel working with electric blasting caps or other electro-explosive devices will not wear static producing clothing such as nylon, silk, or synthetic hair.
- Prior to making connection with the electric blasting cap, the firing circuit will be continuity tested.
- Electric blasting caps will be connected to the firing circuit before connection to the main initiation charge.
- Electric blasting caps of different manufacturers or types will not be used in the same system.
- The shunt will not be removed from the wires until the individual performing the operation has been grounded.
- Test electric blasting caps for continuity with a galvanometer at least 50 feet downwind from any explosives prior to connecting them to the firing circuit. Upon completion of testing, the lead wires will be short-circuited by twisting the bare ends of the wires together. The wires will remain shunted until ready to connect to the firing circuit.
- Do not pull on electrical lead wires of electric blasting caps, detonators or other electro-explosive devices; a detonation may occur.
- Unroll the legs so that the cap is as far as possible from the operator and pointing away from him.
- Place the blasting cap in a hole or behind a barricade before removing the shunt and testing for continuity. Make sure the cap does not point toward other personnel or explosives.

- Use only authorized and serviceable testing equipment.
- Do not connect the blasting machine to the firing wires until all pre-firing tests have been completed and until ready in all respects to fire the charge.
- Do not hold the blasting cap directly in the hand when uncoiling leads. Hold the wires approximately 6 inches from the cap. This will minimize injury should the cap explode. The lead wires should be straightened by hand and not thrown, waved, or snapped to loosen the coils.
- Do not remove the shunt from the lead wires of blasting caps except for testing for continuity or actual connection into the firing circuit. The individual removing the shunts should ground himself prior to this operation to prevent accumulated static electricity from firing the blasting cap.
- Keep both ends of the wiring shorted or twisted together except for testing or firing. Do not connect the blasting caps to the firing circuit unless the power end of the firing circuit leads are shorted.
- Keep all parts of the firing circuit insulated from the ground or other conductors such as bare wires, rails, pipes, or other paths of stray current.

2.11.11.2 Preparation and Priming

2.11.11.2.1 An electric firing system is one in which electricity is used to fire the primary initiating element. An electric impulse supplied from a power source, usually an electric blasting machine, travels through the firing wire and cap lead wires to fire an electric blasting cap. The chief components of the system are the electric blasting cap/electric squibs, firing wire, and the blasting machine. The preparation of the explosive charge for detonation by electrical means is called electric priming.

2.11.11.2.2 Static electricity is an increased hazard when operating in an extremely cold climate or area of low humidity. Care must be taken to reduce the possibility of premature detonation of electric blasting caps and other electro-explosive devices.

2.11.11.3 Procedures:

- Prepare and place all explosive charges.
- After locating a firing position a safe distance away from the charges, lay out the firing wire. (Do not drag firing wire over sand, which may generate a static charge.)
- Test the firing wire by using a blasting galvanometer or test set, after you have ensured the testing equipment is functional, and after the firing wire has been unreeled. Ensure ends are twisted together when not testing.
- Separate firing wire conductors at both ends, and touch those at one end of the galvanometer/test set posts. Needle should not move or lamp glow; if either occurs, the firing wire has a short circuit.
- Twist wires together at one end and touch those at other end to galvanometer/test set posts. This should cause a wide deflection of the needle or the lamp to glow. No movement of the needle indicates a break; a slight movement indicates a point of high resistance that may be caused by a dirty wire, loose wire connections, or wires with several strands broken off at connections.
- Ground yourself. Test the blasting caps by removing the short circuit shunt. Touch one end of the cap lead wire to one post and other cap lead wire to other post. If

galvanometer's needle deflects slightly less than it did when the instrument was tested, the blasting cap is satisfactory; if not, the cap is defective and should not be used; should read at least half-scale. Ensure cap lead wires are twisted together when not testing.

- Repeat process for second electrical blasting cap.
- Ensure you have positive control of the positive block that prevents inadvertent functioning of the electrical firing device. (key, handle).
- Request permission to prime from the Demolition Supervisor. DO NOT PROCEED UNTIL PERMISSION IS GRANTED!
- Ground yourself, ensure the two electric blasting cap lead wires are shunted and the firing cable is shunted at both ends.
- Extend the lead wires of one electrical blasting cap to its full length keeping the outward end of blasting cap pointed away from yourself, your assistant, and the donor charge.
- Using electrical tape or other non-electrically conductive material, insolate each of the two electrical connections to prevent shorting the two leads
- Depart to firing point.
- Take cover.
- Obtain a head count and conduct a visual scan of area for unauthorized personnel.
- Ground yourself. Test entire circuit after inserting caps into the charges and connecting charges with the firing wires and moving to firing position. Touch free ends of firing wire to test instrument posts. This should cause a wide deflection of needle or lamp to glow. If the firing circuit is defective, shunt wire. Then go down-range and recheck circuits. If the splice is found defective, replace wires. If the cap is found defective, replace it. Retest the entire circuit again to make sure that all breaks have been located before attempting to fire.
- Exercise the blasting machine several times before attaching the firing wire. Untwist ends of the firing wire and fasten them to the posts of the blasting machine.
- Yell **"Fire In The Hole"** three times and initiate charge.
- Observe a 5-minute wait time after the detonation. This wait time may be waived by the Demolition Supervisor based on observation of the detonation.
- Remain in designated safe area until Demolition Supervisor announces **"All Clear"**

2.11.11.4 Electric Misfires

2.11.11.4.1 In order to prevent misfires, insure that all blasting caps are included in the firing circuit; all connections between blasting cap wires, connecting wires, and firing wires are properly made; short circuits are avoided; grounds are avoided; and number of blasting caps in any circuit does not exceed the rated capacity of the power source on hand.

2.11.11.4.2 Common causes of electric misfires include inoperative or weak blasting machine or power source; improperly operated blasting machine or power source; defective and damaged connections, causing either a short circuit, a break in the circuit, or high resistance with resulting low current; faulty blasting caps; the use in the same circuit of blasting caps made by different manufacturers or of different design; and the use of more blasting caps than the power source rating permits.

2.11.11.4.3 Clearing electrical misfires:

- Make several successive attempts to fire.
- Check firing wire connections to blasting machine terminals to be sure that contacts are good.
- Make two or three more attempts to fire charge.
- Disconnect blasting machine and short firing wire.
- Connect a second blasting machine and repeat the first four steps. If desired results fail, continue.
- Allow a minimum of 30 minutes to elapse before starting to investigate.
- Test firing circuit with circuit tester for breaks and short circuits, and correct any defects discovered.
- Remove and disconnect old blasting caps and short wires. Place these items on the next demolition shot.
- Connect wires of new blasting cap(s) to firing circuit and re-prime the charge.
- Reconnect firing wire ends to blasting machine and fire charge(s)

2.11.11.5 Non-Electrical Safety Precautions

- Handle non-electric blasting caps only by their open ends except during attachment to safety fuse and/or detonating cord.
- Handle primed safety fuse with care to avoid contact between blasting caps or between the caps and other hard objects.
- Do not prime more than the required number of charges.
- Do not insert anything but safety fuse or detonating cord into the open end of a blasting cap.
- Do not crimp blasting caps by any means except a cap crimper designed for that purpose and insure that the fuse cutting section of the crimper is not accidentally used in crimping.
- Do not allow the safety fuse to coil up and contact itself after being ignited. If the fuse wrapping comes into contact with itself at a point near the blasting cap, premature detonation could occur.
- Handle any percussion detonator with the same care as a blasting cap, taking care to protect its primer end from blow or shock.
- Do not confuse detonating cord with safety fuse.

2.11.11.6 Preparation and Priming

A non-electric system is one in which an explosive charge is prepared for detonation by means of a non-electric blasting cap. The basic priming materials consist of a non-electric blasting cap, which provides the shock adequate to detonate the explosive, the safety fuse, which transmit the flame that fires the blasting cap, and the fuze ignitor. If more than one charge must be detonated simultaneously, the non-electric system must be connected with detonating cord to ensure the simultaneous firing.

2.11.11.7 Procedures:

- Cut and discard approximately a 6-inch length from free end of safety fuse to prevent a misfire caused by exposed powder absorbing moisture from the air. Then cut off 36-

inches of safety fuse to check burning rate. A match may ignite the fuse, but a fuse igniter is recommended for greater accuracy. Conduct this test at least 25-feet downwind from any explosives.

- Ignite fuse and note time required for fuse to burn. Then, compute burning rate per foot by dividing time in seconds by length in feet. All fuses in the same roll should burn at the same rate. The burning rate will vary depending upon the type of fuse, i.e., older military types of fuse coils should burn approximately 30-45 seconds per foot, while the new M700 safety fuse should burn uniformly at 40 seconds per foot.
- Cut fuse long enough to permit person detonating the charge to reach a safe distance by walking a normal pace before the explosion. A minimum of 6-feet of safety fuse will be used. Insure that the safety fuse is cut smoothly and squarely before inserting it into a blasting cap. A jagged or rough cut can cause a misfire.
- Attach fuse igniter inserting free end of safety fuse until it rests against primer.
- Take a blasting cap from cap box and inspect it by looking into open end. If any foreign matter or dirt is present, hold it with open end down, and shake it gently or lightly bump hand holding it against other hand. If foreign matter does not come out, select another cap and destroy the first.
- After blasting cap has been seated, hold cap firmly against fuse.
- Slide second finger down outer edge of blasting cap to guide crimpers, and thus obtain accurate crimping.
- Crimp blasting cap at a point approximately 0.125 to 0.25-inch from the open end. If operations are conducted during inclement weather, a second crimp in close proximity to the first may be used to further waterproof/seal blasting cap.
- Insert cap into explosive (donor charge).
- Lay out safety fuse in a straight line and secure it at each end in such a way as to prevent the safety fuse from recoiling itself after ignition.
- Upon obtaining a head count, the Demolition Supervisor will direct all other team members to the designated safe area
- Upon providing adequate time for the team members to reach the designated safe area, the Demolition Supervisor will yell **"Fire In The Hole"** three times, pull the igniters, and depart to designated safe area
- If a fuse igniter is not available, light safety fuse with a match by splitting the fuse at end, placing head of an unlighted match in powder train, and then lighting the inserted match head with a flaming match.
- Observe a 5-minute wait time after the detonation. This wait time may be waived by the Demolition Supervisor based on observation of the detonation.
- Remain in designated safe area until Demolition Supervisor announces **"All Clear"**

2.11.11.8 Non-electric Misfires

2.11.11.8.1 A misfire should be extremely rare if the following procedures are followed carefully:

- Prepare all primers properly.
- Load charges carefully.
- Place primer properly.

- Perform any tamping operation with care to avoid damage to an otherwise carefully prepared charge.
- Fire charge according to proper technique.
- Use dual firing systems. If both systems are properly assembled, the possibility of a misfire is reduced to a minimum.
- Do not use blasting caps underground; use detonating card.

2.11.11.8.2 Clearing non-electric misfires.

- Allow a minimum of 60 minutes to elapse, after maximum delay predicted for any part of disposal shot has passed, before starting to investigate.
- When practical, insert a new fused blasting cap into charge if this can be done without disturbing the old blasting cap, or prime and place a new charge close enough to the original charge to ensure detonation of both. When necessary, a misfired blasting cap may be removed and a new fused blasting cap inserted.

2.11.11.8.3 Post Demolition/Disposal Procedures

- Do not approach a smoking hole; do not allow personnel out of the designated safe area until cleared to do so with the "All Clear" signal.
- Prior to giving the "All Clear" signal, check pit for 'low orders' or 'kick outs'; Intact ordnance items that failed to detonate will be counter-charged and blown in place. Explosive residue will be collected and detonated.
- Surface sweep pit and remove any fragmentation; metal fragments will be examined to ensure complete detonation of the explosive material.
- Back fill hole and reseed as necessary
- Police up all equipment.
- Notify police, fire, etc. that the operation is complete.

2.12 MATERIAL MANAGEMENT

2.12.1 General

During this OE removal action, ZAPATAENGINEERING will manage the following materials:

- Inert OE
- OE-related Material
- Non-OE Related Debris

2.12.2 Inert OE

Venting of inert ordnance items will be accomplished, as required, in accordance with Safety Concepts and Basic Considerations for UXO Operations.

2.12.3 UXO Related Material

All recovered OE related scrap with at least two dimensions greater than one inch in size will be segregated from non-OE debris, inspected for the presence of explosive or other hazardous material and turned over to a local metals' dealer (as described in Section 2.13). ALL OE-related scrap will be inspected by the SUXOS at intervals consistent with volume accumulated. A final inspection will be conducted immediately prior to release to the metals' dealer, as described in Section 2.13.

2.12.4 Non-UXO Related Debris

ZAPATAENGINEERING will not remove non-UXO related debris from the project site. If this material hinders operations, it will be moved only so far as to allow the continuation of operations. In the event such action is taken, ZAPATAENGINEERING will record the location of such material on the applicable grid sheet.

2.13 OE AND NON-OE SCRAP MANAGEMENT PROCEDURES

Scrap removal is essential to successfully complete subsurface searches. Scrap is defined as metallic debris that is not contaminated with explosives. Scrap can be ordnance-related material as long as it has been inspected to determine that it does not contain explosives or explosive residue and the case is vented to prevent a mechanical rupture if the item were placed in a melting furnace.

2.13.1 Range Residue Inspection

2.13.1.1 OE-related scrap certification will be an ongoing process throughout the project. All OE scrap will be inspected, certified, verified and tracked to its final disposition when being removed from the site per the guidance document Corps of Engineers Ordnance and Explosive (OE), Range Residue Inspection, Certification and Final Disposition Procedures dated 6 August 2001 (Appendix D of the Scope of Work). A four-person visual inspection and identification process conducted by the UXO Tech II, UXO Tech III, Unexploded Ordnance Quality Control Specialist (UXOQCS) and SUXOS confirms that all-inert OE and OE-related scrap is free of any explosive contamination and explosive residue. The on-site personnel will perform the following detailed duties:

- UXO Sweep Personnel will only mark suspected items and will not be allowed to perform any assessment of a suspect item to determine its status.
- UXO Technician I will only tentatively identify a located item as scrap or OE.
- UXO Technician II will:
    1. Inspect each item as it is recovered and determine the following:
        - Is the item a UXO or a component of a military munition?
        - Does the item contain explosives or other dangerous materials?
        - Does the item require detonation?
        - Does the item require demilitarization (demil) or venting to expose internal fillers?
    2. Segregate items requiring demil or venting procedures from those items ready for certification.
    3. Items found to contain dangerous fillers will be processed in accordance with applicable procedures.
- UXO Technician III will:
    1. Inspect recovered items to determine if free of dangerous fillers.
    2. Supervise detonation of items found to contain dangerous fillers and venting/demil procedures.
    3. Supervise the consolidation of recovered scrap metal for containerization and sealing.
- UXO Quality Control Specialist will:
    1. Conduct daily audits of the procedures used by UXO teams and individuals for processing OE or Range Residue.

2. Perform and document, a minimum of 10% random sampling of all scrap metal collected from the various teams to ensure no items of a dangerous or explosives nature are identified as scrap metal.
3. Perform these random checks to satisfy that OE or range residue is free from any explosive hazards, necessary for completion of the Requisition and Turn-in Document, DD Form 1348-1A (Appendix F).

- UXO Site Safety Officer will:
  1. Ensure the specific procedures and responsibilities for processing OE and Range Residue for certification as scrap metal are being followed, performed safely, consistent with applicable regulations, and in accordance with the CEHNC approved project work plan.
  2. Will perform random checks of processed OE and Range Residue to ensure items being identified as scrap are free from any explosive hazards.
- Senior UXO Supervisor will:
  1. Be responsible for ensuring work and Quality Control (QC) Plans specify the procedures and responsibilities for processing OE and Range Residue for the final disposition as scrap metal.
  2. Ensure a Requisition and Turn-in Document, DD Form 1348-1A, is completed for all scrap metal to be transferred for final disposition.
  3. Perform random checks to satisfy that the OE or range residue is free from explosive hazards, necessary to complete the DD 1348-1A.
  4. Certify all scrap metal generated from OE or Range Residue as free of explosive hazards.
  5. Be responsible for ensuring that these inspected materials are secured in a closed, labeled and sealed container and documented as follows;

2.13.1.2 The container will be closed and clearly labeled on the outside with the following information: The first container will be labeled with a unique identification code identifying the **CEHNC/Installation Name/ZAPATAENGINEERING/0001/Seal's unique identification**. Subsequent container labels will continue sequentially. The container will be closed in such a manner that a seal must be broken in order to open the container. A seal will bear the same unique identification as the container or the container will be clearly marked with the seal's identification if different that the container. A documented description of the container will be provide by ZAPATAENGINEERING with the following information for each container; contents, weight of container; location where OE scrap was obtained; name of contractor (ZAPATAENGINEERING), names of certifying and verifying individuals; unique container identification; and seal identification, if required. These documents will be included in a separate section of the final report.

2.13.2 Scrap Certification and Verification

2.13.2.1 The SUXOS and the UXOQC/SO will make a final inspection of the scrap, after which the SUXOS will complete and sign a DD Form 1348-1A as turn-in documentation certifying that the scrap is free of explosive hazard. The CEHNC Safety Specialist will verify the scrap and also sign the DD Form 1348-1A. All DD 1348-1As will clearly show the typed or printed names of ZAPATAENGINEERING's Senior UXO Supervisor and the CEHNC's OE Safety Specialist, organization, signature, and ZAPATAENGINEERING's home office and field office phone number(s) of the persons certifying and verifying the scrap metal. In addition to the data elements required and any locally agreed to directives, the DD 1348-1A will clearly indicate the following for scrap metal:

- Basic material content (Type of metal; e.g., steel or mixed),
- Estimated weight,
- Unique identification of each of the containers and seals stated as being turned over,
- Location where OE scrap was obtained,
- Seal identification, if different from the unique identification of the sealed container, and
- The following statement:
  "This certifies that the materials listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of explosives hazards."

2.13.2.2 All material will be accounted for in the daily and weekly reports. Disposal documentation receipts will be generated identifying the day of off-site removal, approximate scrap weight and signature of the recipient. Turn-in documentation will be submitted as an appendix to the final removal action report.

2.13.3 Detonations

The scrap will be segregated into ordnance related and non-ordnance related scrap. All inert OE and OE-related scrap will be visually inspected. If necessary, the items will be demilitarized with demolition explosives.

2.13.4 Maintaining the Chain-of-Custody and Final Disposition

2.13.4.1 ZAPATAENGINEERING, in coordination with the CEHNC, will arrange for maintaining the chain of custody and final disposition of the certified and verified material. The certified and verified material will only be released to an organization that will:

- Upon receiving the unopened labeled containers each with its unique identified and unbroken seal ensuring a continued chained of custody, and after reviewing and concurring with all the provided supporting documentation, sign for having received and agreeing with the provided documentation that the sealed containers contained no explosive hazards when received. This will be signed on company letterhead and stating that the contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content.
- Send notification and supporting documentation to the sealed container-generating contractor that the sealed containers have been smelted and are now only identifiable by their basic content.

2.13.4.2 These documents will be incorporated by ZAPATAENGINEERING into the final report as documentation for supporting the final disposition of this scrap metal.

2.13.4.3 ZAPATAENGINEERING will turn all scrap metal into Arrow Steel at no additional cost to the government. Arrow Steel will shred or cut the scrap into pieces unrecognizable as OE and sort all the metal prior to selling the metal.

2.14 PROJECT SCHEDULE

The project schedule, as depicted in a Microsoft Project timeline, is included in the Work, Data, and Cost Management Plan (Chapter 8.0).

2.15 OE ACCOUNTABILITY

An Excavation Accountability Form will be completed for each UXO or OE item. All required information will be filled in by the Team Leader in charge of the excavation. The form will reflect the location and depth found, nomenclature, quantity, status and final disposition. The remarks block will be used to record additional information the responsible individual feels may be significant. The forms will be submitted to the SUXOS at the end of each work day. These forms will be a part of the Removal Report.

2.16 RECOVERED INERT UXO

Refer to Section 2.13 for a discussion on this subject.

2.17 ENVIRONMENTAL SAMPLING

The following is a summary of environmental sampling activities to be conducted during this project. For detailed information related to environmental sampling, see the Environmental Sampling and Analysis Plan (ESAP) in Appendix E.

2.17.1 Confirmatory Soil Samples

If smoking soil is observed while excavating the pits containing the white phosphorus, the pits will be over excavated to ensure white phosphorus impacted soil is removed. Confirmatory soil samples will then be collected from beneath the areas where smoking soil was observed using stainless steel pre-cleaned utensils. Soil samples will be analyzed by the government laboratory ERDC-Vicksburg under their standard turn-around-time (TAT). After completing the excavation and confirmatory samples (if required), ZAPATAENGINEERING will begin backfilling. Evaluation of soil sample results will include comparison of detected concentrations to Region IX residential PRGs for white phosphorus of 1.6 mg/kg. No confirmatory samples will be collected if smoking soil is not encountered and the excavation will be backfilled without any additional actions.

2.17.2 Soil Waste Classification Samples

If smoking soil is encountered, it will be allowed to burn off and segregated from non-smoking soils. The soils will only be containerized and sampled for disposal if they were smoking. The material will be placed in 55-gallon drums and staged near the project field office. At the end of the excavation activities, one composite sample will be collected from these drums for waste characterization. As above, these samples will be collected using stainless steel pre-cleaned utensils. Samples will be sent to the government laboratory ERDC – Vicksburg for white phosphorus using standard TAT.

2.17.3 Water Waste Classification Samples

If smoking soil is encountered, one composite water sample will be collected after all decontamination efforts are complete from the 55-gallon drum(s) containing decontamination water. No sample will be collected if smoking soil does not occur. Prior to sampling, the container will be mixed using a pump. The sample will then be collected using a Teflon bailer and will be used to directly fill the pre-cleaned glass laboratory containers. As with the soil, the aqueous sample will be sent to the government laboratory ERDC – Vicksburg for white phosphorus using their standard TAT. In water, white phosphorus has a Region IX tap water PRG of 0.73 ug/L, a Drinking Water Equivalent Level (DWEL) of 0.5 ug/L and a Lifetime Health Advisory of 1 ug/L.

2.18 PUBLIC AFFAIRS / COMMUNITY RELATIONS

2.18.1 ZAPATAENGINEERING will not make available or publicly disclose any data generated or reviewed under this contract or any subcontract unless specifically authorized by the Contracting officer (CO) and the U.S. Army Engineer District, Charleston (CESAC) Public Affairs Office (PAO). When approached by any person or entity requesting information about the subject of this contract, ZAPATAENGINEERING will defer to the PAO for response. Reports or data generated under this project are the property of the government and distribution to any other source by ZAPATAENGINEERING is prohibited unless authorized by the CO.

2.18.2 ZAPATAENGINEERING will assist in the conduct of public meetings and media days, as required, to inform the public of the purpose of this project, the procedures to be followed, and the cooperation required to effect timely project completion. All press releases and media appearances will be coordinated with, and approved by, the CESAC PAO.

2.19 REMOVAL REPORT

At the conclusion of field activities, ZAPATAENGINEERING will submit a Removal Report in accordance with the SOW and DID OE-030.01.

3.0 EXPLOSIVES MANAGEMENT PLAN

3.1 GENERAL

ZAPATAENGINEERING recognizes the critical nature of properly managing the explosives required to perform this ordnance removal action at the Former Camp Croft. This Explosives Management Plan details the procedures to manage the explosives for this project in accordance with the following policies and federal, state, and local laws and regulations:

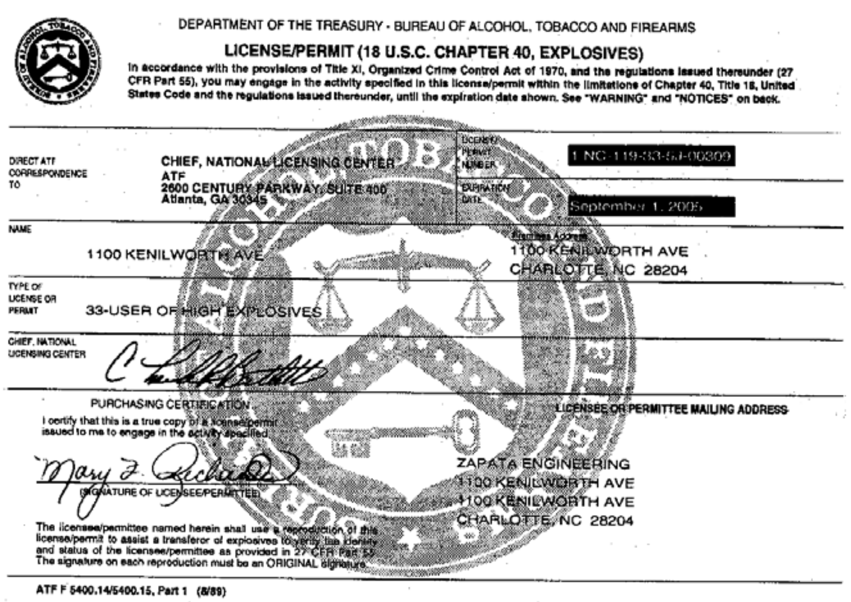
- ZAPATAENGINEERING Corporate Explosives Management Plan;
- Bureau of Alcohol, Tobacco, and Firearms Publication (ATFP) 5400.7 (ATF - Explosives Law and Regulations);
- Department of Defense (DOD) 6055.9-STD (DOD Ammunition and Explosives Safety Standards);
- Department of Transportation (DOT) Regulations;

3.2 LICENSES/PERMITS

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

- Bureau of Alcohol, Tobacco, and Firearms (ATF) User of High Explosives license; License number 1-NC-199-33-5J-00309 (expiration date: September 1, 2005) (See Figure 3-1).
- A letter signed by an authorized official of ZAPATAENGINEERING designating on-site personnel who are authorized to purchase, receive, access, and use explosives.

FIGURE 3-1 ATF USER OF HIGH EXPLOSIVES LICENSE



DEPARTMENT OF THE TREASURY - BUREAU OF ALCOHOL, TOBACCO AND FIREARMS

LICENSE/PERMIT (18 U.S.C. CHAPTER 40, EXPLOSIVES)

In accordance with the provisions of Title XI, Organized Crime Control Act of 1970, and the regulations issued thereunder (27 CFR Part 55), you may engage in the activity specified in this license/permit within the limitations of Chapter 40, Title 18, United States Code and the regulations issued thereunder, until the expiration date shown. See "WARNING" and "NOTICES" on back.

DIRECT ATF CORRESPONDENCE TO: CHIEF, NATIONAL LICENSING CENTER, ATF, 2600 CENTURY PARKWAY, SUITE 400, Atlanta, GA 30345

LICENSE/PERMIT NUMBER: 1 NC-119-33-5J-00309

EXPIRATION DATE: September 1, 2005

NAME: 1100 KENILWORTH AVE

Premises Address: 1100 KENILWORTH AVE, CHARLOTTE, NC 28204

TYPE OF LICENSE OR PERMIT: 33-USER OF HIGH EXPLOSIVES

CHIEF, NATIONAL LICENSING CENTER

PURCHASING CERTIFICATION

I certify that this is a true copy of a license/permit issued to me to engage in the activity specified.

Mary F. Richards
(SIGNATURE OF LICENSEE/PERMITTEE)

The licensee/permittee named herein shall use a reproduction of this license/permit to assist a transferor of explosives to verify the identity and status of the licensee/permittee as provided in 27 CFR Part 55. The signature on each reproduction must be an ORIGINAL signature.

LICENSEE OR PERMITTEE MAILING ADDRESS

ZAPATA ENGINEERING
1100 KENILWORTH AVE
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CHARLOTTE, NC 28204

ATF F 5400.14/5400.15, Part 1 (8/89)

3.3 ACQUISITION

3.3.1 Description and Estimated Quantity of Explosives

The initial explosives requirement estimate for this OE removal action is noted in Table 3-1. Replacement explosives will be supplied based upon rate of use.

3.3.2 Acquisition Source

ZAPATAENGINEERING will use a local explosives vendor for the required replacement materials.

TABLE 3-1 EXPLOSIVES SUPPLY REQUIREMENTS

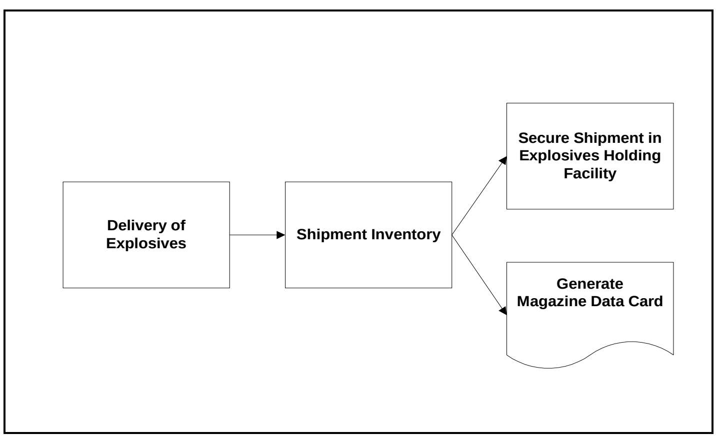
Explosives	Quantity
Electric Blasting Caps	100
1/2 lb booster	80
Detonating Cord	500 ft

3.4 INITIAL RECEIPT

3.4.1 Procedures for Receipt

The SUXOS will act as the Demolition Supervisor. The Demolition Supervisor will inventory, initiate, and maintain all documentation concerning the demolition material upon receipt. The Demolition Supervisor, by signing the receipt documents, will assume accountability for the material. Figure 3-2 provides the procedures to be followed upon receipt of explosives. The Magazine Data Card will be placed in the explosive holding facility to indicate the actual quantity on-hand of each type of explosives.

FIGURE 3-2 PROCEDURES FOR RECEIPT OF EXPLOSIVES



3.4.2 Procedures for Reconciling Discrepancies Upon Receipt

The Demolition Supervisor will conduct a 100% inventory of the incoming explosives. The quantities annotated on the receipt documentation should match the quantities reflected in the inventory. If these quantities do not match, the Senior UXO Supervisor will contact the originator of the receipt documentation. ZAPATAENGINEERING personnel will only sign for the actual quantity of material received, as reflected by the inventory. Receipt documentation will be changed to reflect the proper quantities. Actual quantities must be properly annotated on the shipping documentation prior to ZAPATAENGINEERING accepting delivery. These procedures will be conducted for each receipt of explosives materials.

3.5 STORAGE

3.5.1 Establishing Explosive Storage Facility

3.5.1.1 Demolition materials will be stored in standard earth covered magazines. Refer to the Explosives Siting Plan (Chapter 4.0) for a discussion of the storage facility.

3.5.1.2 The Demolition Supervisor will verify the condition of any proposed storage locations prior to their use for the storage of explosives.

3.5.2 Physical Security

3.5.2.1 Physical security will be provided by subcontracted security firm.

3.5.2.2 ZAPATAENGINEERING will use two existing earth-covered magazines, which will be surrounded by a chain link fence. ZAPATAENGINEERING will secure the fence and storage magazines with high-security locks. The Demolition Supervisor will maintain key control for the storage magazines.

3.6 TRANSPORTATION PROCEDURES

During transportation of explosive material, safety is the primary concern. The most obvious requirements are to protect personnel, the general public, and the environment from fire, blast, noise, fragmentation, and toxic releases. Vehicle operators will be ZAPATAENGINEERING employees, licensed, trained, and informed of the explosive hazards involved with the cargo.

3.6.1 From Storage Facility to On-Site Disposal Locations

3.6.1.1 ZAPATAENGINEERING will segregate the material identified for transport by type and load it into a vehicle meeting the regulations of 49 CFR and applicable state laws. ZAPATAENGINEERING personnel will block, brace (as required), and transport the explosives material required for the disposition of UXO.

3.6.1.2 Prior to movement, the driver will visually inspect the explosive laden vehicle to ensure the load is properly secured and safe-to-move; the Demolition Supervisor will provide oversight during loading. The cargo will be checked to ensure containers are loaded, blocked, braced, tied down, or otherwise secured to the vehicle body to prevent movement. If using a vehicle with an open body, a closed container to contain the explosives will be secured to the bed of the vehicle.

3.6.1.3 The Demolition Supervisor will ensure that the following general safety precautions are observed during transport operations:

- Blasting caps and high explosives will remain separated at all times by means of either transporting these items in separate vehicles, or by using an IME22 container for the blasting caps if transporting the items in the same vehicle
- Explosives will remain covered with a flame resistant tarpaulin, or in a waterproof or spark proof container at all times, except when loading or unloading
- Explosives will not be transported in the passenger compartment of a vehicle
- Explosive laden vehicles will not be left unattended
- No person is permitted to ride on, or in, the cargo compartment
- Smoking in and around vehicles transporting explosives is prohibited
- Refueling of vehicles will be accomplished without the explosive cargo
- Vehicles will not exceed the posted speed limit. If a prudent speed is less than the posted speed limit, the operator may not exceed a safe and reasonable speed.

3.6.2 Vehicle Requirements for Transporting Explosives

3.6.2.1 Transportation vehicles will be designated and inspected to determine that they are suitable and properly equipped for movement of explosives. Inspections and findings will be recorded on the Vehicle Check Sheet (Appendix F).

3.6.2.2 ZAPATAENGINEERING will properly placard transport vehicles to warn personnel and furnish specific guidance to fire fighters and other personnel who may be responding to an emergency involving the vehicle. Transportation on public roads will be in accordance with applicable federal and state regulation, to include driver testing and licensing.

3.7 RECEIPT PROCEDURES

3.7.1 Procedures

3.7.1.1 ZAPATAENGINEERING will initially receive explosives from CEHNC, if available for transfer. Follow on deliveries will be from a local commercial vender.

3.7.1.2 The Demolition Supervisor will issue explosives to members of the Demolition Team with the Explosives Consumption Certificate Form (Appendix F). These forms will be maintained at the ZAPATAENGINEERING site office.

3.7.1.3 As explosive materials are expended, the Demolition Supervisor will annotate the appropriate Magazine Data Cards to reflect the quantity used and the quantity remaining.

3.7.2 Authorized Individuals

An authorizing official of ZAPATAENGINEERING (corporate President or Vice President) will sign a letter designating those personnel who are authorized to purchase, receive, access, and use explosives; a copy of this letter will be maintained on-site. The authorized positions are: Senior UXO Supervisor and Demolition Supervisor.

3.7.3 Certification of Use of Explosives

The Demolition Material Accountability Form certifies that the explosives were expended, as intended, in the UXO disposal process.

3.7.4 Procedures for Reconciling Receipt Documents and Proposed Intervals

The Demolition Team Member receiving the explosives from the Demolition Supervisor will conduct a 100% inventory of the material. The quantities annotated on the Demolition Material Accountability Form should match the quantities reflected in the inventory. If these quantities do not match, the Demolition Team Member will bring this to the attention of the Demolition Supervisor. ZAPATAENGINEERING personnel will only sign for the actual quantity of material received, as reflected by the inventory. Receipt documentation will be changed to reflect the proper quantities. These procedures will be conducted for each receipt of explosives materials.

3.8 INVENTORY

At a minimum, ZAPATAENGINEERING personnel will perform a weekly physical inventory of the stored explosives to reconcile the actual quantities with the quantities annotated on the corresponding Demolition Material Accountability Forms and Magazine Data Cards. Any discrepancies will be immediately reported to the SUXOS, who will initiate an audit to determine the source of the discrepancy.

3.9 LOST, STOLEN, OR UNAUTHORIZED USE OF EXPLOSIVES

Upon discovering lost, stolen, or unauthorized use of explosives, the Demolition Supervisor will report the circumstances to the program manager. The SUXOS will notify the:

- Contracting Officer via telephone within 1 hour of discovery - (256) 895-1150
- Spartanburg County Sheriff Office - (864) 596-2076/2540
- ATF – Atlanta Area Office - (404) 769-5130
- ZAPATAENGINEERING - (704) 358-8240
- Contracting Officer in writing within 24 hours
- Appropriate local law enforcement authorities in writing within 24 hours
- On site CEHNC representative.

3.10 RETURN TO STORAGE OF UNEXPENDED EXPLOSIVES

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

3.11 DISPOSITION OF REMAINING EXPLOSIVES AT THE END OF SITE ACTIVITIES

During operations, ZAPATAENGINEERING will minimize the explosives inventory. At the end of site activities, ZAPATAENGINEERING will perform an economic analysis to determine the most cost-effective method to manage the remaining explosives. This information will be forwarded to the program manager and the CEHNC Project Manager for authorization. The available alternatives include:

- Return unopened containers to the commercial distributor/manufacturer for credit
- Transfer of stocks to another ZAPATAENGINEERING project
- Transfer of stocks to another CEHNC project

3.12 FORMS

3.12.1 The forms required to implement the provisions of this Explosives Management Plan are located in Appendix F.

3.12.2 ZAPATAENGINEERING will obtain and retain a permanent file of all applicable demolition records, including permits, Magazine Data Cards, training records, inspector reports, and any applicable waste manifests.

4.0 EXPLOSIVES SITING PLAN

4.1 ORDNANCE AND EXPLOSIVES AREAS

4.1.1 The MSD for the intrusive part of this operation has been determined to be 650 feet. The Minimum Separation Distance between UXO teams operating on the site during intrusive operations shall never be less than 200 feet. See Chapter 2, paragraph 2.11.7 for a detailed discussion of MSD.

4.1.2 **Grid 17 –** UXB International conducted a removal action in Grid 17 within OOU 3. With the exception of three identifiable pits within a 30-foot radius, Grid 17 was cleared. Excavation was halted when 12 complete M15 White Phosphorous (WP) hand grenades (unarmed) were recovered. It is anticipated that these three pits are interconnected and more M15 WP grenades are buried. Fragmentation distance for the MPM is 512 feet.

4.1.3 **Grid 40** - UXB International conducted a removal action in Grid 40 within OOU 3. With the exception of one identifiable pit (15-foot diameter), Grid 40 was cleared. Excavation was halted when 150 pounds of smoke canisters were recovered. No UXO were recovered from this pit. It is anticipated that this pit contains more smoke canisters. Fragmentation distance for the MPM is 200 feet.

4.2 PLANNED OR ESTABLISHED DEMOLITION AREAS

For recovered UXO that are determined as acceptable-to-move, ZAPATAENGINEERING will transport these items to the designated safe disposal area (SDA) sited under the amended Explosive Safety Submission. The use of a SDA reduces UXO transportation distance, reduces hazard exposure to the general public, and achieves quantity-distances required for the net explosive weight (plus donor charge) of the UXO. For the M15 WP grenades the designated safe disposal area is the Vulcan Quarry, which was used during the previous removal action activities.

4.3 BLOW-IN-PLACE

4.3.1 ZAPATAENGINEERING will blow-in-place any fuzed ordnance or ordnance deemed unsafe to move. If predetermined MSD's for a particular round are not available, blow-in-place procedures will not occur until approval has been received from the on-site CEHNC Safety Representative.

4.3.2 Blow-in-place operations will be performed only as a last resort when the UXO is not acceptable to move to a safe disposal area. Should BIP procedures become necessary, careful, planning and coordination with the Government Safety Specialist is imperative to reduce blast and ground shock. The exact location of underground utilities must be known and blast abatement procedures should be employed when their use may eliminate or limit collateral damage. The MSD for blow-in-place activities, however, is determined using the same procedures as for established demolition areas. If a BIP item is encountered, MSD will be established as outlined in Chapter 2.

4.4 COLLECTION POINTS

Collection points are areas used to temporarily accumulate OE within a search grid pending transport to another area for storage or destruction. Collection points have the same exclusion zone as the MPM for the grid in progress.

4.5 IN-GRID CONSOLIDATED SHOTS

If larger OE/UXO is encountered, fragmentation distance will be adjusted appropriately and a safe separation distance for personnel will be established based on the MSD's. Consolidated shots will be conducted in accordance with CEHNC document of August 1998 with terminology update of March 2000 (Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosive Sites.

4.6 EXPLOSIVES STORAGE MAGAZINES

4.6.1 Magazine Type

4.6.1.1 For this operation ZAPATAENGINEERING will utilize existing earth-covered explosive storage magazines located at street address 800 Dairy Ridge Road for the storage of explosives. These magazines are already sited and have been previously used by other UXO contractors. These existing explosive storage magazines are in compliance with Quantity Distance criteria (as specified in Chapter 9, Table 9-1, DOD 6055.9-STD) since other UXO contractors have previously approved these magazines for use.

4.6.1.2 Engineering controls used to mitigate exposures to the public are not required for these existing explosive storage magazines.

4.6.2 Explosives

For this operation ZAPATAENGINEERING intends to limit the Net Explosives Weight (NEW) of the material in storage to less than 100 lbs per magazine. A listing of potential explosives is found in Chapter 3, Explosives Management Plan.

4.7 SITE MAPS

Site maps are included in Appendix B and will include the appropriate Quantity Distance Arcs from the amended Explosive Safety Submission and other explosives-related information identified in this plan.

Figure B-1	Former Camp Croft Project Site
Figure B-2	OOU 3 Project Site (Grid 17, 40, and 35P4
Figure B-3	OOU 11C Project Site
Figure B-4	OOU 11D Project Site
Figure B-5	OOU 3 Buffer Area Project Site
Figure B-6	Quantity Distance Map (OOU 3 Grid 17, 40, and 35P4)
Figure B-7	Quantity Distance Map (OOU 3 Buffer Area, OOU 11C, and OOU 11D)

5.0 GEOPHYSICAL PROVE-OUT PLAN AND REPORT

5.1 PURPOSE

5.1.1 The Geophysical Prove-out (GPO) Plan has been prepared in response to the Scope of Work (SOW) for the Munitions and Explosives of Concern (MEC) Removal Action at Ordnance Operable Unit (OOU) 3 and Optional Areas OOU 11C and OOU 11 D at former Camp Croft, Spartanburg, South Carolina. Initial activities include conducting an intrusive excavation in several previously identified pits located in Grid 17 (approximately 1.1 acres) and Grid 40 (approximately 0.9 acres) of OOU 3. Following this removal action, ZAPATAENGINEERING will oversee digital geophysical mapping (DGM) activities in Grid 17, Grid 40 and Grid 35P4 (approximately 0.7 acres) for quality control and to ensure adequacy of the current and previous removal actions. This plan was developed using information obtained from the SOW, previous studies and investigations and site visits conducted by ZAPATAENGINEERING. Optional tasks that may be authorized in the future, at the discretion of the Government on a priority basis, include:

- Geophysical mapping and intrusive investigation/clearance of approximately 9.48 acres in OOU 11C,
- Geophysical mapping and intrusive investigation/clearance of approximately 11.2 acres in OOU 11D,
- Geophysical mapping and intrusive investigation/clearance of approximately 24.0 acres in OOU 3, between the Wedgewood Subdivision and the adjacent golf course.

5.1.2 The objectives of the GPO are to demonstrate and document the site-specific capabilities of the proposed survey platforms, sensors, positioning equipment, data analysis, data management and associated equipment, and personnel to operate as an integrated system capable of meeting data quality objectives for Camp Croft’s performance goals.

5.1.3 The GPO will consist of geophysical instrument tests over buried MEC items in an area that is similar in geology, vegetation, terrain and geophysical background noise to that of the general geophysical survey area. The GPO is designed to evaluate the capabilities of proposed geophysical sensors, positioning methodologies, sensor deployment, data flow and data processing procedures to meet the geophysical objectives of this investigation.

5.1.4 ZAPATAENGINEERING and NAEVA Geophysics, Inc. (NAEVA) will collect and analyze GPO data using the same equipment and procedures that will be proposed for the general DGM survey. Instrument height, instrument orientation and direction of travel, instrument channel selections, measurement interval along survey line, lane width, etc., will be evaluated in accordance with DID OE-005-05A.01.

5.2 GPO WORK PLAN

5.2.1 The Geophysical Prove-out (GPO) Plan is prepared and submitted in accordance with DID OE-005-05A.01 and describes our approach for instrument sensor evaluation and position location. The approved GPO Plan will be submitted as an appendix to the Final Ordnance and Explosives Removal Action Work Plan (Work Plan).

5.2.2 Upon completion of the GPO, ZAPATAENGINEERING will produce Draft and Final versions of the GPO Letter Report prepared in accordance with OE DID OE-005-05A.01 and the SOW. The Final GPO Letter Report will be included as an appendix to the Work Plan and Final Report.

5.2.3 Prove-Out Size and Location

ZAPATAENGINEERING will establish one prove-out test grid location (approximately 0.25 acre) representative of the terrain and vegetation within the areas of investigation (Attachment A, Figure 5-1).

5.2.4 Seed Items

5.2.4.1 ZAPATAENGINEERING will emplace seed items, representing MEC expected to be present at the project sites, at varying depths and orientations (Table 5-1). The items' ID and location will be documented in the field book and with photographs.

Table 5-1 Conceptual Seed Item Details

ID Number	**Item**	**Location**			**Position with Respect to Path**
		X (feet)	Y (feet)	Z^1 (inches)	Orientation
1	MK II Hand Grenade	TBD	TBD	12.0	Perpendicular
2	M9 Rifle Grenade	TBD	TBD	11.0	Perpendicular
3	MK II Hand Grenade	TBD	TBD	6.0	Perpendicular
4	2.36-inch Rocket, M6A1	TBD	TBD	26.0	Perpendicular
5	2.36-inch Rocket, M6A1 (motor)	TBD	TBD	13.75	Perpendicular
6	MK II Hand Grenade	TBD	TBD	6.0	Perpendicular
7	2.36-inch Rocket, M6A1	TBD	TBD	26.0	Perpendicular
8	M9 Rifle Grenade	TBD	TBD	22.0	Perpendicular
9	MK II Hand Grenade	TBD	TBD	6.0	Perpendicular
10	2.36-inch Rocket, M6A1	TBD	TBD	13.0	Perpendicular
11	2.36-inch Rocket, M6A1	TBD	TBD	13.0	Perpendicular
12	M9 Rifle Grenade	TBD	TBD	22.0	Perpendicular
13	MK II Hand Grenade	TBD	TBD	12.0	Perpendicular
14	M9 Rifle Grenade	TBD	TBD	22.0	Perpendicular
15	MK II Hand Grenade	TBD	TBD	12.0	Perpendicular
16	M9 Rifle Grenade	TBD	TBD	11.0	Perpendicular
17	2.36-inch Rocket, M6A1	TBD	TBD	13.0	Perpendicular
18	M9 Rifle Grenade	TBD	TBD	11.0	Perpendicular

Note:
[1] – Depth to top of item below ground surface
TBD – To be determined following background DGM analysis

5.2.4.2 B.P. Barber and Associates (B.P. Barber) will survey the ends and center of each seed item and the adjacent surface elevation after the item is buried. An Excel spreadsheet will be prepared containing the ID numbers, end and center locations, adjacent ground surface elevations and depths below ground surface for each of the seed items placed in the GPO grid.

5.2.4.3 The seeded items will be painted blue and tagged with a non-biodegradable label identifying the items as inert and providing a contract reference, a point of contact address, phone number and a target identifier as described in Appendix A to the Scope of Work.

5.2.5 Site Preparation

Brush clearing will be done as needed. A ZAPATAENGINEERING UXO Technician will remove surface metal items that are identified in the plot during initial selection of the site. The layout of the test plot will duplicate, as closely as possible, the conditions under which the geophysical survey will be conducted. The GPO plot location will be placed half in the open area and half in the woods to demonstrate positioning capabilities.

5.2.6 Location Surveying

5.2.6.1 A Professional Land Surveyor from B.P. Barber will conduct surveying and certify that all surveying requirements are in accordance with DID OE-005-07.01.

5.2.6.2 B.P. Barber field personnel will survey corner points of the test plot to an accuracy of two cm horizontally and five cm vertically. Grid corners will be marked with wood stakes, numbered with permanent marker and flagged. The end points and center point along each seed item will be surveyed once placed in the ground. After burial of the seed items, the surface elevation will be surveyed to provide accurate depths below ground surface.

5.2.7 Pre-Seeding (Background) Geophysical Mapping

DGM, using the EM and MAG instruments, over the proposed test plot will be conducted before the burial of test items to provide background response information and ensure that seeded items are not placed near natural or cultural anomalies. Any metal identified as a result of the background DGM surveys will be left in place.

5.2.8 Quality Control

To ensure high quality geophysical data, data collection and processing steps will be monitored.

5.2.8.1 Data Collection Quality Control

Quality control (QC) procedures for standard equipment tests and data quality requirements will be reviewed prior to production DGM. The QC procedures and schedules detailed in Attachment B will be followed.

5.2.8.2 Data Processing Quality Control

Data collection and processing quality control steps include, but are not limited to:

- Reviewing field data sheets (Attachment C) and log forms for completeness.
- Reviewing static instrument standardization files to verify repeatability of amplitude response.
- Monitoring data for gaps or incomplete coverage (indicating sensor failure). Areas with data point gaps not caused by documented physical obstacles greater than an amount determined significant by the GPO will be resurveyed. Data gaps generated by physical or cultural features will be documented in the site figures.
- Visually comparing target anomaly selections to the DGM anomalies generated by the known seeded items.

- Removing unreasonable data spikes from the data.
- Monitoring and applying heading and lag corrections.
- Tracking data processing steps to ensure all data are processed in the same manner.
- Documenting additional processing (i.e., filtering) which may be useful in data analysis and target identification.

5.2.8.3 ZAPATAENGINEERING'S Senior Geophysicist will conduct an independent evaluation of raw and processed geophysical data to ensure the geophysical data meets quality standards set forth in the SOW.

5.2.9 Anomaly Avoidance

During GPO activities, the project team, including a Senior UXO Supervisor, will walk the parcels. Following review of the electromagnetic and magnetic DGM background survey, the project team will establish one GPO grid in an area free of metallic surface items. All seed items will be buried under the direct supervision of the SUXOS at a location demonstrated by the DGM results to be free of surface and subsurface anomalies. When a specific location is identified for a seed item, the location will be checked, again, with a handheld EM (i.e., Fisher or White) metal detector to ensure the absence of MEC. All site personnel will practice anomaly avoidance methods during establishment of the geophysical prove-out.

5.2.10 Seeding

5.2.10.1 The initial day will be spent in determining the suitability of the prove out site and collecting DGM background data with the EM instrument. Once the prove-out location is identified, a licensed professional land surveyor from B. P. Barber will survey the grid corner points. ZAPATAENGINEERING will emplace seed items at varying depths and orientations denoting the locations in the field book and with photographs.

5.2.10.2 ZAPATAENGINEERING will design and oversee preparation of the GPO plot to include a percentage of seed items with locations unknown (blind items) to NAEVA (Attachment A, Figure 5-2). ZAPATAENGINEERING will perform independent analyses of the geophysical data collection and processing procedures.

5.2.10.3 ZAPATAENGINEERING's Senior Geophysicist will oversee the GPO design and geophysical methods to ensure data integrity.

5.2.11 Data Collection Variables

5.2.11.1 NAEVA will test electromagnetic (EM) and magnetic (MAG) instruments during the GPO and will use either technology for collection of geophysical data at former Camp Croft based on the GPO results. Sensor positioning will be achieved through the use of tape measures and marked ropes placed across the areas of investigation. This technique facilitates straight-line profiling and allows the placement of fiducial marks within the data sets. Data will be collected utilizing local coordinates referenced to the southwest corner of the GPO grid. NAEVA will convert the geophysical data from local coordinates into the Universal Transverse Mercator (UTM) coordinate system (meters) during data processing. To assure positional accuracy, a spike or survey nail will be placed within the GPO grid at a known location to confirm that positioning data are accurate.

5.2.11.2 Instruments to be used

5.2.11.2.1 EM-61 MK2 instruments are high-resolution time-domain metal detectors capable of detecting both ferrous and non-ferrous metallic objects. In comparison with other metal detectors, especially magnetometers, it is typically much better suited for work in proximity to buildings, vehicles, metal fences, and underground utilities. The EM system consists of air-cored coils, a digital data recorder, batteries and processing electronics. The transmitter of the EM generates a pulsed primary magnetic field, which induces eddy currents in nearby metallic objects. The response induced by these eddy currents is measured by each of two spatially separated receiver coils. Secondary voltages induced in both coils are measured in millivolts (mV). The coils are vertically separated by 40 cm. Data from all four channels of the EM-61 MK2 will be processed during the GPO. EM has proven very effective on projects with an MEC clearance depth of four feet. Target location resolution of approximately 0.5 meters can be expected. A minimum line spacing of 0.75m will be used to collect EM data, and wider line paths may be tested. A minimum survey speed of approximately 0.7 m/s will be used to collect EM data. However, faster speeds may be evaluated if comparable results (i.e., sampling density and signal to noise ratios) can be achieved.

5.2.11.2.2 The magnetic instrument to be used is the Scintrex Smartmag SM-4 system, a highly sensitive self-oscillating split-beam cesium vapor magnetometer. It measures the total magnetic field with a sensitivity of +/- 0.01 nanoTeslas (nT) at sample rates up to 100 Hertz (Hz) (range 15,000-100,000 nT). Minimum magnetic rover sampling rate will be ten Hz. In the event that this rate is found to be inadequate the frequency will be adjusted. In the event that this frequency is found to be insufficient, the sampling frequency may be increased. An advantage of using a cesium vapor magnetometer is greater depth of exploration for large ferrous objects compared to typical electromagnetic methods. Because the earth's magnetic field drifts over the course of a day, a base station will be employed to collect continuous readings at five-second intervals to correct for any diurnal drift to the survey data. Base station readings will be collected using a Scintrex Envi Mag proton procession magnetometer. The Scintrex Smartmag SM-4 system will be tested over a single item at two different heights, one at 0.10m (if site conditions permit) and one to be determined on-site. A minimum line spacing of 0.5m will be used to collect MAG data and wider line paths may be evaluated during the GPO.

5.2.11.2.3 ZAPATAENGINEERING and NAEVA will collect and analyze GPO test plot data using the same equipment and procedures that are intended for the geophysical investigation at former Camp Croft. Key personnel that perform the GPO will also conduct the production survey to provide project continuity.

5.2.12 Data Analysis and Interpretation

5.2.12.1 Initial data processing will be performed on-site by the geophysical team to assess the quality and completeness of the data. Data temporarily stored in the field logger will be downloaded into a laptop computer for on-site review and editing. Proprietary software supplied by the instrument's manufacturer will be used to make positional corrections based on the fiducial marks in the data. Initial instrument drift correction or leveling might be performed at this point. The data will then be gridded and displayed on the screen as a color contour image with the track plot of the instrument's path overlain on the map.

5.2.12.2 Once the initial editing steps have been performed, the data will be transferred to NAEVA's corporate offices for advanced analysis/interpretation and final map production. All data will be carefully leveled, contoured, and displayed on a map for interpretation. Targets will be selected from these maps by initially running the data through Geosoft's UXO package. Each anomaly selected by Geosoft as a target will be scrutinized by the project geophysicists, and evaluated as to the validity and position reported by Geosoft. Targets that are found to be invalid or misplaced will be moved or removed. Additionally, anomalies that are not selected by Geosoft, yet deemed to represent a target, will be picked manually. Dig sheets (Attachment C, DID OE-005-05.01) will be created using minimum response criteria that will be decided upon following the evaluation of baseline GPO survey. Geophysical data collected during the GPO (raw and processed) will be posted on a secure website (https://oe.zapeng.com) and provided to USAESCH on a CD-ROM in accordance with DID OE-005-05.01.

5.2.13 Reacquisition

Data collected at the GPO grid from each geophysical instrument will be post-processed and analyzed. ZAPATAENGINEERING will prepare a dig sheet (Attachment C of DID OE005-05.01), of the selected target anomalies and provide them to the project team for comparison with seeded item locations. ZAPATAENGINEERING and NAEVA will perform anomaly reacquisition and verification, and record these measurements on the dig-sheet. This will be done to the same extent and with the same equipment (active or passive) as planned for the production geophysical investigation. Items placed at depth and not detected by the hand-held equipment in the GPO will not be uncovered to depth of detection as will be done in the actual DGM follow-up.

5.2.14 Data Evaluation

ZAPATAENGINEERING will evaluate and score the data so that the different geophysical approaches can be compared and ranked. Scoring criteria will include, as a minimum, the following: percent of seeded items detected (by class or size, and overall); number of unknown targets; production rate; cost per unit area; equipment durability and safety.

5.3 GPO LETTER REPORT

5.3.1 After the GPO fieldwork has been completed, a GPO Letter Report will be prepared in accordance with DID OE-005-05A.01, to include, but not be limited to, the following:

- As-built drawing of the GPO plot;
- Coordinates, depths, and pictures of the seed items;
- Color maps of the geophysical data;
- Summary of the GPO results;
- Proposed recommended geophysical equipment (including manufacturer specifications), techniques, and methodologies; and
- The GPO Letter Report will specify and define the various procedures, processes and verification methods that will be used throughout the project, as well as specify the pass/fail criteria for each.

5.3.2 A CD will be prepared and submitted with the letter report containing the following files:

- The GPO Letter Report (Microsoft Word format); Raw and final processed geophysical data will be in column delineated ASCII files in the format X, Y, V1, V2… where X= Easting Coordinate, Y=Northing Coordinate, V1, V2, V3, etc. are the instrument readings. Data will be located in the UTM Coordinate System.
- Geophysical maps in their native format (Surfer, Geosoft Oasis Montaj, UHUNTER, OEGEO or OEGIS formats) and as raster bit-map images such as BMP, JPEG or GIF;
- Seed item location spreadsheet (Microsoft Excel format); and
- Spreadsheet (Microsoft Excel format) of contractor picks for each sensor type.
- Spreadsheet (Microsoft Excel format) of all control points, survey points and benchmarks established or used during the location survey task.

5.3.3 ZAPATAENGINEERING will not proceed with production geophysical mapping until the Government approves the GPO results as provided in the GPO Letter Report, and Notice to Proceed is received from the Contracting Officer. This Letter Report will be included as an Appendix to the Final Work Plan and to future geophysical reports associated with the survey area.

ATTACHMENT A

FIGURES

Note: Imagery supplied by Spartanburg County, SC (1996)

400 0 400 800 Feet

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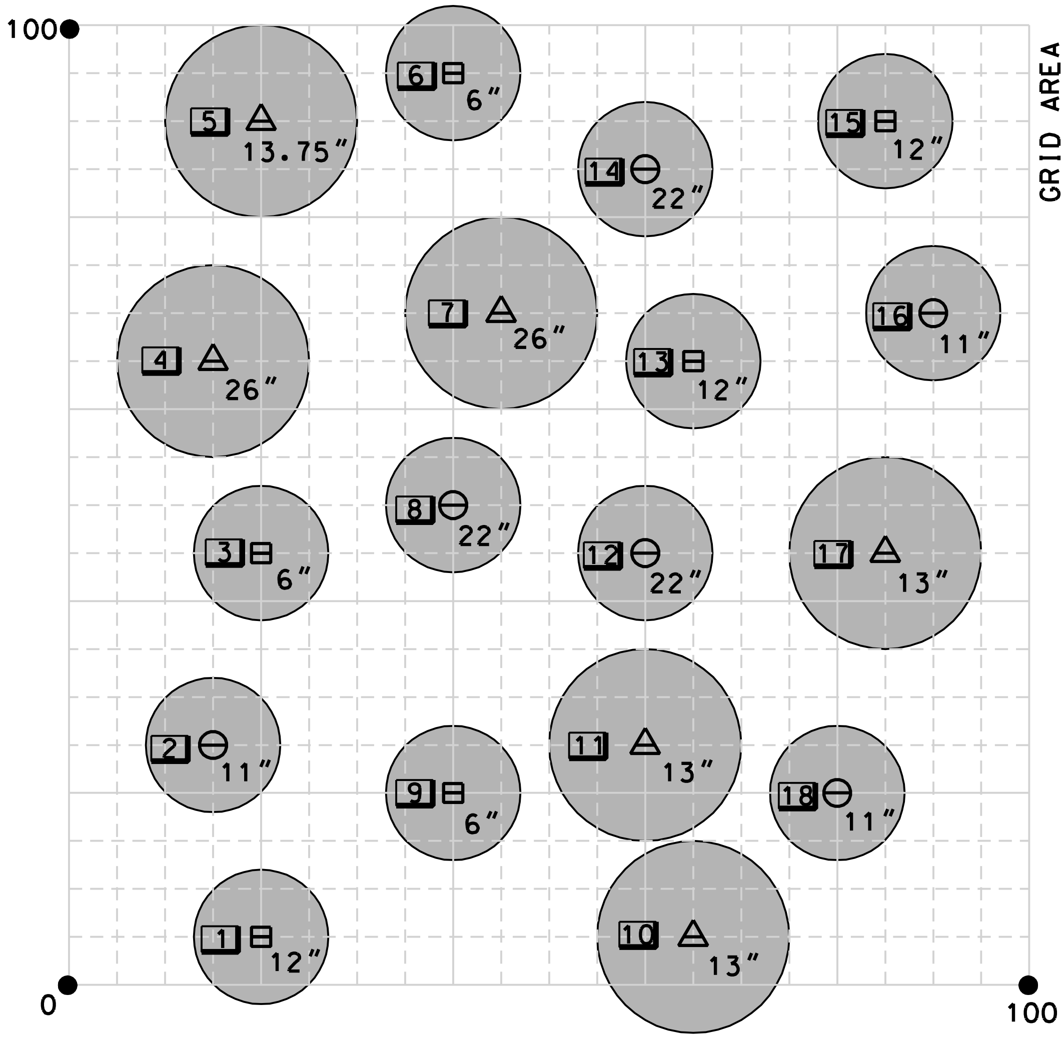
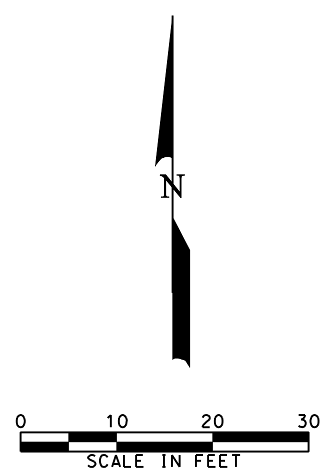
AND SUPPORT CENTER
HUNTSVILLE, ALABAMA

FORMER CAMP CROFT
GPO TEST GRID LOCATION

PROJECT #:	PAGE #:	DATE:	DRAWN BY:	REVIEWD BY:	FIGURE:
2615	A-1	JULY 2004	TBB	MLW	5-1





EXPLANATION

- △ 2.36-inch Rocket, M6A1 Perpendicular
- ⊖ M9 Rifle Grenade Perpendicular
- ⊟ MK II Hand Grenade Perpendicular
- 24" Depth Below Ground Surface (inches)
- ● Separation Distance Buffer

NOTE: SEED ITEMS ARE NOT DRAWN TO SCALE.

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Conceptual Seed Item Map
Former Camp Croft

PAGE:	PROJECT #:	DATE:	DRAWN BY:	CHECKED BY:	FIGURE:
A-2	2615	JULY 2004	RLN	DSW	5-2

ATTACHMENT B

GEOPHYSICAL QC PROCEDURES AND GUIDELINES

INSTRUMENT STANDARDIZATION QUALITY CONTROL REQUIREMENTS FOR OE DIGITAL GEOPHYSICAL MAPPING

To facilitate the detection of buried munitions, the US Army Engineering and Support Center, Huntsville (USAESCH) has defined standard equipment tests and data quality requirements for its Ordnance and Explosives – Digital Geophysical Mapping (OE-DGM) contractors. USAESCH has found that it is imperative to perform and review QC tests before carrying out production geophysical work. This ensures that the geophysical system is functioning properly and optimized for the target objectives.

The most common instruments in use today for metallic OE detection are magnetometers, and electromagnetic metal detectors. This document will identify the USAESCH required QC tests and acceptance criteria for these types of instruments.

1.0 QC Steps/Tests

The required equipment tests and frequency of testing are summarized in Table 1.

TABLE 1 QC TEST FREQUENCY

Test #	Test Description	Specific detector	Power on	Beginning of Day	Beginning & End of Day	1st Day of Project for each operator	1 Line per Grid or 100 ft. per Linear Mile
1	Equipment Warm-up		X				
2	Record Sensor Positions			X			
3	Personnel Test			X			
4	Vibration Test (Cable Shake)			X			
5	Static Background and Static Spike				X		
6	Azimuthal Test	Magnetometer Only				X	
7	Height Optimization					X	
8	6 Line Test					X	
9	Octant Test - (Heading Error Test)	Magnetometer Only				X	
10	Repeat Lines						X

1.1 Equipment/Electronics Warm-up

Purpose: Minimize sensor drift due to thermal stabilization. Most instruments need a few minutes to warm up before data collection begins. Follow the manufacturer's instructions or, if none are given, observe the data readings until they stabilize.

Acceptance Criteria: Equipment Specific (typically 5 minutes).

1.2 Record Relative Sensor Positions

Purpose: Document relative navigation and sensor offsets, detector separation, and detector heights above the ground surface. This will ensure that detector offset corrections and gradient calculations can be done correctly and that the surveys are repeatable.
Acceptance Criteria: +/- One inch (2.54 cm)

1.3 Personnel Test

Purpose: Ensure survey personnel have removed all potential interference sources from their "bodies". Common interference sources are ballpoint pens in the operator's pocket and steel-toed boots or large metallic belt buckles, which can produce data anomalies similar to OE targets. All personnel who will be coming within close proximity of the sensor during survey operations must approach the sensor and have a second person monitor and record the results.

Acceptance Criteria: EM61 +/- 2mV, Mag +/- 3nT

1.4 Vibration Test (Cable Shake)

Purpose: Identify and replace shorting cables and broken pin-outs on connectors. With the instrument held in a static position and collecting data, shake all cables to test for shorts and broken pin-outs. An assistant is helpful to observe any changes in instrument response. If shorts are found, the cable should be immediately repaired or replaced. After repair, cables need to be rigorously tested before use.

Acceptance Criteria: Data Profile does not exhibit data spike responses.

1.5 Static Background and Static Standard Response (Spike) Test

Purpose: Quantify instrument background readings, electronic drift, locate potential interference spikes in the time domain, and determine impulse response and repeatability of the instrument to a standard test item. A standard 2" diameter steel trailer ball (Uniball- available from U-haul) is the preferred test item, as it is easily acquired and transported. Improper instrument function, the presence of local sources of ambient noise (such as EM transmissions from high-voltage electric lines), and instability in the earth's magnetic field (as during a magnetic storm) are all potential causes of inconsistent, non-repeatable readings. A minimum of three minutes static background collection after instrument warm-up, followed by a 1-minute standard (spike) test followed by a 1-minute static background data is required. The operator must review the readings to confirm their stability prior to continuing with the geophysical survey.

Acceptance Criteria: Static Background Test: EM61 +/- 2.5 mV, Mag +/- 1nT

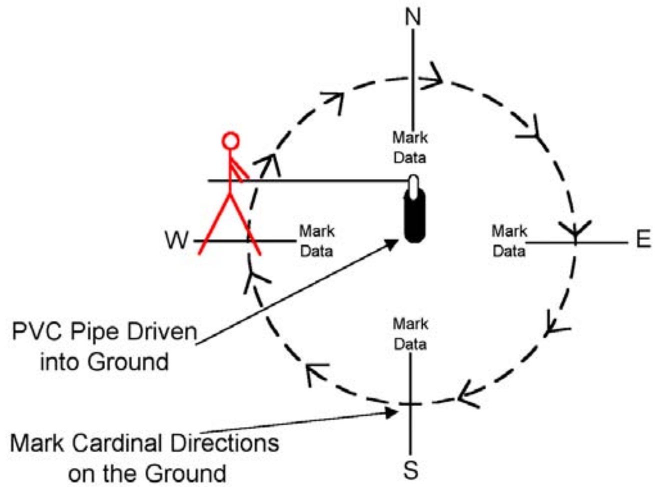
Spike Test: EM61 and Mag +/- 20% of standard item response, after background correction.

1.6 Azimuthal Test (Magnetometer sensor systems only)

Purpose: Optimize sensor orientation to avoid optically pumped magnetometer sensor "Dead Zones". This test is performed to document the differences in readings based on sensor orientation with respect to the earth's local magnetic field. An illustration of the Azimuthal Test is given in Figure 1. A variety of sensor orientations should be evaluated, to minimize the observed deviation in amplitude, and reduce chances of encountering magnetic "dead zones" for cesium vapor magnetometers.

Acceptance Criteria: Sensor Orientation that minimizes the observed deviation in amplitude and is devoid of drop-outs.

Figure 1



1.7 Height Optimization

Purpose: Determine the sensor height that optimizes the target signal-to-noise ratio and maintains adequate sensitivity. This test is most often applied to magnetics, and for the GEM-3 instrument. It could also be used for an EM-61 used in harness or "litter" mode. A line is established with at least one test object along its length. Data is collected with the instrument using a minimum of three different sensor heights, and the height that best meets the objectives is selected.

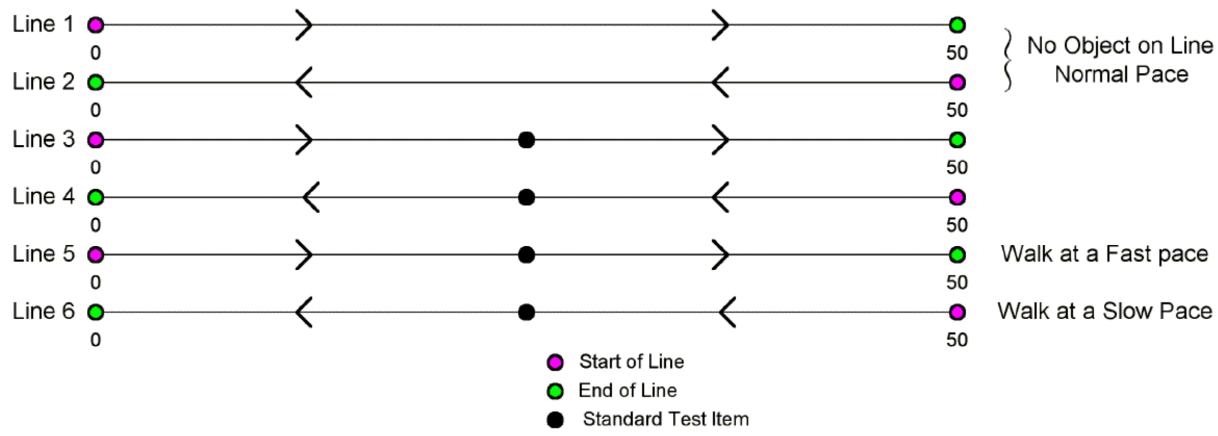
Acceptance Criteria: Maximum signal-to-noise ratio that reliably detects smallest target objective.

1.8 Six Line Test

Purpose: Document latency, heading effects, repeatability of response amplitude, and positional accuracy.

This test should be performed in an area relatively clear of anomalous response. The test line will be well marked to facilitate data collection over the exact same line each time the test is performed. Background response over the test line is established in Lines 1 and 2. A standard test item, such as a steel trailer hitch ball will be used for Lines 3 through 6. Heading effects, repeatability of response amplitude, positional accuracy, and latency are evaluated.
Acceptance Criteria: Repeatability of response amplitude +/-20%, Positional Accuracy +/- 20cm

Figure 2

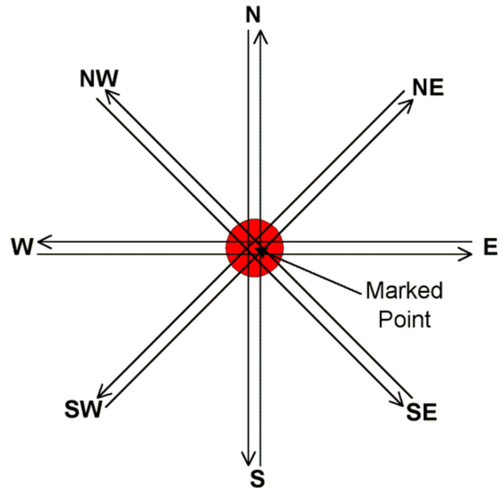


1.9 Octant Test (Heading Error Test for Magnetometer systems)
Purpose: Determine Heading effects (systematic shift based on direction of travel along the survey line). A magnetometer's response to ferromagnetic objects varies slightly according to the orientation of the sensor in relation to the console electronics and the operator. It is recommended that test be performed for all equipment and operator combinations.

A total of eight lines of magnetic data are collected, passing over the same central point. The arrangement of lines for the test is illustrated in Figure 3. The difference in the response over the central point documents heading effects.

Acceptance Criteria: Document heading error for post-processing correction.

Figure 3



1.10 Repeat Data

Purpose: Determine positional and geophysical data repeatability. One line per grid, or 100 feet per mile for transect or meandering path surveys, will be repeated before and after the survey. This repeat line should have the test standard placed at approximately the halfway point in an area lacking anomalous responses. The repeat line will be located at least 10 feet outside of the grid/transect/meandering path and parallel to the direction of travel.

When viewed in profile and compared to original data, repeat data provides a means of evaluating the ability of the instrument to respond consistently, and evaluates the positional accuracy of the data. Errors in positional repeatability outside acceptable tolerances indicate a problem in the method of navigation or navigational equipment operation. Errors outside acceptable tolerances for the amplitude repeatability response indicate a problem in the detector system or in the ability of the operator to perform an adequate survey.
Acceptance Criteria: Repeatability of response amplitude +/-20%, Positional Accuracy +/- 20cm

ATTACHMENT C

GEOPHYSICAL FIELD DATA SHEET

☐ QC checked by ____________
Date: __________

Field Data Sheet

☐ QA checked by _________
Date: ________

Project Name: ________________________________ **Project Location:** ________________________________

Geophysical Contractor: ________________________ **Design Center POC:** ____________________________

Project Geophysicist: __________________________ **Site Geophysicist:** ______________________________

Survey Area ID: __________ **Date:** ____________ **Field Team:** ____________________________________

Survey Type: ☐Grid ☐Meandering Path ☐Transect ☐Other ____________

Coordinate System: ☐UTM ☐State Plane NAD _____ ☐Local ☐Other ____________ **Unit of Measure:** ☐ meters ☐ feet

Sketch of Survey Area: **Approx. Scale:** ___________ **North Arrow:**

____

Terrain:

☐Level ☐Moderate Slope ☐Steep

☐Rolling ☐Ruts ☐Gullies

☐Rocky ☐Swampy ☐Dangerous

Tree Cover: **Tree Height:** ____

☐None ☐Light ☐Medium ☐Thick

Brush:

☐None ☐Light ☐Medium ☐Thick

Weather:

☐Sunny ☐Cloudy ☐Drizzle

☐Rain ☐Thunderstorms ☐Hail

☐Fog ☐Humid ☐Snow

Grid Corner Coordinates:

	UTM/State Plane	Local
SW	__________, __________	__________, __________
NW	__________, __________	__________, __________
NE	__________, __________	__________, __________
SE	__________, __________	__________, __________

	Start	End	File Name
Battery Voltage:	_____	_____	
Static Background Value:	_____	_____	_______, _______
Static Response Value:	_____	_____	_______, _______
Instrument Clock Drift:	___________		

Raw Data File Name: ____________________________ **Repeat Data File Name:** ____________________________

Geophysical Instrumentation: ______________________________________ **Serial Number:** _______________

Base Station: ____ **Serial Number:** _______________

Navigation Method: ____ **Serial Number:** _______________

Additional Comments: ____

____

____

6.0 GEOPHYSICAL INVESTIGATION PLAN

6.1 UNEXPLODED ORDNANCE (UXO) SAFETY

During initial fieldwork and intrusive activities, NAEVA will be accompanied by a UXO Technician II. Prior to the geophysical survey team entering an area potentially containing UXO, the UXO Technician II shall conduct visual surveys for surface ordnance and a magnetometer or electromagnetic survey of each specific intrusive activity site to ensure the site is anomaly free prior to the crew setting monuments or driving stakes. The UXO Technician II will not be required on a full time basis for non-intrusive activities.

6.2 PERSONNEL QUALIFICATIONS

6.2.1 ZAPATAENGINEERING's Senior Geophysicist will oversee the geophysical data collection and processing procedures. Personnel will provide qualifications prior to job commencement.

6.2.2 Personnel involved with the geophysical field operations will have completed the OSHA training course for Hazardous Waste Operations. All training will be in accordance with the following documents; 29 CFR 1910.120, EM 385-1-1 (CEHNC Safety and Health Requirements Manual), ER 385-1-92 (Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) and Ordnance and Explosive (OE activities)). Additionally, the Medical Surveillance program will be in effect, with personnel having received their latest exam within the last 12 months.

6.3 GEOPHYSICAL INVESTIGATION PLAN OUTLINE

6.3.1 Site Description

The Former Camp Croft was located approximately five miles southeast of Spartanburg, South Carolina. The OOU 3, 11C, and 11D encompass a total of approximately 48 acres and comprise the Wedgewood Subdivision, a private residential community and adjacent property. Areas of concern within OOU3 include approximately 24 acres. OOU 11C is approximately 9.48 acres. OOU 11D is approximately 11.2 acres. An overall site map of Camp Croft and the projects sites can be seen in Figure B-1 in Appendix B.

6.3.2 Geophysical Data Quality Objectives

6.3.2.1 Geophysical data quality objectives (DQOs) are discussed in the Geophysical Investigation Plan herein and outlined below:

- Instrument latency will be corrected using an appropriate correction routine that accounts for instrument latency time and sensor velocity. Corrections must be specific for all segments of data with equal sensor velocities.
- No "zig-zag" or "chevron" effects will be visible in the data maps when plotted at the scales used to detect the smallest amplitude signal for any given UXO item expected at this site. Simple "lag" corrections or "offset" corrections that use a single correction parameter for an entire dataset are not likely to meet this DQO when the sensor velocity is not constant.

- No "striping" will be visible at either the following specifications: a) in vertical gradient data above a 0.1 nT/ft level between lines and b) no "striping" visible in total field (TF) data above a 0.5 nT level between lines, or at the degree of leveling achieved and approved in the GPO.
- The base station data will exhibit normal characteristics for such data (background variations of less than one nT (typical) between measurements during periods without magnetic storms), and will not show indications of interference from cultural sources in excess of those observed during the prove-out.
- For any given dataset of EM data, all processed data channels will be leveled using the same routines and parameters.
- All leveling and/or filtering routines that are applied to data will be evaluated to confirm that routines do not alter the nature of the original measured response.
- Along-track sampling densities will not exceed 0.7 feet for EM data and will not exceed 0.5 feet for magnetometer data (based on results from the GPO.)
- For EM data, the across-track line spacing will not exceed 2.5 feet or the across-track width of the sensor, as determined and approved in the GPO. For magnetometer data, the across-track line spacing will not exceed two feet.
- The senior geophysicist or one of his/her designates will certify that all dig results have been reviewed by them and that they accept the reported findings as reasonable for the interpreted anomaly signatures. The purpose of this DQO is to ensure to the government that the contractor's team is maintaining open lines of communication between the dig teams and the people interpreting the geophysical data.
- The sum of all data positioning errors in the final datasets will not exceed +/- 1 foot. This DQO is specific to the reported positions of the state-plane coordinates for each data point in the final version of geophysical data. This DQO specifically excludes the accuracy of reported coordinates for selected anomalies. The purpose of this DQO is to ensure that proper field procedures are developed and used to minimize navigation errors and to identify any errors early in the event they occur. Typical sources of navigation errors include the accuracy of placing survey markers (e.g. grid corners and transect markers) and accuracies in dead-reckoning (the ability of the operator to maintain a straight line between survey markers, which is typically +/- 0.5 foot).

6.3.2.2 The DQOs will be reviewed and continually evaluated during data collection and processing to ensure failures are recognized and corrective actions are implemented as soon as possible.

6.3.3 Specific Area(s) to be investigated

6.3.3.1 Initial activities include conducting an intrusive excavation in several previously identified pits located in Grid 17 (approximately 1.1 acres) and Grid 40 (approximately 0.9 acres) of OOU 3. Following this removal action, ZAPATAENGINEERING will perform DGM in Grids 17, 40, and Grid 35P4 (approximately 0.7 acres), for quality control and to ensure adequacy of the current and previous removal actions in these areas.

6.3.3.2 Optional tasks that may be authorized in the future at the discretion of the Government on a priority basis, include:

- Geophysical Mapping and intrusive investigation/clearance of 9.48 acres in OOU 11C,

- Geophysical Mapping and intrusive investigation/clearance of 11.2 acres in OOU 11D,

- Geophysical Mapping and intrusive investigation/clearance of 24.0 acres in OOU 3, between the Wedgewood Subdivision and the Creek Golf Club.

6.3.4 Past, Current, and future use

6.3.4.1 Past Use.

Past use is documented in Chapter 1 herein.

6.3.4.2 Current and Future Use.

Sites within the project area are mixed use: residential, recreational, and undeveloped.

6.3.4.3 Anticipated UXO type, Composition and Quantity.

6.3.4.3.1 The types of UXO discovered at the project sites include:

- M15 White Phosphorous (WP) Hand Grenades, MKII Grenades, and 105mm smoke canisters (Hexachlorathane Zinc); quantity unknown (OOU3),
- M9 Rifle Grenade; quantity unknown (OOU 11C),
- MKII Grenades; quantity unknown (OOU 11D),
- MKII Grenades; quantity unknown (OOU3).

6.3.4.3.2 It is anticipated that additional UXO and OE scrap may be found to a depth of four feet.

6.3.5 Vegetation

The sites to be investigated are currently either landscaped or moderately wooded areas. Vegetation in residential areas might include grass, shrubs, and sparsely located trees. Dense underbrush, mature trees, tall grasses, or thickets in undeveloped areas may decrease geophysical data collection production rates in the wooded areas.

6.3.6 Geologic Conditions

6.3.6.1 The Inner Piedmont geological area of South Carolina is primarily a composite stack of thrust sheets containing greisses, schists, amphibolites, some ultramafic bodies, and intrusive granitoids (UXB International, Inc., August 1999). Weathered unconsolidated sediments are primarily alluvium (flood plain deposits) and weathered basement rock, or saprolite.

6.3.6.2 The localized bedrock in the vicinity of Former Camp Croft is primarily biotite schist, gneiss, amphibolite, and was likely deposited in an environment that also received some volcanic material (UXB International, Inc., August 1999), with overlying weathered residuum (saprolite). The median thickness of the saprolite is typically between 50 to 60 feet in the localized area. Extreme variances in these depths (from 20 feet to 400+ feet) are on record (USDA).

6.3.7 Soil Conditions

The soil at the former Camp Croft site is typically high in iron and iron minerals. As expected in a weathering environment, the overburden thickness is greater in the lower areas of the site, where weathering tends to be more progressive, as opposed to higher areas (i.e., on knolls, hilltops, etc.) where bedrock is typically closer to the surface. The weathering of the soil will leave relic rock within the reddish saprolitic soils. Alluvial sand and gravels are found in the lower areas of the site along streambeds.

6.3.8 Groundwater Conditions

Depth to groundwater in the southwest section of Camp Croft (near the current day Camp Croft Landfill) is approximately 20 to 30 feet below grade and occurs in the weathered saprolite soils. The potential yield of wells drilled in the saprolite is considerably less than deeper wells drilled into the fractured rock formations.

6.3.9 Geophysical Conditions and Exceptions

The bedrock and soil at the site are derived from rocks and minerals that have high iron content with associated magnetic properties, which may result in false positive anomalies. The topography is relatively gentle except along the borders of the site where there are gullies and steep slopes. Thick vegetation may exist in these areas and might present additional challenges for data collection or decrease the progress of the survey. In addition, elevated noise levels may be encountered adjacent to residential areas or any given residence. NAEVA EM61 and EM61-MKII instruments are equipped with 50 Hz and 60 Hz filters to diminish utility line noise, and backpack filters may be installed if severe noise is encountered. These and other factors will be considered during data analysis.

6.3.10 Site Utilities

Portions of the site are residential. As such, utilities include both overhead and underground electrical power lines, phone lines, and underground cable television lines. These utilities are directed from overhead trunk lines into the subdivision, then routed underground to individual dwellings. No gas lines are thought to be located in the work areas. Water and sewer lines are buried underground between homes and main lines. No wells or septic tanks are known in the investigation area. Utility locations will be marked prior to intrusive investigations.

6.3.11 Man-made Features Potentially affecting Geophysical Investigations

Man-made features, in addition to those listed above that will affect geophysical investigations are:

- Buildings, sidewalks, and fences
- Above ground and underground utilities
- Sewer covers, and culverts
- Roads and curbing
- Buried trash, debris, and artifacts

A digital map layer will be included to identify man-made features potentially affecting the geophysical investigation.

6.3.12 Site-specific Dynamic Events

None noted.

6.3.13 Overall Site Accessibility and Impediments

6.3.13.1 The Government will supply ZAPATAENGINEERING with Rights-of-Entry (ROE) to the individual lots at the site prior to the start of the project.

6.3.13.2 It is possible that access might be limited to some of the sites. In these conditions, all terrain vehicles (ATV) may be necessary to transport teams and equipment to and from the sites.

6.3.14 Potential Worker Hazards

6.3.14.1 UXO Operations Safety and Site-Specific environmental hazards training will be conducted upon personnel mobilization and continually reinforced throughout the project duration through formal Daily Safety and Tailgate Meetings.

6.3.14.2 There are no unusual hazards at the site other than potential UXO. Specific hazards are documented in Appendix D (Site Safety and Health Plan).

6.4 GEOPHYSICAL INVESTIGATION

Using techniques demonstrated during the GPO and approved by CEHNC, NAEVA will conduct geophysical surveying, mapping, and evaluation of the project site. Upon completion of the OE removal, NAEVA will conduct a geophysical survey of Grids 17, 40, and 35P4 as a quality control check. The total area for the geophysical work on these grids is approximately 2.7 acres. NAEVA will also conduct DGM to support an OE removal action in OOU 11C, OOU 11D, and the remaining area within OOU3 (24 acres) between the Wedgewood Subdivision and adjacent golf course. NAEVA will relocate any targets identified in the geophysical data as potential OE items. The targets will be relocated using precision surveying methods and the same geophysical detector type (EM or MAG) that was used in data collection.

6.4.1 Survey Type

NAEVA will utilize either EM or MAG geophysical instruments at the Former Camp Croft to locate potential unexploded ordnance as quality control or mapping for removal activities.

6.4.2 Equipment

6.4.2.1 The instruments and procedures chosen will have successfully demonstrated the capability to collect accurate geophysical data at the GPO grid, which will be representative of site conditions.

6.4.2.2 NAEVA may substitute similar instruments, or add instruments to those proposed. Any instruments which are substituted for or added to those instruments which were approved in the GPO will also be tested at the GPO site for approval by CEHNC geophysicist. Acceptance of this work plan will imply approval for testing the instruments listed. Upon completion of the evaluation, ZAPATAENGINEERING will provide CEHNC the results of the evaluation and the recommended instrument(s) to be used at this site. ZAPATAENGINEERING will not proceed without CEHNC approval.

6.4.3 Procedures

6.4.3.1 Electromagnetic (EM) System

The EM system includes transmitter and receiver coils, processing electronics and a data logger. Data are temporarily stored in a data logger, and then dumped to a Personal Computer (PC) following collection. One meter by one-half meter (20-inch by 40-inch) transmitter/receiver coils will be utilized. The coils will be mounted on a wheeled cart equipped with an odometer and pulled across the survey area by hand. The horizontally co-located coils are separated vertically by 40 cm. The lower coil houses a transmitter and a receiver; the upper coil contains a receiver coil only. The coils will be orientated with the axis of the one-meter side perpendicular to the direction of travel. The odometer will trigger the system at 20 cm intervals along the survey line. The use of fiducial ropes placed at regular intervals across the grid will allow post-collection editing of positions to assure accuracy. Two and a half foot or three-foot travel lanes, as determined by the GPO, will be marked on the fiducial ropes to facilitate straight-line profiling.

6.4.3.2 Magnetics (MAG) System

The MAG system will be the Scintrex Smartmag SM-4 system consisting of a highly sensitive self-oscillating split-beam cesium vapor magnetometer. It measures the total magnetic field with a sensitivity of +/- 0.01 nanoTeslas (nT) (range 15,000-100,000 nT). An advantage of using a cesium vapor magnetometer is greater depth of exploration as compared to typical electromagnetic methods. Base station readings will be collected using a Scintrex Envimag proton procession magnetometer.

6.4.3.3 Sensor Positioning

NAEVA will use the EM or the MAG for collection of geophysical data at the Former Camp Croft. Sensor positioning will be achieved through the use of tape measures and marked ropes placed across the areas of investigation. This technique facilitates straight-line profiling and allows the placement of fiducial marks within the data sets. Data will be collected utilizing local coordinates referenced to the southwest corner of the grid. NAEVA will convert the geophysical data from local coordinates into the Universal Transverse Mercator (UTM) coordinate system during data post-processing.

6.4.4 Personnel

The beginning of the geophysical investigation will be conducted under the direct supervision of ZAPATAENGINEERING's Senior Geophysicist. Site Geophysicists and technicians from NAEVA will collect, process, analyze and evaluate the data.

6.4.5 Production Rates

Geophysical data will be collected using the grid methodology over approximately 2.7 acres in the specified grids within OOU 3, approximately 24 acres of the remaining acres within OOU 3, approximately 9.48 acres in OOU 11C, and approximately 11.2 acres in OOU 11D. The geophysical team estimates DGM rates of approximately 1.5 acres per day. Data collection productivity rate is dependent on the terrain, vegetation cover, and site access.

6.4.6 Data Spatial Density

The minimum size object of interest for the Former Camp Croft is the MKII hand grenade. The Geonics EM instruments have proven very effective on projects with an OE clearance depth of four feet and has demonstrated the capability of detecting a shallow 20 mm round under ideal conditions. EM instruments use coils measuring approximately one-meter (width) by 0.5 meter (length). Data will be recorded at 20-centimeter (approximately 8-inch) intervals along 2.5 feet or 3.0 feet EM Lines, as determined by the GPO Letter Report.

6.5 INSTRUMENT STANDARDIZATION

6.5.1 Data Processing

6.5.1.1 The geophysical sensor data and positional data will be processed and interpreted using the Geosoft Oasis Montaj UXO-detect module data analysis system.

6.5.1.2 Geophysical data, both raw and processed, will be posted on a secure website (https://oe.zapeng.com) and provided to CEHNC on a CD-ROM in accordance with DID OE-005-05.01.

6.5.2 Initial Field Processing

Data temporarily stored in the field logger will be downloaded into a laptop computer for on-site review and editing. Initial data processing will be performed on-site by the geophysical team to assess the quality and completeness of the data. Proprietary software supplied by the instrument's manufacturer will be used to make positional corrections based on the fiducial marks in the data. Any necessary instrument drift correction or leveling will also be performed at this point. The data will then be gridded and displayed on the screen as a color contour image with the track plot of the instrument's path overlain on the map.

6.5.3 Standard Data Analysis

Typical standard data analysis will consist of, but not necessarily be limited to, the following procedures for the appropriate instrument:

- Diurnal correction (magnetic data)
- Positional offset correction
- Sensor bias, background leveling and/or standardization adjustment
- Sensor drift removal
- Latency correction
- Heading error removal (magnetic data)
- Geophysical noise identification and removal (special, temporal, motional, terrain induced)
- Gridding method and search criteria
- Contour level selection with background shading and analysis.

6.5.4 Advanced Data Processing, Digital Filtering, and Enhancement

Once standard data analysis steps have been performed, data will be transferred to NAEVA's corporate offices for advanced analysis/interpretation (if applicable) and final map production. Advanced data processing may be performed to meet the project geophysical DQO's.

Typical advanced data processing, digital filtering and enhancement methods are:

- Dipole match, or analytic signal calculation (magnetic data)
- Adaptive (matched) filtering
- Approximate magnetic volume/mass estimates (magnetic data)
- Approximate depth determination
- Time decay curve analysis (TDEM data)
- Amplitude and phase response analysis (FDEM)
- Data fusion
- Digital filtering and enhancement (low pass, high pass, band pass, convolution, correlation and non-linear).

6.5.5 Anomaly Selection and Decision Criteria

Targets will be selected from these maps initially by Geosoft's UXO package. Each anomaly selected by Geosoft as a target will be scrutinized by trained geophysicists and evaluated for validity and position reported by the picking algorithm. Targets that are found to be invalid or misplaced will be removed or moved. Additionally, anomalies that are not selected by the software, yet deemed to represent a target, will be picked manually. Dig sheets will be created using a minimum response threshold value that will be decided upon following the evaluation of baseline and GPO survey.

6.6 DIG SHEET DEVELOPMENT

6.6.1 The dig sheets will contain the following information:

- Project Site – Former Camp Croft, South Carolina,
- Geophysical Contractor – NAEVA,
- Responsible Geophysicist – To Be Determined, NAEVA,
- Sector Number – To Be Determined,
- Anomaly Number – To Be Determined,
- Response Characteristics – To Be Determined,
- Predicted Easting and Northing – To Be Determined,
- Predicted Depth to Top of Item – To Be Determined.

6.6.2 Final geophysical maps, hard and electronic copies of the dig-sheets, and supporting interpretations will be provided to ZAPATAENGINEERING and posted to a secured website within 14 days of the end of field data collection.

6.7 ANOMALY REACQUISITION

NAEVA shall reacquire all geophysical anomalies identified for excavation on the dig sheets using the reacquisition method tested by ZAPATAENGINEERING and approved by CEHNC on the

GPO Plan. ZAPATAENGINEERING shall flag (PVC flag with the unique identifier number recorded in indelible ink on the flag) the actual field location of each reacquired anomaly shown on the dig sheet and paint the ground (if feasible and allowable) at the flag location with high-visibility paint. Such reacquisition will be carried out concurrently with other site activities and will be completed no later than 14 days after geophysical field investigations are completed. The project team will record and report on all discrepancies between final reacquired anomaly locations as shown on the dig-sheet, actual locations of the excavated anomalies, and also report any anomalies that could not be reacquired.

6.8 FEED-BACK PROCESS

Once anomaly predictions are made and the items are removed, the actual items are compared to the predictions. The anomaly feedback process is essential to increase discrimination abilities. Once anomaly predictions are made and the items are removed, the actual items are compared to the target predictions (locations and magnetic response values). The comparison results will be used to refine instrument settings or modeling thresholds, with concurrence from CEHNC, to reduce the number of false positives.

6.9 QUALITY CONTROL

6.9.1 Quality control (QC) procedures for standard equipment tests and data quality requirements will be reviewed prior to conducting production DGM and will be performed using the frequency schedule detailed in DID OE-005-05.01 Attachment B. These procedures will consist of, but not necessarily be limited to, the following steps for the appropriate instrument:

- A minimum of 15-minutes warm-up time will be allowed for the geophysical sensors prior to data collection.
- Static Test: After a warm-up period, data will be recorded in a stationary mode for a minimum of three minutes. An additional three minutes of measurements will be recorded with a standard item placed beneath the sensor, followed by a three-minute recording with the item removed, to aid in identifying equipment problems and determining instrument drift.
- A personnel test will be performed for each crew member that will approach the instruments during operation.
- Sensor position will be recorded and monitored during geophysical data collection.
- A vibration test of instrument components will be made and recorded.
- Each day, a standard test will be conducted before and after data collection. A metal item (e.g., tow hitch ball) will be placed below the instruments and data will be recorded. Instrument readings during the standard test will be checked to verify results are within 20 percent of standard instrument response established on the first day of data collection.
- An azimuth test will be conducted to eliminate or minimize data dropouts.
- A six-line test will check for and document repeatability of response and position accuracy / latency.
- An octant test will document and provide correction for heading error.
- Repeatability of response will be checked in the field by repeating approximately five percent of line footage in grids or over transects.

- The raw and processed geophysical data will be delivered to ZAPATAENGINEERING to ensure the geophysical quality standards set forth in the SOW and established as a result of the GPO.

6.9.2 ZAPATAENGINEERING's Senior Geophysicist will conduct an independent evaluation of raw and processed geophysical data to ensure the geophysical data meets quality standards set forth in the SOW.

6.9.3 Data Processing Quality Control

Data review and processing QC steps include but may not be limited to:

- Reviewing field data sheets and log forms for completeness.
- Reviewing static instrument standardization files to verify repeatability on amplitude response.
- Monitoring data for gaps or incomplete coverage (indicating sensor failure). Areas with data point gaps, not caused by documented physical obstacles, greater than an amount determined significant by the GPO will be resurveyed. Data gaps generated by physical or cultural features will be documented in the site figures.
- Monitoring survey line separation (across traverse). Gaps determined to be unacceptable in the GPO will be re-surveyed.
- Visually comparing target anomaly selections to the DGM anomalies generated by the known seeded items.
- Removing unreasonable data spikes from the data.
- Monitoring and applying heading and lag corrections.
- Tracking data processing steps to ensure all data are processed in the same manner.
- Documenting additional processing (i.e., filtering) which may be useful in data analysis and target identification.

6.10 CORRECTIVE MEASURES

6.10.1 If any significant discrepancies exist in the positioning or repeatability of the data, the problem will be identified and corrected. Geophysicists will carefully evaluate the geophysical data for any potential problems (i.e., lag correction, abnormal data spikes, or inconsistent background values). All problems will be documented and resolved.

6.10.2 ZAPATAENGINEERING has the final decision-making responsibility on all quality-control issues. If a QC procedure shows a potential problem, the ZAPATAENGINEERING Site Manager and Project Manager will instruct NAEVA on the appropriate corrective actions.

6.11 RECORDS MANAGEMENT

All data will be archived daily onto a separate archiving device, such as a Zip disk or Compact Disk – Read Only Memory (CDROM), to ensure that no information is lost during the project. NAEVA will maintain a data transfer log for all data transactions. ZAPATAENGINEERING will maintain the original or a copy of all records produced during the life of the contract.

6.12 INTERIM REPORTING

During the various stages of the fieldwork, any record generated will be stored. Each deliverable will consist of the records generated to date, since the last deliverable date.

6.13 MAP FORMAT

During the geophysical survey, NAEVA will generate color contour plots of the geophysical data. These maps will include major physical features, such as buildings, roads, utilities, and similar objects. The data and targets will be referenced to the UTM grid plane coordinate system. Geophysical data (raw and processed), target selections, maps, and dig-sheets will be posted on the ZAPATAENGINEERING secure website in the required formats for viewing or downloading by the appropriate parties.

6.14 GEOPHYSICAL INVESTIGATION PERFORMANCE GOALS

6.14.1 OE Detection

The maximum depth of detection for a MKII hand grenade is approximately 2.1 feet (0.6 meters).

ZAPATAENGINEERING will detect and remove metallic items that meet target objectives relating to the diameter and maximum depth of detection for the project ordnance item. If an unexcavated item is located and is considered to be a quality failure, ZAPATAENGINEERING will re-sweep and perform QC on all affected areas prior to re-submitting to the government for verification and acceptance.

6.14.2 Horizontal Accuracy

Horizontally, 95-percent of all excavated items must lie within a one-meter radius of their original surface location as marked on the digsheet. Horizontally, 95-percent of all excavated items must lie within a 35 cm radius of their mapped surface location as marked in the field after reacquisition. If this goal is not achieved, a re-evaluation of the data and field procedures, detection methods, positioning system and QC will be performed. Positional failures will be corrected and a written response explaining the reason and corrective actions will be submitted.

6.14.3 False Positives

There will be no more than 15-percent "false positives" where anomalies reacquired by ZAPATAENGINEERING personnel result in no detectable, metallic material during excavations (calculated as a running average). If this goal is not achieved, a re-evaluation of the data, detection methods being utilized, and overall project QC will be performed. If appropriate, a Corrective Action Plan will be submitted.

6.15 GEOPHYSICAL MAPPING DATA

6.15.1 Geophysical Data Analysis, Field Reacquisition, and Reporting

Data collected during the geophysical investigation will be post-processed and analyzed. ZAPATAENGINEERING will prepare a dig-sheet (Attachment C of DID OE005-05.01) of selected target anomalies and provide them to the project team for reacquisition. NAEVA will perform anomaly reacquisition and verification, and record these measurements on the dig-sheet. This will be done to the same extent and with the same equipment (active or passive) and positioning methods utilized during the DGM event.

6.15.2 Anomaly Reacquisition and Marking

Anomalies will be investigated and intrusively processed as found. Anomaly reacquisition will be performed with the same positioning system and methods that were used for the digital geophysical mapping and development of dig sheets. Any discrepancies between final reacquired mapped locations of the anomalies and the actual location of the excavated anomalies will be recorded and reported.

6.15.3 Anomaly Excavation and Reporting

Anomaly excavation reporting will be recorded daily on the dig sheets generated from the DGM process outlined above. Furthermore, dig sheets will be integrated into the Site Specific Final report as required by DID-OE-005-05.01. Dig sheets will be reviewed and a comparison from the excavation results to the geophysical survey instrument response will be accessed.

7.0 LOCATION SURVEYS AND MAPPING PLAN

B. P. Barber and Associates, Inc. of Columbia, South Carolina will conduct surveying at the sites. All survey plats will be signed and sealed by a registered professional land surveyor (PLS) licensed by the State of South Carolina. A survey crew that meets personnel/work standards as described in DID OE-025.01, will conduct surveys using traditional surveying equipment.

7.1 UNEXPLODED ORDNANCE SAFETY PROVISION

Surveying and data collection activities will be conducted under the direct accompaniment of a ZAPATAENGINEERING UXO Technician. UXO personnel will conduct visual surveys for surface ordnance before the survey crew enters an area suspected to contain OE. A magnetometer survey will be performed in each area where intrusive activities are required to ensure an area is anomaly free before the survey crew installs monuments or stakes. The UXO technician will not be allowed to participate in additional field tasks that would interfere with his OE safety responsibilities. Survey crews will not be present during intrusive OE activities.

7.2 CONTROL POINTS

7.2.1 Survey Monuments and Control Points

Survey monuments will be established (steel pipe driven into the earth) during the Geophysical Prove-Out to mark survey control points. Wooden hubs will be used for all basic grid points.

7.2.2 Accuracy

Established spatial data points such as grid corners, will have an accuracy of Class 1, Third Order or better. Horizontal control will be metric system (meter) and based on the North American Datum of 1983 (NAD 83), UTM Grid System.

7.2.3 Monument Caps

Caps for new monuments will be stamped in a consecutively numbered sequence and will include the project name and the CEHNC initials as necessary.

7.2.4 Plotting

All control points recovered or established during site work will be plotted on a comprehensive site map.

7.2.5 Description Cards

A tabulated list and a description card of all control points established or used for this project will be submitted with the final report. The description cards will be five by eight inch cards describing one monument per card and including a north arrow, the location of the monument relative to reference points, directions to the monument from a known location, the monument's name and number and the final adjusted coordinates and elevations.

7.3 DIGITAL SURVEY DATA

Design files will be created and digitized into a Microstation (*.dgn) file at an elevation of zero. Plots will be a standard metric A-1 size drawing and will have a standard border, revision block, title block, bar scale, legend, and a true and magnetic north arrow with the difference shown in minutes and seconds. Any cell library used will be attached and provided with the digital data set along with other supporting files or data.

7.4 DIGITAL FORMAT FOR MAPPING DATA

All data will conform to the Tri-Service Spatial Data Standards (TSSDS) and will be submitted electronically on a PC – CDROM.

7.5 DELIVERABLE ITEMS AND DATA

The following items and data will be submitted to the CEHNC at the conclusion of the project.

7.5.1 Field Survey

Copies of all field books, layout sheets, computation sheets, abstracts and computer print outs will be suitably bound and clearly marked and identified.

7.5.2 Tabulated List of Control Points

A tabulated list of all control points established or used for this project will be submitted with the final report.

7.5.3 Tabulated List of all UXO Items

A tabulated list of all UXO items discovered during the site work will be submitted with the final report.

8.0 WORK, DATA, AND COST MANAGEMENT PLAN

The Work, Data, and Cost Management Plan has been established by ZAPATAENGINEERING to provide guidance for the effective management of budgeted funds and manpower necessary to complete tasks set forth in the SOW in a cost-effective, timely manner.

8.1 PROJECT MANAGEMENT APPROACH

8.1.1 ZAPATAENGINEERING OE TEAM

ZAPATAENGINEERING has the lead responsibility for all service areas under each task order, including team integration, engineering, program management, data management, geographic information systems (GIS), cost control, program safety, quality control, community relations, and subcontractor selection and management. ZAPATAENGINEERING will coordinate all activities with the CEHNC.

8.1.2 Program Management

ZAPATAENGINEERING's OE teaming structure clearly identifies the lead for each OE task. The Program Manager initiates input from the project team regarding probable site conditions, technical approaches, production and scheduling issues, and safety considerations based on the project background, goals, and objectives. From the issuance of the task order, ZAPATAENGINEERING ensures that the CEHNC is informed of all activities, progress, and problems, along with recommended solutions and other performance issues. ZAPATAENGINEERING's Program Manager is the single point-of-contact for the CEHNC and will always know the work and cost status of each task order.

8.1.3 Project Management

The Project Manager, assigned by the Program Manager, is responsible for ensuring execution of the project in a timely and cost-effective manner. This will be accomplished by continual tracking productivity and expenditures. The UXO QC/SO will submit weekly field progress reports to the Project Manager describing the level of effort by on-site personnel and identifying applicable purchases. The Project Manager will evaluate these data against the negotiated schedule and budget. This will allow potential cost and/or schedule variances to be identified early and corrective actions implemented. Analysis of budget and schedule will be reported to the CEHNC Project Manager on a weekly basis during the field effort.

8.1.4 On-site Project Management

The Project Manager is also responsible for the day-to-day management and execution of the project field operations and personnel. Daily duties include technical review and scheduling, coordinating and monitoring of subcontractor field activities, and enforcing compliance with the Work Plan and Site Safety and Health Plan (SSHP).

8.1.5 Overall Approach

8.1.5.1 Work Plan

This Work Plan was developed and reviewed by ZAPATAENGINEERING personnel familiar with the specific project objectives, the SOW, and contract requirements. The Work Plan was reviewed and approved by the CEHNC. A copy of the Work Plan will be kept on-site during fieldwork.

8.1.5.2 Geophysical Survey and Anomaly Reacquisition

Once the data collection procedures are established, ZAPATAENGINEERING will collect geophysical data over the applicable portions of OOU 3, 11C, and 11D. The ZAPATAENGINEERING Senior Geophysicist will monitor geophysical data-collection events and will report field information to the ZAPATAENGINEERING Project Manager daily. Using the same location equipment utilized during data collection, ZAPATAENGINEERING will relocate and mark with pin flags selected and approved target anomalies.

8.1.5.3 OE Investigation

The ZAPATAENGINEERING project team will conduct the subsurface OE investigation based on geophysical data collected, processed, and evaluated by the CEHNC. OE investigation field data will be forwarded to the ZAPATAENGINEERING Charlotte office on a daily basis. These data will be used to refine the anomaly target selections. ZAPATAENGINEERING will communicate field validation, data processing and re-evaluation updates to the CEHNC on a regular basis and will submit an Anomaly Excavation Report at the conclusion of the OE investigation.

8.1.5.4 Recovered Inert OE and OE-related Scrap

ZAPATAENGINEERING intends to offer scrap metal to Arrow Steel, a local scrap dealer. The metal is offered to the dealer for the reclaim value only. Arrow Steel will remove the scrap metal from the project site at no cost to the government. An alternate metals dealer will be selected if the primary dealer fails to remove the material in a timely manner or no longer desires the metal.

8.1.5.5 Quality Control

Quality Control checks and monitoring are completed by the Quality Control (QC) Manager throughout the life of the project, as necessary.

8.1.5.6 Environmental Sampling

The following is a summary of environmental sampling activities to be conducted during this project. For detailed information related to environmental sampling, see the Environmental Sampling and Analysis Plan (ESAP) in Appendix E.

8.1.5.6.1 Confirmatory Soil Samples

After excavating the pits containing the white phosphorus grenades and if smoking soil was removed, confirmatory soil samples will be collected beneath areas where the white phosphorus impacted soil was located. Samples will be sent to a government laboratory for white phosphorus.

8.1.5.6.2 Soil Waste Classification Samples

For waste disposal requirements, composite samples will be collected from the suspected white phosphorus contaminated soil removed from the pit, only if smoking soils are observed. Samples will be sent to a government laboratory for white phosphorus.

8.1.5.6.3 Water Waste Classification Samples

After all decontamination efforts are complete, one composite water sample will be collected from the 350-gallon tote. Prior to sampling, the tote will be mixed using a pump. Aqueous samples will then be collected from the tote using a Teflon bailer and will be used to directly fill each of the pre-cleaned glass laboratory containers. As with the soil, samples will be sent to a government laboratory for white phosphorus and to GPL for TCLP analysis for Hexachloroethane.

8.1.5.7 Final Removal Report

Upon conclusion of the fieldwork, the ZAPATAENGINEERING Project Manager will compile the fieldwork information and documentation and prepare the draft and final reports. The ZAPATAENGINEERING Project Manager and a minimum of one other ZAPATAENGINEERING project team member will review the reports before submittal.

8.1.6 Controls to Ensure Timely Work under Established Parameters

ZAPATAENGINEERING field personnel will submit daily reports to the Project Manager during all fieldwork efforts. The Project Manager will review all daily reports and compile the information into weekly and monthly summary reports. Based on the projected work schedule, the Project Manager will update the scheduled work timeline to minimize overall schedule and budget disturbances.

8.1.7 Subcontractor Management and Integration Procedures

8.1.7.1 For some task orders, subcontractors support ZAPATAENGINEERING for UXO clean-up and clearance activities, anomaly avoidance, ordnance sampling, identification, removal and venting, geophysical surveys, data processing, analysis and interpretation and other miscellaneous site-specific tasks. The ZAPATAENGINEERING Project Manager reviews the objectives of individual task orders and formulates the appropriate subcontractor team. Once the subcontractor team is formulated, the ZAPATAENGINEERING Contracts Operations Manager develops and establishes the subcontracts. In the event of substandard performance, before any possible schedule delays or cost overruns, ZAPATAENGINEERING will impose progressive disciplinary steps up to and including dismissal. Any violation of safety regulations justifies immediate removal from the site.

8.1.7.2 ZAPATAENGINEERING will utilize the following subcontractors:

- NAEVA – Geophysical Surveying
- B.P. Barber and Associates – Surveying
- Blackwell Grading – Vegetation Removal
- GPL – Sample Analysis
- SAIC – Sample Validation

8.2 PROJECT SCHEDULE

ZAPATAENGINEERING uses Microsoft Project to compile and track scheduled project activities. The ZAPATAENGINEERING Project Manager will monitor and report all tracking information to the CEHNC Project Manager on a monthly basis and during fieldwork on a weekly basis.

8.2.1 Milestones for Task Deliverables

The following milestones were established by ZAPATAENGINEERING during the planning phase of the project and are subject to change:

- Work Plan February 2004;
- Surveying and Mapping April 2004;

- Reacquire and Intrusive Investigation Pits April 2004;
- Geophysical Survey April 2004;
- Anomaly Reacquisition Data April 2004;
- OE Investigation April 2004;
- Quality Control Reports Monthly; and
- Final Removal Report 30 days after completion of field work.

8.3 COST CONTROL AND TRACKING METHODOLOGY

8.3.1 Costing

ZAPATAENGINEERING's project delivery system, Wind2, is designed to control costs and schedules based on real-time budget, cost, and schedule data. The ZAPATAENGINEERING Project Manager reviews this information on a regular basis to anticipate and prevent cost overruns and schedule delays. By frequent review of actual costs and performance progress in comparison with budgets and schedules, potential costs and/or schedule variances can be identified early and corrective action can be implemented. These monitoring procedures will be applied to this contract on a weekly basis to ensure accurate reporting and cost controls.

8.3.2 Billing

ZAPATAENGINEERING uses the Wind2 cost accounting system to manage financial information for all its clients. Subcontractor invoices and employee work records generally are input daily to maintain a real-time snapshot of the project's budget. Project Managers are well versed in the schedule and data analysis functions of both Microsoft Project and Wind2.

8.4 RECURRING DELIVERABLES

Table 8-1 summarizes the list of recurring deliverables associated with this project.

TABLE 8-1 RECURRING DELIVERABLES

Deliverable	Reference	Scheduled Due Date
Weekly Status Reports	DID OE-085.01, SOW 4.12.7	Weekly, NLT the first working day of the following week during fieldwork
Monthly Status Reports	DID OE-080.01, SOW 4.12.6	Monthly, NLT the 10th of the following month
Meeting Minutes	DID OE-045.01, SOW 4.12.4	NLT 10 days after each meeting
Daily Geophysical Data	DID OE-005-05.01	NLT 36 hours after initial collection
Geophysical Data (Raw and Processed)	SOW 4.7.1	NLT five days after data collection
Interim Dig Sheets	DID OE-005-05.01	NLT five days after data collection
Final Geophysical Maps, Dig Sheets, and Supporting Interpretations	DID OE-005-05.01	NLT 14 days after completion of the survey activity
Anomaly Excavation Report	DID OE-005-05.01	NLT 10 days after completion of excavation
Exposure Data Report	DID OE-080.01	Monthly, NLT the 10th of the following month

Created By: KJ Reviewed By: MW

9.0 PROPERTY MANAGEMENT PLAN

ZAPATAENGINEERING's Property Management System provides for controlling, managing and tracking all of the Government-owned property in ZAPATAENGINEERING's possession. This system applies to all property acquired or furnished under Federal contracts or subcontracts awarded to and managed by ZAPATAENGINEERING, including Federal Government property acquired by, received by, or furnished to subcontractors by this company under a Federal Government contract. Federal Acquisition Regulation (FAR) Part 45 applies to Federal Government property controlled by ZAPATAENGINEERING. If provisions of a particular Government contract conflict with any aspect of this Property Management System or corporate management and accounting policies, the specific contract provisions will govern. Portions of this system will be amended to reflect specific contract and program management requirements, as required. It is ZAPATAENGINEERING's policy to meet Federal property control guidelines. In compliance with this policy, it is incumbent upon all ZAPATAENGINEERING personnel and subcontractors who use Government-owned property in support of contracts managed by ZAPATAENGINEERING to adhere to the policies, procedures, and guidelines set forth herein. ZAPATAENGINEERING's Property Management Plan (PMP) has been submitted to and approved by the Government Property Administrator at the CEHNC.

9.1 RESPONSIBILITIES FOR GOVERNMENT PROPERTY

9.1.1 Project Manager

- Ensuring procedure compliance with the Property Management System by all ZAPATAENGINEERING and subcontractor personnel who use the Government property in support of each Government contract.
- Directing the Task/Equipment Manager in all aspects of the Property Management System for particular contracts.
- Ultimate authority and responsibility to control, maintain, protect, and preserve Government property in the possession of ZAPATAENGINEERING.
- Report any loss, damage, or destruction to the Property System Manager as soon as the facts become known.
- Ensuring that each item of Government property is specifically identified in the contract and that any changes in Government property are reflected in formal modification to the contract and are signed by the Contracting Officer.
- Ensuring that equipment is used only on the contract for which it is authorized and in accordance with the terms of the contract.
- Maintaining and calibrating equipment in accordance with manufacturer's recommended serving schedules and documenting all maintenance, repair, and service.

9.1.2 Project/Equipment Manager

- Receiving, marking/tagging, and logging property received directly on site.
- Tracking location, use and condition of equipment distributed on site.
- Assigning equipment to personnel on site and ensuring employees have adequate training for the use of equipment.
- Ensuring that equipment assigned to the site is maintained and calibrated by qualified personnel.

- Ensuring that equipment is decontaminated by field personnel and returned in good condition, allowing for normal wear.

9.1.3 Property System Manager

- Monitoring compliance with the Property Management System.
- Implementing and enforcing the Property Management System for ZAPATAENGINEERING's Government contracts.
- Coordinating with ZAPATAENGINEERING's Contracts Administrator, or designee, to ensure compliance with contract terms, modifications, and other contract administration requirements.
- Serving as ZAPATAENGINEERING's primary point of coordination with the Government Property Administrator regarding the guidelines set forth in the Property Management System as they apply to Government contracts.
- Marking and tagging property received in the ZAPATAENGINEERING office and entering property data into the property log.
- Coordinating periodic property inventories.
- Submitting required reports to the Government Property Administrator.

9.1.4 Equipment Users

The security, condition, proper usage, calibration, and maintenance (before, during and after uses) of equipment.

9.2 SENSITIVE PROPERTY

Sensitive Government property will be handled in accordance with Data Item Descriptions (DIDs) OE-005-03.01, Explosives Management Plan, OE-005-04.01, Explosives Siting Plan and OE-005-09, Property Management Plan.

9.3 RELIEF FROM RESPONSIBILITY AND CONTRACT CLOSURE

Relief from responsibility will be governed by the following standards:

- Reasonable and proper consumption of property in the performance of the contract as determined by the Property Administrator.
- Retention by ZAPATAENGINEERING, with the approval of the CEHNC Contracting Officer, of the property for which the Government has received consideration.
- Authorized sale of property provided the proceeds are received by or credited to the Government.
- A determination by the CEHNC Contracting Officer of ZAPATAENGINEERING's liability for any property that is lost, damaged, destroyed, or consumed in excess of that normally anticipated in a manufacturing or processing operation if:
  - The determination is furnished to the company in writing;
  - The Government is reimbursed where required by the determination; and
  - Property rendered unserviceable by damage is properly disposed of, and the determination cross-referenced to the shipping or other documents evidencing disposal.
- The property will be inventoried at the time of contract closure. Disposition of property will be determined by the Government or as otherwise stated in the contract.

- Property may be transferred to other contracts upon consent of the CEHNC Contracting Officer.

9.4 LIABILITY FOR LOSS, DAMAGE OR DESTRUCTION

Subject to the terms of the contract, the circumstances surrounding the particular case, and in accordance with FAR 45.103, ZAPATAENGINEERING may be liable for shortages, loss, damages, or destruction of Government property. ZAPATAENGINEERING may also be liable when the use or consumption of Government property unreasonably exceeds the allowances provided for by the contract. Reports for expendable property will contain a memorandum to the contract file indicating that loss, damage, or destruction has occurred and will be reported by the Project Manager or designee.

9.4.1 Contractor Requirements

ZAPATAENGINEERING will promptly investigate and report all cases of loss damage, or destruction of Government property to the Government Property Administer. It is ZAPATAENGINEERING's policy to assure that the Property Management System provides for the following items.

- Internal reporting of any loss, damage or destruction (LDD) to the Property System Manager or designee.
- Investigation of such LDD in accordance with the Government property clauses and FAR 45.504.
- Prompt reporting by the responsible company organization to the Government Property Administrator, in accordance with FAR 45.504(b) and FAR 45.508-2.
- Additional reporting may be imposed by specific agency requirements for other types of property, including precious metals, explosives, firearms, hazardous materials, controlled substances, etc.
- The following information will be provided to the Property System Manager or designee, when applicable, for each case of LDD of Government Property.
- Date of incident.
- Description of property including Serial Number, Part Number, or Identification Number.
- Contract Number.
- Acquisition cost.
- Full narrative of the incident, location, etc.
- Cause and corrective action taken or to be taken to prevent recurrence.
- Estimated scrap proceeds (when applicable).
- Repair direct labor and material costs (when applicable).
- Estimated cost to replace (when applicable).
- Copies of supporting documentation.
- The contract provision under which relief of responsibility is sought.
- Date of report.
- Statement that no insurance costs or other means of covering LDD of Government property were charged to the contract, if applicable.

- Statement that, in the event ZAPATAENGINEERING was or will be reimbursed or compensated for LDD of Government property (e.g., reimbursed by a subcontractor), the Government will receive equitable reimbursement.

9.5 RECORDS AND REPORTS OF GOVERNMENT PROPERTY

The Task/Equipment Manager will maintain the Government property log on-site while the Property System Manager will maintain the log in the office. The property log will include the following information.

- Property Number
- Property Nomenclature
- Manufacturer's Name
- Manufacturer's Model No.
- Serial Number
- Part Number
- Equipment Type
- Size/Capacity
- Date Received
- Condition Code
- Physical Location
- User's Name
- Contract Number
- Unit Price
- Posting Reference and Date of Transaction
- Date of Disposal and Disposition
- Quantity Received, Issued, and On Hand
- National Stock Number (if provided)
- Description of Material Content of Scrap
- Assignment and/or utilization of Government property will be documented through the use of the Property Assignment Sheet and Property Control Cards, in Appendix B.

9.6 IDENTIFICATION AND RECEIPT OF GOVERNMENT PROPERTY

9.6.1 Upon receipt of Government property, the item will be marked and/or tagged by the Property System Manager or designee for property arriving at the office and the Project/Equipment Manager for property arriving at the project site, in accordance with FAR 45.506, and then documented in the Property Control Log. For on-site equipment and supplies, the Project/Equipment Manager will keep the property log on file, with copies forwarded to the Property System Manager on a monthly basis while on site. For equipment logged at the office, the Property System Manager or designee will keep the log on file.

9.6.2 A sign-out sheet will track items transferred to an individual Project. The sign-out sheet must contain the following information: Receiving Project Number, Date, and Description of the Item, Quantity and the Cost associated with the transfer. On a monthly basis, all transfer cost will be processed though ZAPATAENGINEERING's financial accounting system.

9.7 SEGREGATION OF GOVERNMENT PROPERTY

Government property will be kept physically separate from ZAPATAENGINEERING-owned property; however, it may be co-mingled under the following circumstances.

- When approved by the Property Administrator in connection with research and development contracts.
- When material is included in a multi-contract cost and material control system.
- When material of a uniform nature is produced from both Government-owned and ZAPATAENGINEERING -owned material and physical segregation is impractical.
- When material produced from Government-owned material is insignificant in consideration of the cost of segregation and control.
- When Government contracts involved are fixed-price and provide for retention of the material by the contractor.
- When otherwise approved by the Property Administrator.

9.8 PHYSICAL INVENTORIES OF GOVERNMENT PROPERTY

Physical inventories will be performed at the end of the project (task order) period of performance (POP) if less than one year, and annually if greater than one year. The Project Manager and Property System Manager, or designee, are responsible for oversight. The Project Manager will establish the type, procedure, and performance of this inventory. Personnel who have custody of the property will not participate in the performance of the inventory.

9.9 PROPERTY IN POSSESSION OF SUBCONTRACTORS

Subcontractors possessing or controlling Government property will be required to adequately care for and maintain that property in accordance with that subcontractor's Property Management System, which must first be approved by ZAPATAENGINEERING's Contract Operations Manager. This system will include procedures necessary for accomplishing this responsibility.

9.10 ACQUISITION

Requests for acquisition of Government property will be made to the Project Manager or his designee. Consent will be requested from the CEHNC Contracting Officer prior to the acquisition of facility items. If items requested are not available for issue, they will be ordered by the Project/Equipment Manager. Government property issued on site will be signed out. The Task/Equipment Manager will keep a copy of the sign-out card on file, with a copy forwarded to the contract for tracking purposes.

9.10.1 Description and Quantity

Table 9-1 list the required field equipment and anticipated quantities necessary to complete project objectives in an acceptable and timely manner.

9.10.2 Source and Estimated Rental/Acquisition Costs

Based on the SOW and the estimated short length of the overall fieldwork effort, ZAPATAENGINEERING has determined short-term rental of expensive equipment is the most economical method for equipment acquisition. The digital camera, laptop computer, printer/scanner/fax and GPS unit will be rented from companies in Charlotte, NC and shipped to the site. The project team will provide the magnetometers used during the safety escort phases of the project. Based on site conditions, project team size, ZAPATAENGINEERING and its subcontractors would rent appropriate vehicles.

TABLE 9-1 REQUIRED FIELD EQUIPMENT

Description	Rate	Unit	Quantity	Extended Costs
Office Trailer - 12'x60', 2 offices with built-in desks	$359.00	month	3	$1,077.00
Office Trailer - Delivery/Pickup and Setup/Knockdown	$408.00	each	1	$408.00
Office Trailer - Steps (Aluminum)	$45.00	month	3	$135.00
Office Trailer - Anchors/Tiedowns	$320.00	each	1	$320.00
Portable Toilet	$70.00	month	3	$210.00
Portable Toilet - Delivery/Pickup	$0.00	each	1	$0.00
Electrical Service	$50.00	month	3	$150.00
Electrical Service - Installation Fee	$100.00	each	1	$100.00
Telephone Service	$50.00	month	3	$150.00
Telephone Service - Installation Fee	$60.00	each	1	$60.00
Internet Service	$45.00	month	3	$135.00
Laptop Computer	$295.00	month	3	$885.00
Printer/Scanner/Fax Machine	$75.00	month	3	$225.00
Computer setup, delivery and pickup fee	$50.00	each	1	$50.00
Work Gloves	$3.30	each	5	$16.50
PVC Pin Flags - Red, Yellow & White (600 ea.)	$4.30	50+ bundle	10	$43.00
Ear Protection	$24.50	each	3	$73.50
Eye Protection	$5.95	each	3	$17.85
Eyewash Kit and Additive	$6.55	each	3	$19.65
Igloo Drinking Cooler Kit	$84.40	each	2	$168.80
Fire Extinguisher	$99.50	each	2	$199.00
Air Horn	$15.00	each	2	$30.00
Fiberglass Measuring Tapes - 300 ft	$81.50	each	1	$81.50
Fieldbook	$16.50	each	2	$33.00
Space Pens	$6.95	each	5	$34.75
Fluorescent Spray Paint	$3.95	each	5	$19.75
Caution Tape	$9.95	each	5	$49.75
Survey Flagging Tape	$1.60	each	10	$16.00
Shovels	$22.95	each	2	$45.90
Hand Trowels	$4.98	each	2	$9.96
Schonstedt ($110 shipping, $8/day for 44 days)	$462.00	lump	1	$462.00
		SUM:		$5,225.91

9.10.3 Basis of Selection for Leased Vehicles

Based on site conditions and project team size, ZAPATAENGINEERING and its subcontractors do not anticipate the rental of four-wheel drive trucks or SUVs.

9.11 CONSUMABLES AND PERSONAL PROPERTY INCLUDED IN OVERHEAD RATE

Consumable supplies included in ZAPATAENGINEERING's overhead are those associated with general office supplies. Examples of these items are pens, pencils, staples and staplers, paper clips, tape and dispensers, desktop supplies, etc. These types of items are classified as consumable, and due to the general nature and immaterial cost associated with these consumables, they are purchased as part of ZAPATAENGINEERING's overhead and are allocated to projects on an indirect cost basis. This process has been disclosed and accepted by ZAPATAENGINEERING's informed Defense Contract Audit Agency (DCAA) auditor.

9.12 STORAGE AND TRANSFER OF GOVERNMENT PROPERTY

Government property will be stored in a secure area. In general, each storage area has one or more the following: secure locks, an alarm or alternate security system, locked cages and storage cabinets. Government property will be segregated by contract and stored on shelves or bins (when not in use). Requests for the transfer of Government Property to other projects will be documented with an equipment transfer form (Form DD 1149). Information on the location of all Government owned property will be maintained in the property logs in the possession of the Site/Equipment Manager for on-site property and the Property System Manager or designee for property in the office.

9.13 DISPOSITION OF GOVERNMENT PROPERTY

Disposal will be accomplished in accordance with FAR 45.6 or as otherwise directed in each contract. Table 9-2 lists the condition codes used when disposing property.

TABLE 9-2 CONDITION CODES FOR DISPOSING PROPERTY

(1)	Unused-good	Unused property that is usable without repairs and identical or interchangeable with new items from normal supply sources.
(2)	Unused-fair	Unused property that is usable without repairs, but is deteriorated or damaged to the extent that utility is somewhat impaired.
(3)	Unused-poor	Unused property that is usable without repairs, but considerable deteriorated or damaged.
(4)	Used-good	Used property that is usable without repairs and most of its useful life remains.
(5)	Used-fair	Used property that is usable without repairs, but is somewhat worn or deteriorated and may soon require repairs.
(6)	Used-poor	Used property that may be used without repairs, but is considerable worn or deteriorated to the degree that remaining utility is limited or major repairs will soon be required.
(7)	Repair required (a)	Required repairs are minor and should not exceed 15% of good condition original acquisition cost.
(8)	Repair required (b)	Required repairs are considerable and are estimated to range fair condition from 16% to 40% or original acquisition cost.
(9)	Repair required (c)	Required repairs are major because property is badly damaged, poor condition, worn, or deteriorated, and is estimated to range from 41% to 65% or original acquisition cost.
(X)	Salvage	Property has some value in excess of its basic material content, but repair or rehabilitation to use for the originally intended purpose is clearly impractical. Repair for any use would exceed 65% of the original acquisition cost.
(S)	Scrap	Material that has no value except for basic material content.
(E)	Expended	Property that has been consumed in the performance of work.
(M)	Missing	Property that is lost, stolen, or missing.

Created By: MLW Reviewed By: SCM

10.0 QUALITY CONTROL PLAN

10.1 GENERAL

Quality Control for OE operations will vary to some degree depending on the particular type of OE activity to be performed. For the purpose of this Work Plan, the QC procedures for each category of OE operations will be discussed.

10.2 QC PROCESS

QC processes and procedures are associated with personnel, data collection/analysis, instruments/sensors and other equipment, data deliverable items, and for measuring the effectiveness of OE removal actions. This Quality Control Plan (QCP) provides procedures for controlling and measuring quality of all work performed during the conduct of OE operations. This QCP provides procedures for:

- Testing and calibrating equipment used to perform work;
- Monitoring/measuring the effectiveness of work performed;
- Inspecting the maintenance and accuracy of site records;
- Determining compliance with site safety, environmental, and operational plans, and;
- Ensuring the accuracy, timeliness, and completeness of data deliverables.

10.3 AUDIT PROCEDURES

ZAPATAENGINEERING has developed detailed plans for performing OE operations. These plans are designed to safely and effectively sample the OE contamination of the site and to perform effective OE clearance, disposing of all OE encountered. To ensure that these plans are being properly executed/implemented, ZAPATAENGINEERING performs the following QC functions:

10.3.1 Daily QC Audits

All instruments and equipment that require calibrations will be checked prior to the start of each work day. Batteries will be replaced as needed and the instruments will be checked against a known source. The UXO QC Specialist (QCS) is responsible for ensuring that personnel accomplish all QC checks and that the appropriate log entries are made. The QC Specialist performs random, unscheduled checks of the various sites to ensure that personnel accomplish all work specified in the Work Plan and submits a report of his findings to the Senior UXO Supervisor.

10.3.2 Digital Geophysical Mapping (DGM) Quality Control

10.3.2.1 Quality control (QC) procedures for standard equipment tests and data quality requirements will be reviewed prior to conducting production DGM and will be performed using the frequency schedule detailed in DID OE-005-05.01 Attachment B. These procedures will consist of, but not necessarily be limited to, the following steps for the appropriate instrument:

- A minimum of 15-minutes warm-up time will be allowed for the geophysical sensors prior to data collection.
- Static Test: After a warm-up period, data will be recorded in a stationary mode for a minimum of three minutes. An additional three minutes of measurements will be recorded with a standard item placed beneath the sensor, followed by a three-minute

recording with the item removed, to aid in identifying equipment problems and determining instrument drift.

- A personnel test will be performed for each crew member that will approach the instruments during operation.
- Sensor position will be recorded and monitored during geophysical data collection.
- A vibration test of instrument components will be made and recorded.
- Each day, a standard test will be conducted before and after data collection. A metal item (e.g., tow hitch ball) will be placed below the instruments and data will be recorded. Instrument readings during the standard test will be checked to verify results are within 20 percent of standard instrument response established on the first day of data collection.
- An azimuth test will be conducted to eliminate or minimize data dropouts.
- A six-line test will check for and document repeatability of response and position accuracy / latency.
- An octant test will document and provide correction for heading error.
- Repeatability of response will be checked in the field by repeating approximately five percent of line footage in grids or over transects.
- The raw and processed geophysical data will be delivered to ZAPATAENGINEERING to ensure the geophysical quality standards set forth in the SOW and established as a result of the GPO.

10.3.2.2 ZAPATAENGINEERING'S Senior Geophysicist will conduct an independent evaluation of raw and processed geophysical data to ensure the geophysical data meets quality standards set forth in the SOW and established as a result of the GPO.

10.3.2.3 The GPO will be used as a matrix benchmark. Site conditions and/or matrices can vary outside of the GPO plot location. Therefore, particular emphasis will be placed on the level of signal-to-noise (not to be used as pass or fail criteria) that is acceptable for detecting all target objectives to their maximum expected or detectable depth (as defined in DID OE-005-05.01) determined by the GPO. Data acquisition procedures and methods will be defined during the GPO so that effective verification procedures can be incorporated into all work performed. Also, different aspects of data collection methods (i.e., function variables of speed and/or terrain) that may be prone to 'failure' or that may lead to target items not being detected/selected will be defined during the GPO and methods will be developed to detect and/or prevent those failures from occurring.

10.3.3 DGM Data Processing Quality Control

Data review and processing QC steps include but may not be limited to:

- Reviewing field data sheets and log forms for completeness.
- Reviewing static instrument standardization files to verify repeatability on amplitude response.
- Monitoring data for gaps or incomplete coverage (indicating sensor failure). Areas with data point gaps, not caused by documented physical obstacles, greater than an amount determined significant by the GPO will be resurveyed. Data gaps generated by physical or cultural features will be documented in the site figures.

- Monitoring survey line separation (across traverse). Gaps determined to be unacceptable in the GPO will be re-surveyed.
- Visually comparing target anomaly selections to the DGM anomalies generated by the known seeded items.
- Removing unreasonable data spikes from the data.
- Monitoring and applying heading and lag corrections.
- Tracking data processing steps to ensure all data are processed in the same manner.
- Documenting additional processing (i.e., filtering) which may be useful in data analysis and target identification.

10.3.4 DGM Corrective Measures

10.3.4.1 If any significant discrepancies exist in the positioning or repeatability of the data, the problem will be identified and corrected. Geophysicists will carefully evaluate the geophysical data for any potential problems (i.e., lag correction, abnormal data spikes, or inconsistent background values). All problems will be documented and resolved.

10.3.4.2 ZAPATAENGINEERING has the final decision-making responsibility on all quality-control issues. If a QC procedure shows a potential problem, the ZAPATAENGINEERING Site Manager and Project Manager will instruct NAEVA on the appropriate corrective actions.

10.3.5 Periodic QC Audits

Periodic audits are typically performed by the Quality Manager or a designated representative. The purpose is to determine the effectiveness of QC measures performed at a work site. The Quality Manager reviews logs, records, and files for completeness and accuracy, monitors daily briefs, directs the QCS to conduct checks of selected areas recorded as cleared or completed, and inspects equipment.

10.3.6 Emergency Equipment

Emergency equipment or emergency items will be inspected daily, or as required by the manufacturer, to ensure they are operating as designed and are in good repair.

10.3.7 Magnetometers.

10.3.7.1 Testing.

Magnetometers will be field tested each day on a known target to ensure they are operating properly. Schonstedt Magnetometers do not require calibration; they have a simple “Go/No Go” field operational check. This check is achieved by locating a buried target of a similar size and characteristics as a UXO. In this case, a MKII grenade or equivalent will be buried to a depth close to the maximum depth of detection (24.7 inches) to ensure proper equipment operation and the operator’s ability to interpret the instrument signal. Chapter 5 contains the details for establishing the test plot. Failure to detect the test target is reason to reject the instrument and return it to the manufacturer for repairs.

10.3.7.2 Validation.

During daily operations, random checks of the magnetometers will be performed by the QCS and/or the SUXOS to ensure the equipment is operating and being operated properly. These random checks are made by the QCS and/or SUXOS by observing the operators use the magnetometer and then using the instrument to re-sweep an area cleared by that magnetometer.

10.3.7.3 Battery Checks.

This procedure is only applicable to instruments that have battery test switches and meters with battery function scales. During daily operations, checks will include frequent battery checks. Instrument battery function tests will be performed in the morning and after the lunch break. Battery function tests will be performed by switching the instrument's function to the Battery Test position and observing that the needle deflects to the appropriate area of the meter. A random check of this instrument is made in the same manner as described in the Validation paragraph above.

10.3.7.4 Operational Maintenance.

Daily maintenance will include cleaning, minor repairs to the equipment, and battery changes when needed. Repairs may include replacing control knobs and tightening connections as stated in the manufacturer's manual, but normally repairs will be accomplished by returning the equipment to the manufacturer. After-operation maintenance (upon project completion) will include removal of the batteries prior to packing and shipping. Batteries will be removed from magnetometers when stored for more than 24 hours and before shipment.

10.3.7.5 Documentation.

Documentation of the status of the magnetometers will be recorded on copies of the Magnetometer Check Sheet in Appendix F. Each form will be neatly printed in black ink, typed or kept on the on-site computerized formats. Each document will become part of the official site record.

10.3.8 Radios/Cellular Telephones.

10.3.8.1 Testing.

At the beginning of each workday and before departing the headquarters area, each radio and cellular telephone will be checked to ensure it is operating properly. A radio check will be performed by contacting the headquarters' base station or the SUXOS/UXO Safety Officer's (UXOSO) hand held unit. Cellular phones will be checked by placing a call to one of the headquarters' land lines.

10.3.8.2 During Operation.

The UXOSO will perform random communication checks with each team to ensure proper communications are maintained. Proper operation of cellular telephones will be verified by reading the built in digital display ensuring that you are in a service area.

10.3.8.3 After Operation.

Maintenance will include cleaning the equipment and turning it off before inserting into the battery charger.

10.3.8.4 Documentation.

Documentation of the status of communications equipment will be recorded on the Daily QC Journal provided in Appendix F. Each form will be neatly printed in black ink, typed or kept in the on-site computerized formats. Each document will become part of the official site record.

Site personnel keep a record of all long distance calls and/or a record of all substantive phone conversations related to the performance of the project. Substantive telephone calls are defined as:

- All calls to or from Government personnel requiring action by either the Government or ZAPATAENGINEERING.
- All calls to or from Government personnel directly or indirectly affecting contract terms and conditions.
- All calls to or from federal, state, or local regulatory agency personnel.
- All calls to contractor personnel requiring calling party to be referred to Huntsville Center Public Affairs Office.

10.3.8.5 Vehicles and Associated Equipment.

10.3.8.5.1 Each day, before the vehicle leaves the headquarters area, the operator will perform a check of the vehicle. The check will include under the hood and safety equipment checks. These checks will be documented on the Vehicle Check Sheet in Appendix F.

10.3.8.5.2 Under the hood checks will include:

- Fluid levels
- Belts
- Hoses
- Checks for leaks

10.3.8.5.3 Safety equipment checks will include:

- Windshield wipers
- Fire extinguishers
- First aid kits
- Vehicle horn and lights
- Tires

10.3.8.5.4 During operation, checks/maintenance will include cleaning the equipment and replenishing any expended safety equipment. After operation, checks/maintenance will include cleaning the equipment and replenishing any expended safety equipment.

10.3.8.6 Hand Tools.

UXO tools and demolition kits will be inspected before use, or at least weekly, to ensure they are complete and in good repair.

10.3.8.7 Site-Specific Items.

Individual sites may require items that are not normally included in the site inventory. These items may include Personal Protective Equipment (PPE) or special tools. Site-specific items will be inspected to ensure they are in good repair. Special tools or equipment acquired after the site is opened will be included in the site inventory.

10.3.8.8 Operational Checks.

Maintenance checks of equipment will be done in accordance with the manufacturer’s manual.

10.4 LESSONS LEARNED

Any lessons learned will be noted by the QCS in his daily report. This information will be given to the SUXOS and included in his daily log. Lessons learned will be included in the project final report. Any lessons learned of an emergency nature will be brought to the immediate attention of the CEHNC Safety Specialist, Project Manager and ZAPATAENGINEERING Program Manager.

10.5 DELIVERABLE REQUIREMENTS

10.5.1 Planning documents, (e.g., Work Plan, Explosive Safety Submission, etc.) will be developed by the task's Project Manager and reviewed by the ZAPATAENGINEERING Program Manager prior to submittal to CEHNC. Funding/budget related items will be developed by the ZAPATAENGINEERING Contracts Operations Manager and reviewed by the ZAPATAENGINEERING Program Manager prior to submittal to CEHNC. Data collection and assemblage for task specific reporting requirements will be conducted by the task SUXOS. This information will be reviewed and finalized by the Project Manager prior to submittal to CEHNC. Final reporting requirements will be prepared by the Project Manager and reviewed by the ZAPATAENGINEERING Program Manager prior to submittal to CEHNC.

10.5.2 Any contractual changes or change requests will be prepared by the Project Manager and reviewed and submitted by the ZAPATAENGINEERING Contracts Operations Manager.

10.5.3 Training is conducted by the UXOSO and SUXOS and UXOS. Attendance records (and student performance when applicable) are maintained. Prior to assignment to a duty position or change in duty position, the UXO Technician assigned QC duties performs a check of the individual's site personnel record to ensure that the employee is qualified to fill the position.

10.6 FIELD OPERATIONS DOCUMENTATION

10.6.1 Verifiable sample collection and custody is an integral part of all field operations. Several steps will be taken in the field to document and ensure that samples collected in the field have been properly acquired, preserved, and identified. This information will be included in additional reports drafted after field activities are complete. Refer to Appendix E, Section 6.0 of the ESAP for more information.

10.6.2 Sample collection, storage, packing, and shipment will be properly documented to ensure chemical data integrity. Chemical QA information will be recorded in the field logbook using indelible ink. Corrections to be made will be identified by drawing a single line through the error, then initialing and dating the line. Each page will be dated, initialed, and sequentially numbered. The inside cover will include the address and telephone number of the ZAPATAENGINEERING office. The cover of each field logbook will bear the following:

- project name;
- project number; and
- opening and closing dates for data contained in the book.

10.6.3 At the beginning of each daily entry, the date, start time, weather, and planned activities will be recorded. The names of visitors and the purpose of their visits will be noted. Any deviations from the ESAP will be recorded along with the reason for the deviation. In addition to the field logbook, data acquisition information will be recorded on the Chain-of-Custody (Figure E-1 in Appendix E) and Daily Quality Control Report (Appendix F).

10.6.4 Sampling personnel will record the preparation activities that may be pertinent to the sampling event at each sampling location in the field logbook. For soil sampling, this documentation may include information on the presence of surface staining, water logging or ponding, proximity to roads or waste piles, apparent upgradient physiographic or hydrogeologic features of significance, background volatile vapor concentrations, the depth from which the samples were collected, and sampling techniques.

10.6.5 A unique identification number will be assigned to each sample. The sample identification number will contain an alphanumeric sequence referencing the sample by matrix and location, depth, and/or relative position in the sampling sequence. Upon sample collection, the ZAPATAENGINEERING field technician will label sample containers with this identification number that uniquely identifies the sample. The sample identification number will be logged in the field logbook, and on the Chain-of-Custody Record (Figure E-1). ZAPATAENGINEERING will reference all information pertaining to a particular sample by its unique identification number recorded on the sample bottle, in the field logbook, and on the sample chain-of-custody form. All Quality Control duplicate samples will be identified as QCx, with the x representing the ascending QC sample order. ZAPATAENGINEERING will keep a log relating each Quality Control sample to its duplicate soil sample. This procedure will ensure that the laboratory will not know which Quality Control sample matches the standard sample.

10.6.6. To assure that the samples are representative of the area from which they are collected, chain-of-custody records will be used as control documents to ensure that samples are handled properly, and sample custody is maintained. The chain-of-custody record will be initiated by the field sampling personnel upon collection of the sample, and will accompany each sample cooler. Each individual who has possession of the samples will sign the chain-of-custody. To control common problems such as labeling errors, chain-of-custody errors, and transcription errors, detailed procedures for properly recording sample information and analytical requests on chain-of-custody forms, and for sample packaging and shipment are described in herein. Field personnel are required to become familiar with the appropriate sections of this Work Plan, prior to initiating fieldwork.

10.6.7 The sample technician will generate a sample register in the field. The function of the sample register is to provide a comprehensive record of collected samples to be used for shipment tracking, tracking receipt of analytical data, and to provide a foundation for information management. All information will be recorded daily in indelible ink. Daily entries will include information on the date and time sampled, sample location, headspace readings, sample identification number, sample type, matrix type, laboratory destination, date shipped, shipment tracking number, and associated QA/QC samples.

10.7 QC TRAINING PLAN

Employee training is an integral part of producing quality products. ZAPATAENGINEERING conducts site-specific employee training prior to the start of operations and supplements this initial training, as necessary, throughout the remainder of the project. At a minimum, ZAPATAENGINEERING personnel receive the following types of training:

- **OSHA**: Current certification in accordance with 29 CFR 1910-120 (e);
- **Safety**: Review of the Site-Specific Safety and Health Plan with specific emphasis on the hazards known to exist on-site;
- **Equipment Operator Training**: Tailored to operator experience level and project objectives;
- **Daily Safety Training**: Tailgate briefings outlining the day's activities, unique hazards and safety precautions, and other operational issues related to the project.

10.8 CHEMICAL DATA QUALITY MANAGEMENT

Specific information on chemical data quality management is included in Appendix E, Environmental Sampling and Analysis Plan.

10.9 SITE SPECIFIC FINAL REPORT (SSFR)

QC records for all aspects of the project will be submitted for review and included in the SSFR.

10.10 RECORDS AND DOCUMENTS

10.10.1 Records and Record Keeping

10.10.1.1 The ZAPATAENGINEERING UXOQCS will perform quality conformance inspections (QCI) as required in the basic contract and this Work Plan. They will include as a minimum:

- Equipment calibration audits:
  - Inspection of records;
  - Observation of calibration tasks/steps.
- Property accountability audits:
  - Inspection of records;
  - Physical inventory of equipment and supplies to include explosives;
  - Inspection of physical security for site equipment, and;
  - Inspection of site training records, safety records and reports.
- UXO-related tasks audits:
  - Record checks of site journals, grids sheets and team leader QC logs;
  - Over the shoulder checks of removal related tasks, such as magnetometer operations, performing UXO intrusive tasks, backfilling, etc;
  - Search effectiveness checks will include a magnetometer survey of a minimum of 10 percent of each grid. Equipment operator maintenance audits.
- PPE audits:
  - Checks of inventory, use and disposal records;
  - Observation of use;
  - Documentation of proper disposal.

10.10.1.2 The QCS will document in his daily QC journal, on the appropriate form, the results of his inspections of records, audits, QC checks of grids, and the corrective action for quality defects.

10.10.1.3 QC records of audits/inspections will be maintained on-site and available for Government inspection.

10.10.1.4 The QC inspections are not a substitute for the accountability of ZAPATAENGINEERING's personnel in supervisory positions. UXOS's are responsible and accountable for accomplishing operator performed maintenance and proper operation of all equipment assigned to their UXO Teams.

10.10.2Scrap Inspection

Thorough scrap inspection is an important task of all UXO operations and is an essential element of Quality Control. The QCS will meticulously inspect all scrap located during the project and report the results to the SUXOS to be put in the daily log. He shall note the total amount of scrap, both UXO and non-UXO recovered on a daily basis, and evaluate the effect of scrap inspection on his other QC duties. If the QCS feels additional resources are required to satisfactorily perform his daily scrap inspections, he will document the facts and submit them to the ZAPATAENGINEERING Project Manager.

10.10.3Scrap Definition

Scrap is defined as metallic debris larger than one inch square that is not contaminated with explosives or explosive residues. Scrap removal is essential to successfully complete UXO clearance activities. Scrap can be ordnance-related material as long as it has been inspected to ensure it does not contain explosives or explosive residues. If the ordnance item has an internal cavity, the cavity must be vented to ensure it does not contain explosives or explosive residues, and to prevent a mechanical rupture if the item were placed in a melting furnace.

10.10.4Scrap Classification

Metallic items located in a grid will be visually inspected and classified in one or more of the following categories:

- Non-OE Scrap - not ordnance related and requires no further action;
- OE Scrap - does not require explosive venting or demilitarization;
- Inert Ordnance - requires explosive venting or demilitarization;
- OE – Unfired or abandoned explosives that requires venting or demilitarization;
- UXO - requires disposal by explosive venting or detonation;
- Unknown - requires inspection by SUXOS, UXOSO, QCS or on-site CEHNC Safety Specialist.

10.10.5Scrap Inspection

Each workday morning the QCS will ensure each UXOS has designated a specific area as team's "Scrap Staging Area." During the course of workday the QCS will conduct "spot inspections" of the scrap. At the end of each workday the QCS may observe the scrap inspection team inspecting the scrap. Prior to removing any scrap from the grid area the scrap must be inspected and certified free of explosives and explosive residues by the QCS. The QCS may request an UXO Technician be assigned to assist him in his scrap inspection. The QCS will document this inspection in his daily report. If no scrap is inspected it shall be documented in his daily report as "No Scrap Inspected." In addition, he will ensure all ordnance scrap and inert ordnance is removed from the grid at the end of each workday and locked in a solid container designated by the SUXOS as the scrap container.

10.10.6Scrap Certification

Prior to releasing the scrap to a scrap dealer, a final inspection of the scrap will be made by the SUXOS and the CEHNC on-site Safety Specialist after which they will sign a DD Form 1348-1A stating:

“This certifies that the materials listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of explosives hazards.”

10.11 QUALITY CONTROL/QUALITY ASSURANCE

10.11.1 For QC/QA purposes, ZAPATAENGINEERING will find and remove ferrous items, which are equivalent (+/- ½ inch) in diameter to a Mark II hand grenade. With respect to the pits within Grid 17 of OOU-3, ZAPATAENGINEERING will find all ferrous items, which are equivalent (+/- ½ inch) in diameter to an M15 WP Grenade.

10.11.2 In addition to the QC process performed by ZAPATAENGINEERING, the Government will conduct QA inspections on all phases and types of work performed. ZAPATAENGINEERING will provide one UXO Tech II to assist the Government Safety person in performing QA. The UXO Tech II will be used at the technical direction of the Government Safety person to measure coordinates in grids per dig lists provided by the Government Safety person, to do intrusive digging as technically directed by the Government Safety person, and/or to perform other types of assistance needed during the Government Safety person’s QA check of Contractor grids. The inspections will be accomplished only after the Government has been notified in writing that the Contractor’s QC activities have been completed. The Government reserves the right to perform QA inspections at any time during the project.

10.11.3 Quality failure is defined as the discovery, during QA inspections, of a ferrous item, which is (+/- ½ inch) of the diameter of the OE item(s) for the specific areas above at a depth less than given by the SOW (Appendix C). Quality failure can also be defined in workmanship as not complying with the approved work plan or other accepted industry practices or defined in safety as not complying with basic safety concepts and other industry safety practices. The ferrous item does not have to be OE related to result in grid failure. Failed grids shall be completely re-cleared in accordance with the approved work plan at no cost to the Government. The Government Safety person will perform QA again on the grid. This failure and re-sweep will be repeated until the grid passes Government QA inspection, again at ZAPATAENGINEERING’s expense. ZAPATAENGINEERING will provide full documentation detailing what failed the QA process, why it failed, and how the problem was corrected at no cost to the Government.

10.12 DAILY QUALITY CONTROL REPORTS

Daily Quality Control Journals (see Appendix F) will be completed and submitted to the Project Manager and /or SUXOS. These reports will include descriptions of the areas quality control checked and the results of the checks. Records of these inspections will be submitted at the end of the project.

11.0 ENVIRONMENTAL PROTECTION PLAN

11.1 INTRODUCTION

11.1.1 Environmental protection is defined as maintaining the environment in its natural state during project execution; as much as possible.

11.1.2 This Site Specific Environmental Protection Plan (SSEPP) has been specifically developed to document site-specific environmental conditions prior to sampling and removal activities in and adjacent to the proposed work areas at the Former Camp Croft. The SSEPP addresses the potential impacts that the proposed action may have on the surrounding environment and to suggest measures to be implemented during the proposed sampling in order to protect identified environmentally sensitive areas. The goal of the environmental protection plan is to present a methodology to minimize the pollution of air, water, and land resources; protect identified site specific environmentally sensitive, cultural and/or historical resources; and safely and efficiently execute the UXO removal project at the areas identified in the SOW in and around the former Camp Croft in accordance with all applicable Federal, State and local regulations.

11.1.3 The SSEPP meets the requirements of Data Item Description OE-005-12.01, applicable sections of Army Regulations AR 385-64, AR 385-40, and EM 385-40, and DOD 6055-9 (Standard DOD Ammunitions and Explosives Safety Standards).

11.2 ENVIRONMENTAL SURVEY

11.2.1 ES Requirements

According to DID OE-005-12.01 a joint existing condition survey, also known as an Environmental Survey (ES), will be conducted by the Contractor and the CEHNC representative prior to the start of any on-site response activities. The survey is meant to identify any wetlands, protected species, cultural sites, historical sites, special habitats or other protected areas and to report the condition of trees, shrubs and grassy areas in and immediately adjacent to the work area, storage area and access routes, and identify and comply with potential applicable or relevant and appropriate requirements (ARARs).

Table 11-1 is a tabulation of the applicable ARARs associated with Camp Croft.

Table 11-1
Potential Federal Chemical-Specific ARARs/TBCs

POTENTIAL ARARs/TBCs	CITATION OR REFERENCE	REQUIREMENTS	APPLICABILITY	COMMENTS AND ANALYSIS
Clean Air Act of 1963, as amended (42 USC 7401-7462)				
Threshold Limit Values (TLVs), American Conference of Governmental Industrial Hygienists	ACGIH, ISBN: 0-936712-92-9	TLVs and Biological Exposure Indices (BEIs) are listed as guidelines to assist in the control of health hazards.	Applicable	Applicable to all alternatives for the protection of decommissioning workers and personnel working at the site.
Clean Water Act, as amended (33 USC Sect. 1251-1376)				
Water Quality Standards and Effluent Limitations	40 CFR 302	Protection of intended uses of receiving waters (e.g., public water supply, recreational uses).	To Be Considered	Pertains to any discharge permits in effect at off-site waste disposal facilities. All wastes generated from this Removal Action will be disposed at appropriately licensed and permitted facilities.
National Pollutant Discharge Elimination System (NPDES) Permit Regulations	40 CFR 122, 125	Establishes permitting requirements and criteria and standards for technology-based treatment requirements for effluent discharge and stormwater runoff.	To Be Considered	Pertains to any discharge permits in effect at off-site waste disposal facilities. All wastes generated from this Removal Action will be disposed at appropriately licensed and permitted facilities.

Resource Conservation and Recovery Act of 1976 (as amended by HSWA of 1984) (40 USC 6901)				
Identification and Listing of Hazardous Waste	40 CFR Part 261	Defines those solid wastes which are subject to regulation as hazardous waste under 40 CFR Parts 262-265 and Parts 124, 270, and 271.	Potentially Applicable	Applicable to alternatives involving off-site transport and disposal of classified hazardous wastes, if present.

Potential Federal Location-Specific ARARs/TBCs

POTENTIAL ARARs/TBCs	CITATION OR REFERENCE	REQUIREMENTS	APPLICABILITY	COMMENTS AND ANALYSIS
National Historic Preservation Act of 1966	7 CFR 650 36 CFR 800	Establishes requirements for determining a site,s eligibility for listing in the National Register of Historic Places	To Be Considered	Historic significance of Camp Croft is recognized but selection of a recommended alternative will not be decided on by historic significance alone.
Endangered Species Act of 1973	16 USC 1531 et seq. 50 CFR 402	Establishes requirements to protect species threatened by extinction and habitats critical to their survival	Relevant and Appropriate	Known endangered, threatened, or species of special concern have been identified at South Carolina, although not specifically at the project site.
Resource Conservation and Recovery Act Standards for Owners and Operators of Hazardous Waste TSD Facilities	40 CFR 264.18	Establishes location standards including seismic considerations and flood plain requirements.	To Be Considered	Pertains to locations of any off-site waste disposal facilities. All wastes generated from this Removal Action will be disposed at appropriately licensed and permitted facilities
Protection of Wetlands	Executive Order 11990	Requires minimization of destruction, loss, or degradation of wetlands.	To Be Considered	There are no wetlands located within the state or federal mandated within the current project locations, however,

				future site may require protecting.
Fish and Wildlife Coordination Act	16 USC 661-666 40 CFR 6.302 [g]	Requires consultation when a federal department or agency proposes or authorizes any modification of any stream or other water body; requires adequate provisions for protection of fish and wildlife resources. It also establishes policy for Executive Order 11990, "Protection of Wetlands."	To Be Considered	The Removal Action does not involve modification of any water bodies; the site is a completely developed parcel of land with no known significant wildlife habitats.

Potential Federal Action-Specific ARARs/TBCs

POTENTIAL ARARs/TBCs	CITATION OR REFERENCE	REQUIREMENTS	APPLICABILITY	COMMENTS AND ANALYSIS
Occupational Safety and Health Administration (OSHA) Regulations (29 USC 651)				
Occupational Health and Safety Requirements	29 CFR 1910.120	Establishes limits for worker exposures during response actions at CERCLA sites.	Applicable	Applicable to all alternatives for the protection of personnel working at the site.
Health and Safety Requirements for Construction Activities	29 CFR Part 1926	Establishes construction standards.	Applicable	Applicable to all alternatives for the protection of personnel working at the site.
Clean Air Act				
National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	Establishes standards for ambient air quality to protect public health and welfare.	Applicable	Applicable to alternatives that have the potential to impact ambient air quality.
Resource Conservation and Recovery Act of 1976 (RCRA) (42 USC 6901)				

Standards for Waste Generators and Transporters	40 CFR Parts 262 and 263	Applicable to generators and transporters of hazardous waste. Requires that transporters must be licensed hazardous waste haulers.	Applicable	Applicable to alternatives that involve off-site transport and disposal of hazardous wastes.
Standards for Owners and Operators	40 CFR 264	Standards for owners and operators of hazardous waste facilities.	To Be Considered	Pertains to off-site waste disposal facilities. All wastes generated from this Removal Action will be disposed at appropriately licensed and permitted facilities.
Containers	40 CFR 264.171 through 264.178	Regulations cited under 40 CFR 264.171 to 264.178 (Subpart I) concern permanent on-site storage of hazardous wastes or temporary storage phases used during various cleanup actions such as removal or incineration.	Potentially Applicable	Applicable to alternatives, which require use of temporary containers to hold hazardous wastes, if used.
RCRA Hazardous Waste Management Regulations, Subtitle C	40 CFR 264	Applicable to the treatment, storage, transportation and disposal of hazardous wastes listed under 40 CFR 261.	To Be Considered	Pertains to off-site waste disposal facilities. All wastes generated from this Removal Action will be disposed at appropriately licensed and permitted facilities.
RCRA Solid Waste Management Regulations, Subtitle D	40 CFR 264	Applicable to the management and disposal of non-hazardous wastes.	To Be Considered	Pertains to off-site waste disposal facilities. All wastes generated from this Removal Action will be disposed at appropriately licensed and permitted facilities.
RCRA Hazardous Waste Permit Program	40 CFR 270	USEPA-administered hazardous waste permit program.	To Be Considered	Pertains to off-site waste disposal facilities. All wastes generated from this Removal Action will be disposed at appropriately licensed and permitted facilities.
Land Disposal Restrictions	40 CFR Part 268	Applicable to alternatives involving land disposal of hazardous wastes, and requires treatment to diminish a waste's	Applicable	Pertains to off-site waste disposal facilities. All wastes generated from this Removal Action will be disposed at appropriately licensed and permitted facilities.

		toxicity and/or minimize contaminant migration.		
Other Federal Waste Transport Regulations				
Hazardous Materials Transportation Act of 1974, as amended	49 CFR 170-189 23 CFR 1-1399	Federal Highway Administration, Department of Transportation, and National Highway Traffic Safety Administration regulations are codified in Title 23 (Highways) of the Code of Federal Regulations. DOD shall comply with the requirements governing hazardous materials and waste transportation.	Applicable	Applicable to alternatives that involve off-site transport and disposal of hazardous wastes.
Other Federal ARARs				
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA)	40 CFR 300 42 USC 8601 et seq.	Requires cleanup and notification if there is a release or threatened release of hazardous substance	Applicable	The Removal Action for the site will be completed under CERCLA requirements.
Superfund Amendments and Reauthorization Act of 1986 (SARA)	Public Law 99-499	See CERCLA above.	Applicable	The Removal Action for the site will be completed under CERCLA requirements.
Emergency Planning and Community Right-To-Know Act	42 USC 11001	Requires facilities to report the release of extremely hazardous substances and other specified chemicals, to provide material safety data sheets or lists, and to provide estimates of the amounts of hazardous chemicals on site.	Applicable	The Removal Action for the site will be completed under CERCLA requirements.

Archaeological and Historical Preservation Act of 1974	Public Law 93--291	Requires action to recover and preserve artifacts in areas where activity my cause irreparable harm, loss, or destruction of significant artifacts.	Applicable	There are presently no known areas at the site with potential to contain significant archaeological or historical artifacts.
Noise Control Act of 1972	42 USC 4901 et seq.	Requires facilities to maintain noise levels that do not jeopardize the health and safety of the public.	Applicable	Applicable to all alternatives that may generate noise.
Noise Pollution and Abatement Act of 1970	42 USCS 7641, 7642	To amend Clean Air Act to provide for a more effective program to improve the quality of the Nation's air (noise abatement).	Applicable	Applicable to all alternatives that may generate noise.
Soil and Water Resources Conservation Act of 1977	16 USCS 2001 (1991)	Provides for the conservation of soil, water and related resources for sustained use.	Relevant and Appropriate	The Removal Action for the site will be completed under CERCLA requirements.
Superfund Implementation	Executive Order 12580	DOD shall comply with the NCP in addition to other requirements of the order.	Applicable	The Removal Action for the site will be completed under CERCLA requirements.
The Native American Grave Protection and Repatriation Act (NAGPRA)	Public Law 101-601 (Nov. 16, 1990)	Law provides for protection of Native American graves and for other related purposes	Applicable	There are presently no known areas at the site with potential to contain Native American burial grounds.
Explosives Safety				
DOD	DOD 6055.1.STD	Provides Ammunition and Explosives Safety Standard	Applicable	Applicable to all activities associated with Ammunition and Explosives,
Army	AR 385-10	Army’s Safety Program	Applicable	Applicable to all activities associated with Ammunition and Explosives,

USACE	EM 1110-1-4009	Provides USACE with procedures to perform OE response activities	Applicable	Applicable to all activities associated with Ammunition and Explosives.

11.2.2 Geology and Topography

11.2.2.1 Topography. Refer to Chapter 1, Introduction, paragraph 1.4

11.2.2.2 Geology. Refer to Chapter 6, Geophysical Investigation Plan

11.3 NATURAL RESOURCES

11.3.1 Wildlife Resources

The areas identified in the SOW are mixed use; a developed subdivision, golf course, and undeveloped tracts adjacent to developed areas. As such, further review of natural databases (state and federal) is not applicable.

11.3.2 Plant Resources

The areas identified in the SOW are of mixed use: a developed subdivision, golf course, and undeveloped tracts adjacent to developed areas. As such, further review of natural resources databases (state and federal) is not applicable.

11.3.3 Threatened and Endangered Species

The areas identified in the SOW are of mixed use: a developed subdivision, golf course, and undeveloped tracts adjacent to developed areas. As such, further review of natural databases (state and federal) is not applicable. There are at least two threatened and endangered plants located on Camp Croft/Croft State Natural Area. The plants are Meadow Sedge (C. gracilescens) and Smooth Sunflower (Helianthus laevigatus).

11.3.4 Wetlands

The areas identified in the SOW do not contain wetlands.

11.3.5 Water Resources

11.3.5.1 Surface Water

There is no surface water in the vicinity of the work areas on Camp Croft.

11.3.5.2 Groundwater

11.3.5.2.1 The saprolite unit within the Camp Croft area contains a heterogeneous mixture of sand, silt, and clay with an approximate saturate of hydraulic conductivity of 10-4 to 10-7 cm/sec. The Hornblende Gneiss Bedrock beneath the saprolite has a permeability estimate greater than 10-3 cm/sec. The saprolite and bedrock units are considered to be interconnected and make up the aquifer in this region.

11.3.5.2.2 Groundwater depth in the south west section of Camp Grant near the current day Camp Croft Landfill is twenty to thirty feet and can be considered typical of groundwater depths through out the former camp. The saprolite in this area has a potential yield of 72,000 gallons per day Vs 201,600 gallons per day for the bedrock unit.

11.3.6 Air Quality

11.3.6.1 The US Environmental Protection Agency has established National Ambient Air Quality Standards (NAAQS) pursuant to Sections 109 and 301(a) of the Clean Air Act (CAA).

These standards, expressed in micrograms per cubic meter, establish safe concentration levels for each criteria pollutant. NAAQS have been set for six pollutants: particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone and lead.

11.3.6.2 The United States is divided into attainment and non-attainment areas, usually by county or Metropolitan Statistical area. Areas not meeting NAAQS are designated non-attainment for the specific pollutant.

11.3.6.3 It is not anticipated that activities to be conducted during the scope of work will have any significant effect on air quality as ordnance testing activities and normal vehicle use are considered minor mobile sources of air emissions.

11.3.7 Noise

Noise can be defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level of energy content (amplitude). The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. The decibel (dB) scale is used to quantify sound intensity. Since the human ear is not equally sensitive to all frequencies within the entire spectrum, noise measurements are weighted more heavily within those frequencies of maximum human sensitivity in a process called “A-weighting” (expressed as dBA). Additionally, sudden, short duration infrasonic and lower frequency noise such as cannon fire is measured on a “C-weighted” scale (dBC) and is considered more disturbing than A-weighted noise. The OSHA Permissible Exposure Limit (PEL) for noise is 85 dB (29 CFR 1910.95). It is considered highly unlikely that this noise level would be reached.

11.3.8 Cultural Resources

11.3.8.1 There is ample evidence of early man's activity in and around that portion of the old Camp Croft that is current day Croft State Natural Area. The most evident example is a pre-historic soapstone quarry located in the south-west corner of the park. The Croft Soapstone Quarry was registered with the South Carolina Heritage Trust Program as a Heritage Site on January 20, 1989.

11.3.8.2 Other relevant statutes that pertain to historic sites may require additional compliance procedures when applicable are the Native American Graves Protection and Repatriation Act (NAGPRA) and the Archeological Resources Protection Act (ARPA).

11.3.8.3 NAGPRA requires that all work stop for thirty days in the event that Native American human remains or cultural items are discovered during intrusive investigation or construction activities. It also requires that the agency ceases activity in the area of the discovery for thirty days and takes measures to protect the discovery. During this period, the agency is required to consult with recognized Native American tribes having cultural affiliation with the remains before excavation and removal of any of the materials.

11.3.8.4 ARPA serves to protect all archeological sites on federal land from disturbance and contains established standards for archeological site excavation permits.

11.3.9 Archaeological Resources

There are no known archeological resources on the subject site.

11.3.10Historic and Historic Architectural Resources

The Croft State Park Management Plan includes reference to a number of early "post-settlement" activities and potential historic sites (approximately 55) within the park grounds. Of significance are: the home of John Thomas, Sr. where a Revolutionary War skirmish took place (exact location of the Thomas house has not been determined), and eight cemeteries with the oldest headstone dated 1802 (one of the cemeteries is a suspected fake that was set up as a "training area for troops at Camp Croft.").

11.3.11Compliance with ARARs

ZAPATAENGINEERING will submit a report to the Army Corps of Engineers reporting the existing conditions and identification/compliance with potential applicable or relevant and appropriate requirements.

11.4 ENVIRONMENTAL PROTECTION STRATEGY

11.4.1 Project Impact

It is not anticipated that the scope of work will adversely affect any species encountered within the sampling areas. However, if the work area falls within an area marked and identified by the US Army Corps of Engineers (or US Fish and Wildlife or any other appropriate regulatory agency) as containing endangered/threatened species of flora or fauna or suitable habitat for protected species, ZAPATAENGINEERING will institute the environmental protective measures discussed below. ZAPATAENGINEERING proposes to institute these measures to ensure that the proposed scope of work does not impact the species and their associated habitat found in the proposed scope of work at the former Camp Croft.

11.4.2 Environmental Protective Measures

11.4.2.1 Prior to the initiation of intrusive activities (including surveying, brush clearing) ZAPATAENGINEERING will coordinate with the appropriate CEHNC POC (who will in turn coordinate with appropriate regulatory agencies) to obtain all information and prior surveys needed to help institute environmental protective measures.

11.4.2.2 ZAPATAENGINEERING will institute Environmental Protective Measures in those areas that were surveyed and field marked by the CEHNC or their representatives as suitable threatened/endangered specie habitat areas prior to the start of work.

11.4.3 Cultural or Historical Resources

11.4.3.1 There are no known cultural or historical items of value located within the confines of the project site. If the CEHNC identifies an area as containing cultural or historic items, ZAPATAENGINEERING will institute protective measures when working in these areas.

11.4.3.2 Any and all items discovered during excavation that may have an apparent cultural, historical or archaeological interest will be carefully preserved in an undisturbed state. The SUXOS will immediately report the find to the Contracting Officer Representative so that the proper authorities can be notified.

11.4.4 Protective Measures

In the event that cultural resources are encountered ZAPATAENGINEERING will institute the following protective measures in the same order listed: avoidance via elimination of the area from the removal action after approval from CEHNC, construction of physical protective measures.

11.4.5 Wetlands

The subject site described in the scope of work is currently developed or adjacent to developed areas, and as such, no wetlands are found on the subject site.

11.4.6 Storage Areas

ZAPATAENGINEERING will use protective barriers to prevent the possible migration of solid (soils, silts, and sediments) and liquid contaminants into adjacent or down gradient environmental system.

11.4.7 Trees and Shrubs

11.4.7.1 General

11.4.7.1.1 No ropes, cables, guys, or any other device shall be fastened or attached to nearby trees or anchorages. ZAPATAENGINEERING shall conduct excavation activities so that trees and shrubs lying outside areas designated for clearing will not be defaced, injured, or destroyed. ZAPATAENGINEERING shall provide temporary protection for trees by placing poles, planks, or boards around them if the possibility of injury caused by heavy equipment exists. Protective stakes may be placed around sensitive vegetation to identify their presence. Any vegetation damaged during work efforts will be restored, if practical. No flora or fauna will be imported or exported without approval from the contracting officer.

11.4.7.1.2 Operations will be conducted so that root structures of vegetation are not disturbed, allowing quick resurgence of cover and foliage.

11.4.7.1.3 ZAPATAENGINEERING shall take all actions necessary to protect and prevent damage to trees, shrubs, and vegetation. ZAPATAENGINEERING personnel will disturb only the vegetation necessary for safe and effective access to the sampling of the area. Selective pruning of brush is required to prevent excessive removal of vegetation. When in or near an environmentally sensitive area (e.g. endangered species nesting sites), any brush that is cut will be lifted and carried (not dragged) from the cut site to prevent damage to environmentally sensitive areas. Dragging of brush along the ground could damage environmental or culturally sensitive items in the area. Care will be taken when walking in or near sensitive areas to prevent further damage.

11.4.8 Tree Protective Structures

The contractor will conduct soil disturbance activities so that trees and shrubs lying outside areas designated for clearing will not be defaced, injured or destroyed. The contractor will provide temporary protection for trees, consisting of placing poles, planks or boards around them, if there is a possibility for injury through the use of heavy equipment. For trees or shrubs less than five (5) feet in height, elevated flags or markers will be placed close to the tree or shrub to provide extra visibility. Cables, ropes, or other restraints will not be attached to any tree or shrub.

11.4.9 Restoration of Damaged Trees

All trees may require removal to facilitate investigative actions; discretion will be used prior to any final decisions. Vegetation areas disturbed by the project will be restored as directed by the Contracting Officer/Contracting Officer Representative. Trees, which are marred unavoidably, will be trimmed and treated with an approved wound dressing as soon as possible.

11.4.10Water Resources

All project activities will be conducted in a manner to prevent the discharge of pollutants into adjacent waterways within, and outside, the work area. Each site will be controlled to prevent run-on/run-off of water from the site.

11.4.11Control of Water Used Onsite

Surface water restrictions will be established at points in the area, which could allow contaminated water to migrate out of the area. Water sources such as sinks, showers, and all toilet facilities will be of the fixed, indoor type or the portable type and all wastes will be transported to an approved and permitted facility off-site. Water used for the decontamination of personnel and equipment will be contained onsite in approved containers, so as not to allow it to spread. Chemical solutions used for decontamination will be saved in approved containers, sampled, and disposed as directed by the Contracting Officer/Contracting Officer Representative.

11.4.12Control of Run-on Water

All reasonable precautions will be taken to prevent run-on from entering areas of the site where the water may be exposed to contaminated soils, water, or waste. Such precautions may include grading, temporary dikes, sandbags, or other actions as directed by the Contracting Officer/Contracting Officer Representative.

11.4.13Control of Run-off Water and Sediment

11.4.13.1 Run-off Controls

All project activities will be conducted in a manner that prevents the discharge of pollutants into adjacent waterways. All toilet facilities will be of the fixed, indoor type or the portable type, and waste disposal will be at an off-site facility. If any areas are adjacent to wetlands, sandbags or other barrier devices will be used to prevent the spread of potentially contaminated soil or water. Decontamination water from cleaning personnel and equipment will be contained on-site to prohibit it from spreading across the surface to any adjacent wetlands. Chemical solutions used for decontamination will be stored in approved containers, sampled, and disposed of as directed by the COR.

11.4.13.2 Soil Erosion and Sediment/Siltation Control

11.4.13.2.1 All removed soil will be placed in the vicinity of the activity and ultimately returned to the same area upon completion of the project. If needed, fabric silt fencing will be installed to adequately control erosion problems. If necessary, diversion dikes and ditches will be installed and regrading conducted to control sediment migration.

11.4.13.2.2 All erosion and sediment control measures will be properly maintained throughout the duration of the project. In all cases, the area of soil exposed during soil disturbance will be kept to a minimum. The spoils pile will be covered with plastic/tarp to minimize any soil run-off. Reseeding will be initiated as soon as possible to minimize erosion potential. All soil disturbance activities will be accomplished per the depth specified in the Work Plan, or to the point up to where the water table is encountered. All deviations from depth restrictions prescribed by the Work Plan, or deeper than encountered water table will be performed only upon authorization from the Contracting Officer/Contracting Officer Representative. Diversion dikes and ditches will be installed and regrading conducted to control sediment migration by water run-on/run-off.

11.5 WASTE DISPOSAL

11.5.1 Introduction

11.5.1.1 During the investigation, if ZAPATAENGINEERING encounters any signs of hazardous materials/waste, ZAPATAENGINEERING will make appropriate attempts to avoid those areas if possible and proper. ZAPATAENGINEERING will not compromise the integrity of the investigation, and if hazardous materials are encountered, or are thought to be present, appropriate Health and Safety measures will be undertaken.

11.5.1.2 Material Safety Data Sheets (MSDSs) for hazardous materials that will be used during the duration of the project will be maintained on site.

11.5.1.3 For the purposes of this Work Plan, all waste generated will be properly containerized and disposed of in accordance with all applicable regulations and through approved channels. Generation of hazardous waste is anticipated. For wastewater management, run-on/run-off is controlled, and sanitary wastewater is disposed out of the area. If decontamination water is generated, it will be placed in approved containers for disposal outside the area in accordance with all applicable federal, state and local regulations.

11.5.1.4 Conventional unexploded ordnance (UXO) and ordnance explosive (OE) will be handled, transported, and disposed of in accordance with this Work Plan. If chemical warfare materiels (CWM) are encountered, the contractor will immediately close all operations. The encountered CWM shall be secured without removal by two UXO technicians. ZAPATAENGINEERING will contact the Contracting Officer/Contracting Officer Representative, who will immediately contact the Technical Escort Unit (TEU). The contractor will stand-by and render assistance as directed.

11.5.1.5 Uncontaminated waste materials, such as trash and general debris, will be placed in appropriate trash receptacles for disposal by an authorized waste contractor.

11.5.2 Uncontaminated Waste

Non-hazardous, solid waste materials, such as trash and general debris, will be placed in a trashcan in the truck and disposed of by a local waste hauler in accordance with applicable regulations.

11.5.3 Contaminated Waste

Although there are no known chemical warfare materiels on site, the possibility exists that a hazardous substance or substance may be encountered during intrusive activities. In the event that CWM is encountered, ZAPATAENGINEERING will stop operations and immediately notify the

Contracting Officer/Contracting Officer Representative before proceeding further. ZAPATAENGINEERING is aware that waste that is potentially hazardous will be handled in accordance with applicable regulations. Material Safety Data Sheets for hazardous materials that will be used during the duration of the project will be maintained on site.

11.5.4 Packaging, Labeling, Storage, and Disposal

All hazardous materials will be stored in authorized containers and labeled in accordance with all applicable regulations. See Chapter 3.0 of the Work Plan for discussion of handling, storage and disposal of explosives. Any waste generated by ZAPATAENGINEERING will be collected, stored and labeled in accordance with all applicable regulations. ZAPATAENGINEERING does anticipate the generation of hazardous waste during the execution of the proposed project.

11.5.5 Manifesting and Transportation

ZAPATAENGINEERING does predict that there will be hazardous waste to be manifested or transported as there are known HC smoke canisters (partials and fully intact canisters) and potentially white phosphorus contaminated soils on site. This potential waste will be manifest in accordance with the 40 CFR 262, Subpart b. ZAPATAENGINEERING intends to recycle all scrap metal, which excludes the generator from manifesting requirements of 40 CFR 262, Subpart b.

11.5.6 Compliance with 40 CFR 262, Subpart b

It is anticipated that 40 CFR 262 will apply to this operation, since white phosphorus grenades were previously identified in the soil. If hazardous wastes are generated, ZAPATAENGINEERING will initiate appropriate manifests and ensure that the paperwork is completed from point of generation to disposal.

11.5.7 Compliance with DOT Shipping Regulations

Transportation of all wastes and materials will be conducted in accordance with applicable DOT regulations including; labeling, use of placards and documentation of transportation.

11.5.8 Burning

11.5.8.1 There are no plans for burning materials within or around the job site; however, any burning of materials that may occur shall conform to all local and State regulations.

11.5.8.2 If it is determined that specific materials will require open burning, the contractor will obtain authorization in writing prior to conducting open burn operations. The contractor will assist the Contracting Officer/Contracting Officer Representative as necessary to obtain the permits in accordance with applicable federal and state regulations.

11.5.9 Dust Control

11.5.9.1 The work procedures in this Work Plan are designed to minimize particulate emissions. The SUXOS shall ensure there is no evidence of human exposure to dust during soil/sediment activities. Control of fugitive particulates will involve measures such as: watering down dry or barren areas, roadways and soil disturbance site areas; and covering of spoils piles with plastic/tarp. During dry, windy periods when dust is visible, water will be used where needed for dust control. If necessary, spoil areas will be covered with tarps.

11.5.9.2 The work procedures in this Work Plan are designed to minimize particulate emissions. The SUXOS shall ensure there is no evidence of human exposure to dust during soil/sediment activities. Control of fugitive particulates will involve measures such as: watering down dry or barren areas, roadways and soil disturbance site areas; and covering of spoils piles with plastic/tarp. During dry, windy periods when dust is visible, water will be used where needed for dust control. If necessary, spoil areas will be covered with tarps.

11.5.10Air Pollution Control

11.5.10.1 White Phosphorus

11.5.10.1.1 As discussed above, white phosphorus is the primary contaminant of concern at this site. It highly flammable and may spontaneously ignite on contact with air producing irritating or toxic fumes (phosphorus oxide) in a fire. The American Conference of Governmental Industrial Hygienists (ACGIH) within their 2003 Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) has established an 8-hour Time Weighted Average (TWA) of 0.1 mg/m3. The National Institute of Occupational Safety and Health (NIOSH) has established an Immediately Dangerous to Life and Health (IDLH) level of 5 mg/m3 (NIOSH, 1997). A dust monitor will be used to monitor airborne particulates will sifting suspected contaminated soil. If the dust monitor readings exceed the 8-hour TWA for white phosphorus, all personnel will evacuate to an upwind rally point that is at least 300 feet from the work site and the QCS/SO will monitor the rally point to verify that white phosphorus smoke particulates are below the 8-hour TWA. Work will not resume without consulting the ZAPATAENGINEERING Safety and Health Manager, and dust monitoring readings drop below the 8-hour TWA. Dust suppression may be utilized to control any airborne particulates. See SSHP (Appendix D) for more information.

11.5.10.1.2 If white phosphorus is encountered and it combusts and/or smokes, all personnel will evacuate to a upwind rally point that is at least 300 feet from the work site and the QCS/SO will monitor the rally point to verify that WP smoke particulates are below the 8-hour TWA.

11.5.11Spill Control Plan

11.5.11.1 ZAPATAENGINEERING plans to conduct all fueling and repair of vehicles off site. This practice will decrease the amount of pollutants that need to be stored on the site. Liquids of a hazardous nature that are absolutely necessary to conduct the scope of work will be stored in small quantities. If it is necessary to store hazardous waste or materials with hazardous constituents in a storage tank (a stationary device, designed to contain an accumulation of hazardous waste which is constructed primarily of non-earthen materials), it will be placed within an approved secondary containment of adequate size to contain a spill (110% of storage tank size). The tank will be managed in accordance with 40 CFR Subpart I. In addition, in the unlikely event that ZAPATAENGINEERING will need to store containers of hazardous waste on site, they will be used and managed in accordance with 40 CFR Subpart I. Any spills originating from small containers (e.g. gasoline cans) will be contained by the use of absorbent materials.

11.5.11.2 Section 304 of the Emergency Planning and Community Right to Know Act requires reporting releases of Extremely Hazardous Substances (EHS) and CERCLA hazardous substances in amounts that equal or exceed the substance’s reportable quantity (RQ). A RQ is the amount of a hazardous substance, which requires notification if released into the environment (air, water or land) from a fixed facility.

11.5.12 Spill Potential.

Due to the nature of the operations, the potential for a spill of pollutants to the environment (air, water, and land) is highly unlikely.

11.5.13 Preventative Spill Control Measures.

11.5.13.1 All containers of liquids containing petroleum products or other chemicals with potentially hazardous constituents will be managed carefully and kept closed. The containers will be stored in a location away from the main operations to decrease chances of container damage and chances of spillage.

11.5.13.2 Vehicles will be maintained in good operating condition and will be left running only when necessary. All vehicles used during the course of the sampling will be fueled, maintained, and serviced at an off- site location. No routine cleaning or washing of vehicles or equipment will be permitted on-site.

11.5.14 Decontamination and Disposal

11.5.14.1 Decontamination of excavating and sampling equipment will be in accordance with Section 11 of Appendix D.

11.5.14.2 Although UXO are potentially hazardous, once detonated, the only remaining material requiring disposal will be scrap metal. ZAPATAENGINEERING intends to arrange for recycling of all scrap metal through a local dealer. In accordance with 40 CFR 261.6(a)(3), scrap metal, if to be recycled, is not subject to parts 262-266, or 268, 270 or 124 (most of RCRA including permit requirements). ZAPATAENGINEERING will recycle all scrap metal generated as a result of necessary removal and maintain records of all recycling.

11.5.15 Emergency Procedures

11.5.15.1 Although ZAPATAENGINEERING plans to conduct all fueling and repair of vehicles off-site, significantly decreasing the amount of pollutants stored on site, it is necessary to plan in the unlikely event of a release of pollutants.

11.5.15.2 The following sections describe the procedures to be following in the event that a pollutant is released to the environment (air, water, and land). Refer to Appendix D (Site Health and Safety Plan) for all emergencies involving personnel injury or natural disasters.

11.5.15.3 In the event of a spill that exceeds the reportable quantity, site personnel will immediately inform the SUXOS, who will immediately report the spill to the Contracting Officer and Contracting Officer Representative.

11.5.16 Control and Containment of Spill

In the event of pollutant release to the environment the following steps will be taken:

- Immediately inform the SUXOS, who will determine if the spill exceeds the RQ. If the RQ is exceeded the SUXOS will immediately report the spill to the Contracting Officer/Contracting Officer Representative.

- Locate the source of the spillage or leak and stop/contain the flow, if it can be done safely, utilizing properly protected personnel. (See Site Safety and Health Plan for discussion of appropriate PPE for specific pollutant being addressed). Notify on-site Health and Safety Officer.
- Stay upwind of and out of low areas.
- Keep combustibles away from the spilled material.
- Use appropriate and approved methods (e.g. water), to reduce vapors, gases, and/or dust emissions
- Begin containment and recovery of the spilled materials.
- Initiate reporting procedures after consultation with SUXOS and CO.

11.5.17Isolation and Security of the Area

ZAPATAENGINEERING personnel will provide security to control the work area. All hazardous materials associated with the project (primarily explosives) will be secured as discussed in the Explosives Management Section of this Work Plan.

11.5.18Consideration of Wind Direction

Due to the nature of the operations and because chemical warfare materiels are not known to be present at the Camp Croft Formerly Used Defense Site, there should not be any gaseous emissions of a hazardous nature released during the sampling activities. However, prevailing wind conditions are discussed daily during safety briefings.

11.5.19Emissions

While the ordnance detonation may result in emissions of inhalable particulates, these activities are not expected to adversely affect air quality.

11.5.20Post-Intrusive Clean-up

11.5.20.1 Upon project completion and subject to instructions by the Contracting Officer Representative, ZAPATAENGINEERING shall remove all temporary construction facilities, stockpiles of excess material, and other signs of activity. As directed by the COR, specified disturbed areas will be regraded and seeded in an effort to restore the area to near original condition.

11.5.20.2 The reclamation of all areas affected by site activities such as administrative areas, stockpiles or storage areas, drill holes and soil disturbance areas will include re-contouring and grading to match adjacent areas. Whenever possible, existing topsoil will be removed and stored separately from subsurface spoils, and returned during final grading operations. Reclamation of temporary construction roads will include smoothing and grading to eliminate ruts and to match the contours of the adjacent areas. Eroded or caved-in banks will be trimmed and leveled to provide stability and adequate drainage.

11.5.21Temporary Facilities

Unless directed by the COR to do otherwise, all temporary facilities that were erected by ZAPATAENGINEERING to execute the scope of work, will be removed during de-mobilization.

11.5.22 Disturbed Areas

11.5.22.1 All excavation activities associated with this project will be conducted to minimize impacts to land resources within and outside the project boundaries. Areas impacted by the project will be restored, as practical, to a condition that appears to be natural and does not detract from the overall appearance of the site. If detonation of hazardous ordnance is necessary, significant soil compaction is not anticipated. Detonations may increase naturally occurring fractures within the soil, making areas where drainage is poor and slopes are higher more susceptible to slide and creep movements. All soils excavated at the site will be returned to their original locations.

11.5.22.2 All areas (including wetlands, historical sites, archaeological sites, and natural habitats) damaged or otherwise altered by activities associated with this project will be restored, as much as practical, to near-natural or pre-existing conditions. Restoration will be as directed by the Contracting Officer/Contracting Officer Representative in accordance with the contract document.

11.5.23 Noncompliance/Corrective Action

Upon written notification of any noncompliance with Federal and State laws and regulations, ZAPATAENGINEERING shall immediately initiate actions to correct the situation. The SUXOS will notify the client (in writing) of the proposed corrective actions and will verify that the actions are implemented immediately and effectively. After the situation has been remedied, the SUXOS will send written notification of the results to the client.

11.5.24 Access Routes

The access routes due to the nature of the project (residential subdivision) will be determined upon arrival at site.

12.0 INVESTIGATIVE DERIVED WASTE PLAN

12.0.1 Investigative derived waste (IDW) includes recovered smoke canisters, soils, disposable personal protection equipment (PPE), and decontamination fluids. All decontamination water will initially be collected in 55-gallon drums and labeled with appropriate identification. If smoking soil is observed, it will be allowed to burn out and collected in separate 55-gallon drums and labeled as "Soil - Solid". Tyvek suits, personal protective equipment (PPE), and other plastics will also be collected in separate 55-gallon drums and labeled as "plastics". Smoke canisters will also be collected in separate 55-gallon drums and labeled as "Smoke Canisters - Solid". Analytical results from earlier investigations determined that the smoke canisters should be disposed of as hazardous waste. This generator knowledge will be used for waste classification and profiling. A copy of the previous waste profile is included in Attachment I. The drums will be stored on pallets near the field office. The storage area for the drums will be flagged with brightly colored barrier tape and stakes or safety cones. Labeling will include the date, ZAPATAENGINEERING'S phone number, the U.S. Army Corps of Engineers point-of-contact and phone number, and content description (i.e., decon water, etc.).

12.0.2 Sample results from soil and water testing (if required) will be used to assist in the classification of IDW. All IDW will be handled in a manner consistent with EPA Region IV guidance provided in EPA Region IV Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual, February 1991, Section 4.5, and Management of Investigative-Derived Wastes During Site Inspections, EPA/540/G-91/009, May 1991.

12.0.3 Operations at the former Camp Croft will potentially generate four types of IDW streams, identified below.

Waste Stream	*Product*
Hexachloroethane-ZincOxide Smoke Canisters (Used)	Solid
Decon Water	Liquid
Soil with White Phosphorus Contamination	Solid
Surface Run-On Water from Excavation	Liquid
Used PPE	Solid

12.1 IDW WASTE STREAMS

12.1.1 Hexachloroethane-Zinc Oxide Smoke Canisters

There are known HC smoke canisters (partials and fully intact canisters) on site. Analytical results from earlier investigations determined that the smoke canisters should be disposed of as hazardous waste. This generator knowledge will be used for waste classification and profiling, thus no sampling of the canisters will be required. A copy of the previous waste profile is included in Attachment I. Recovered smoke canisters will be collected in 55-gallon drums and labeled as "Smoke Canisters -Solid". These drums will be transported and disposed of by Clean Harbors, Inc., utilizing incineration.

12.1.2 Surface Water

Site personnel will drum water generated during decontamination activities, and sequentially number each, including date, site, and origin and suspected contaminant(s). A composite water sample will only be collected from the drums if smoking soils are encountered during the execution of this task order. Labels for samples will read "W = IDW water". As indicated on Table E-1, if required, this composite wastewater characterization sample will be analyzed for white phosphorus using standard TAT. In water, white phosphorus has a Region IX tap water PRG of 0.73 ug/L, a Drinking Water Equivalent Level (DWEL) of 0.5 ug/L and a Lifetime Health Advisory of 1 ug/L. If analytical laboratory results indicate the IDW is contaminated or hazardous, it will be shipped to the permitted Clean Harbors facility. If laboratory results indicate that the water stored in the drums doesn't require treatment or no composite sample is required, the water will be discharged at a nearby stormwater drainage system.

12.1.3 Used PPE

Expendable PPE will be disposed of as non-hazardous solid waste in a Subtitle D landfill.

12.1.4 Soil

Suspected contaminated soil will be sifted to segregate scrap from the soil. Soils will then be stockpiled inside the engineering control structure. If smoking soil is encountered, it will be allowed to burn off and segregated from non-smoking soils. The soils will only be containerized and sampled for disposal if they were smoking. The material will be placed in 55-gallon drums and staged near the project field office. At the end of the excavation activities, one composite sample will be collected from these drums for waste characterization using stainless steel pre-cleaned utensils. Labels for samples will read "S = IDW soil". ERDC - Vicksburg will analyze the sample under their standard TAT for white phosphorus as specifically required for waste acceptance by the disposal facility. Table E-1 is a summary of the analytical sampling requirements for soil waste characterization samples. Based on the analytical results, the soil will be disposed of in accordance with federal, state and local regulations.

12.2 DISPOSAL

The respective waste disposal methods to be utilized for soil and water IDW will be dependent upon the classification of the waste as non-contaminated, Resource Conservation and Recovery Act (RCRA) hazardous, or RCRA non-hazardous. Classification of smoke canisters will be based on historical site information, including historical analytical data. The material will remain on-site until the IDW has been classified. All material will be disposed of within 30 days of receiving laboratory results. Wastes determined to be non-contaminated will be disposed of on-site near the source. ZAPATAENGINEERING will have the capability onsite to perform all loading functions. ZAPATAENGINEERING will obtain documentation of final treatment/disposal of all soil deemed hazardous waste, as indicated in Section 12.2.8 of the Investigative Derived Waste Plan.

12.2.1 Waste Profile Sheet

Waste Profile Sheets for soil will be prepared as indicated in Section 12.2.8.1 of the Investigative Derived Waste Plan.

12.2.2 Shipping Labels

Labels will be affixed as indicated in Section 12.2.8.2 of the Investigative Derived Waste Plan.

12.2.3 Manifesting

Soil will be manifested as indicated in Section 12.2.8.3 of the Investigative Derived Waste Plan.

12.2.4 Weight Slips

A signed weight slip will be provided to CEHNC, indicating the actual weight shipped to the approved Treatment, Storage and Disposal Facility accepting the waste.

12.2.5 Notification of Waste Shipped

Forms required under Land Disposal Restrictions [40 CFR 268] will be attached to the manifest.

12.2.6 Certificate of Disposal/Destruction

ZAPATAENGINEERING will secure proof of the disposal/treatment of the waste in the form of a Certificate of Disposal signed by the licensed, RCRA-permitted TSDF accepting the waste. The certificate will include the type of material, and method and date of treatment.

12.2.7 Containers

Packaging and shipping containers will be made of sturdy, leak-proof materials and meet DOT specifications for materials and construction. Typically, the permitted Treatment, Storage and Disposal Facility (TSDF) specifies the use of DOT 1A1 and 1A2 (old DOT 17E and 17H) drums for hazardous liquid wastes and hazardous solid wastes.

12.2.7.1 On-Site Tracking

ZAPATAENGINEERING will implement a tracking system to follow all waste streams generated on-site. Every container will have a distinct, prominently displayed identification number corresponding to the location of origin and date of excavation of each respective drum or container. Figure 12-1 is a copy of a Waste Container ID Form, which will include all pertinent information on each individual container or drum. The Site Manager will keep copies of these forms in a folder in the office trailer. The Waste Container Log Form (Figure 12-2) will list all container ID’s, providing a means of monitoring the status of items awaiting disposal in the waste staging area. This form will track all information necessary to properly dispose of the waste, culminating with receipt of a waste approval code from the permitted facility destined to receive the individual waste items.

12.2.7.2 Marking for Storage

Each container will be clearly marked with an "accumulation start date". The accumulation start date is the date that waste is first placed (accumulated) in the container.

FIGURE 12-1 WASTE CONTAINER ID FORM

ZAPATAENGINEERING

Trust • Integrity • Quality

US Army Corps of Engineers, Charleston District
Former Camp Croft Site
Spartanburg, South Carolina

Date___________________

Container ID___________

Date Generated_____________

Container Type: ☐ Poly Open Top ☐ Poly Closed Top

Size_______ Other (describe)_______________________________________

Waste Type: ☐ Soil ☐ Decon Water ☐ Groundwater ☐ Smoke Canisters ☐ PPE

Other (describe)_______________________________________

Estimated Weight or Volume_________________

Source of container contents, depth and location ______________________________
____
____
____
____
____

Sample ID:________________________________

Comments:____
____

FIGURE 12-2 WASTE CONTAINER LOG FORM

ZAPATAENGINEERING
TRUST • INTEGRITY • QUALITY

US Army Corps of Engineers, Charleston District
Former Camp Croft

Date Generated	Container Number	Container Size / Type	Waste Type	Estimated Weight / Volume	Contents (Sample No., Location, Depth)	Trailer Number	Manifest Number	Date Shipped	Disposal Site	Waste Approval Code

12.2.7.3 Transportation

As soon as validated analytical results are available, they will be provided to CEHNC and CESAC for concurrence. Once the results/waste codes have been validated by CEHNC and CESAC, the Site Manager will immediately forward them to the permitted Treatment, Storage and Disposal Facility (TSDF), in order to expedite acceptance of the material by the facility. ZAPATAENGINEERING will then mark each container with the appropriate waste code (D001, D002, F005, etc.). No containers will leave the job site until receipt of manifesting codes from the approved facility receiving the waste(s). Likewise, prior to leaving the facility, the permitted hauler will affix appropriate placards to each vehicle and ensure that all other DOT transporter requirements are met.

12.2.8 Disposal Documentation

12.2.8.1 Waste Profile Sheet

Waste-specific information is required of all waste to be considered for transportation, storage, treatment or disposal. This information determines how the waste may be transported, stored, treated or disposed of in a legal, safe and environmentally sound manner. After receipt of analytical results for samples of HTW waste, ZAPATAENGINEERING will prepare Waste Profile Sheets incorporating the results.

12.2.8.2 Shipping Labels

Each hazardous waste container will be labeled and clearly marked with the following information, as shown Table 12-1 (49 CFR 172.101 dictates which label to use):

- Proper shipping name and UN/NA number (found in 49 CFR 172.101).
- Generator name and address.
- Manifest document number.
- Hazardous Waste Warning. This warning states, "Hazardous Waste Federal Law Prohibits Improper Disposal. If found, contact the nearest police, public safety authority, or the U.S. EPA."
- Hazard labels. Hazard labels are 4" by 4" labels stating information such as FLAMMABLE, CORROSIVE, or OXIDIZER.

TABLE 12-1 SHIPPING LABEL INFORMATION

Shipping Name	***Hazardous Waste Solid, n.o.s.***
ID Number	NA 3077, packing group (PG) listed as III
RQ and Notation, if over 100 pounds	*1000 lbs*
DOT Label (49 CFR 172.430)	Hazard Class 9
Consignee’s or consignor’s name and address	*US Army Corps of Engineers,* *Charleston District* *69-A Hagood Avenue* *Charleston, SC 29403-5107* *(843) 329-8054*

*The shipping label information is preliminary and will be reviewed and possibly revised after analytical data is reviewed for waste characterization.

12.2.8.3 Manifesting

A manifest is a multi-copy form used for shipping hazardous and non-hazardous waste off-site, detailing information concerning the generator, transporter, TSDF, and the amount and type of waste. ZAPATAENGINEERING will oversee preparation of waste manifests in accordance with EPA and State of South Carolina requirements. Waste determined to be hazardous will be manifested as such for shipment to a permitted TSD facility. Generators of hazardous waste are liable for the proper handling and disposal of their waste. A representative of the Charleston District of the US Army Corps of Engineers (CESAC) will sign all waste manifests as the generator of record. If ZAPATAENGINEERING does not receive a copy of the manifest back from the TSDF within 35 days of shipment, the final TSDF will be contacted to check on the status of the waste.

12.2.8.4 Weight Slips

12.2.8.4.1 Actual Weight

The actual weight of waste shipped to the approved Treatment, Storage and Disposal Facility will be documented with a signed weight slip. The CESAC and CEHNC representatives will receive copies of weight slips.

12.2.8.4.2 Calculated Weight

As an alternative to actual weighing, the weight of bulk shipments may be computed, provided that the specific gravity of the material is known and the volume actually picked up is determined. For example, 2,000 gallons of liquid with a specific gravity of 1.4 has a calculated weight of 23,344 pounds. (2,000 x 1.4 x 8.337, where one gallon of water weighs 8.337 pounds). Specific gravity will be obtained from a waste profile sheet.

12.2.8.4.3 Notification of Waste Shipped

Forms required under Land Disposal Restrictions [40 CFR 268] will be attached to the manifest.

12.2.8.4.4 Certificate of Disposal/Destruction

Final treatment/disposal means either: treatment so that such wastes no longer meet the definition of a hazardous waste as defined in 40 CFR 261; or treatment of a waste by a RCRA handling method specified in 40 CFR Parts 264/265 Appendix 1, Table 2, paragraph 2. Simple acceptance of the hazardous waste at a properly permitted treatment, storage, or disposal facility (TSDF) does not meet the definition of final treatment nor final disposal. ZAPATAENGINEERING, on behalf of the generator, CESAC, will obtain all necessary documentation to prove that the final treatment or disposal of all items has been accomplished.

12.3 SOIL MONITORING AND DISPOSAL

12.3.1 Introduction

Soil samples taken from the locations of identified pits will be monitored and analyzed for the presence of industrial chemicals, and to determine disposal options consistent with regulations in USEPA 40CFR Part 261: Identification and Listing of Hazardous Waste.

12.3.2 Soil Handling Procedures

Environmental sampling will be conducted on a limited basis to support the M15 WP grenade removal within the pits previously identified in Grid 17 of OOU 3. ZAPATAENGINEERING will implement the approved Environmental Sampling and Analysis Plan as necessary. For planning purposes, a maximum of ten (10) environmental samples will be taken if smoking soils are encountered. If necessary, the pits will be over excavated to ensure all white phosphorus impacted soil is removed and confirmatory soil samples will be collected beneath the areas where smoking soil occurred. Analysis will include white phosphorus by SW7580 under standard TAT.

12.3.3 Disposal

If HTW contaminants are suspected, ZAPATAENGINEERING will submit the industrial chemical sample to a Corps' validated laboratory for characterization.

12.3.3.1 HTW Soil

Soil exceeding the white phosphorus criteria will be staged for offsite treatment and disposal, or shipped to a Subtitle C landfill as hazardous waste.

12.3.3.2 Contaminated Non-HTW Soil

Contaminated soil (based on sample results) that is not characteristically hazardous will be stockpiled for offsite treatment and disposal.

12.3.3.3 Extraneous Debris Soil

ZAPATAENGINEERING will monitor for the presence of foreign debris in soil, which may preclude its use as backfill material. Soil containing foreign debris, but free of contamination and within standards, will normally be used to supplement clean backfill material. However, should the on-site CEHNC representative deem such soil unsuitable as fill material, it will be forwarded to a Subtitle D landfill.

12.3.3.4 Containers

HTW-contaminated soil will be placed in sealed, burnable 55-gallon drums for storage, pending shipment for disposal at an approved RCRA facility.

12.3.3.5 On-Site Tracking

Soil will be tracked as indicated in Section 12.2.7.1. ZAPATAENGINEERING will use a system to match each individual soil sample with its respective analytical results, location of origin, corresponding container number, and/or its holding area stockpile.

12.3.3.6 Transportation

Transportation of soil will be as indicated in Section 12.2.7.3. All shipments will be in accordance with DOT regulations.

12.4 DISPOSAL DOCUMENTATION

ZAPATAENGINEERING will obtain documentation of final treatment/disposal of all soil deemed hazardous waste, as indicated in Section 12.2.8.

12.4.1 Waste Profile Sheet

Waste Profile Sheets for soil will be prepared as indicated in Section 12.2.8.1.

12.4.2 Shipping Labels

Labels will be affixed as indicated in Section 12.2.8.2.

12.4.3 Manifesting

Soil will be manifested as indicated in Section 12.2.8.3.

12.4.4 Weight Slips

A signed weight slip will be provided to the CEHNC and CESAC offices, indicating the actual weight shipped to the approved Treatment, Storage and Disposal Facility accepting the soil.

12.4.5 Notification of Waste Shipped

Forms required under Land Disposal Restrictions [40 CFR 268] will be attached to the manifest.

12.4.6 Certificate of Disposal/Destruction

ZAPATAENGINEERING will secure proof of the disposal/treatment of the contaminated soil in the form of a Certificate of Disposal signed by the licensed, RCRA-permitted TSDF accepting the waste. The certificate will include the type of material, and method and date of treatment.

13.0 GEOGRAPHICAL INFORMATION SYSTEMS PLAN

13.1 SITE-SPECIFIC GEOGRAPHICAL INFORMATION SYSTEM (GIS)

13.1.1 Development of an extensive GIS is not anticipated for this project; however, data collected will be stored in a format compatible with those listed in DID OE-005-14.01 and the system in use by the CEHNC (currently managed by ZAPATAENGINEERING for Camp Croft). ZAPATAENGINEERING will evaluate and manage the data to ensure they conform to CEHNC GIS requirements. ZAPATAENGINEERING recognizes that site data will likely be added to the GIS database already in use by the CEHNC.

13.1.2 ZAPATAENGINEERING will use the existing base map to include topographic information, site boundaries, and surrounding populous areas. ZAPATAENGINEERING will further develop this base map to include historical aerial photography (if available), delineation of historic land uses, and current land uses in accordance with US Army Corps of Engineers guidelines. As the fieldwork is conducted, survey, geophysical, sampling locations, and OE data will be incorporated into the map.

13.1.3 This map is a web-based application providing the user immediate access to maps and related site data via the Internet. The advantage of this application is ease of access through Internet browsing software (Internet Explorer) for instant access to site data. Grid and sampling data points will be integrated into the GIS layers as field progress is made. Map layers will be developed in conformance with the Tri-Service Spatial Data Standards and Tri-Service Guidelines for Installation mapping and Geospatial data. This will allow the GIS data to be queried, retrieved, and disseminated to the CEHNC and CEHNC Team members via a password-protected server. With advanced approval by CEHNC or the Charleston District, stakeholders or members of the public can have access to maps via the password-protected server.

14.0 INTERIM HOLDING FACILITY SITING PLAN

Sub-Plan is not required by Task Order

15.0 PHYSICAL SECURITY PLAN FOR RCWM PROJECTS

Sub-Plan is not required by Task Order

16.0 REFERENCES

AR 190-11, Physical Security Regulation

AR 200-2, Environmental Effects of Army Actions

AR 385-10, Army Safety Program

AR 385-65, Identification of Inert Ammunition and Ammunition Components
CEHNC-OE-CX, IGD 98-04, Reportable Material at Ordnance and Explosives (OE) Response
Sites, OE Center of Expertise (CX)

CEHNC-OE-CX, IGD 98-04, Small Arms Determinations, Ordnance and Explosives

CEHNC-OE-CX, IGD 99-02, Small Arms Determinations, OE Center of Expertise (CX)

Code of Federal Regulations (CFR), Hazardous Waste Operation, 29 CFR 1910.120

Code of Federal Regulations (CFR), Military Munition Rule, 40 CFR 266.201

Code of Federal Regulations (CFR), National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR 300.415

Code of Federal Regulations (CFR), Reporting Theft or Loss of Explosive Materials, 27 CFR 55.30

DA Pam 385-64, Ammunition and Explosives Safety Standards
DOD 6055.9-STD, Ammunition and Explosives Safety Standards
EP 1110-1-17, Establishing a Temporary Open Burn and Open Detonation Site for Conventional Ordnance and Explosives Projects

EP 111-01-18, Ordnance and Explosives Response

ER 1110-1-12, CEHNC Engineering and Construction Quality Management

ER 1110-1-8153, OE Response

HNC-ED-CS-S-97-7-Revision 1, Buried Explosion Module (BEM): A Method for Determining the Effects of Detonation of a Buried Munition

HNC-ED-CS-S-98-1, Methods for Predicting Primary Fragmentation Characteristics of Cased Explosives

HNC-ED-CS-S-98-2, Method for Calculating Range to No More Than One Hazardous Fragment per 600 Square Feet

HNC-ED-CS-S-98-7, Use of Sandbags for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions

HNC-ED-CS-S-00-3, Use of Water for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonations of Munitions

HQDA Interim Guidance for Biological Warfare Materiel and Non-Stockpile Chemical Warfare Materiel Response Activities

HQDA Policy Memorandum, "Explosives Safety Policy for Real Property Containing Conventional OE"

National Institute of Occupational Safety and Health (NIOSH), NIOSH Pocket Guide to Chemical Hazards, June 1997.

TM 9-1300, Military Explosives

US Army Corps of Engineers, Washington D.C., Basic Safety Concepts and Considerations for Ordnance and Explosives Operations, EP 385-1-95a, 29/06/2001.

US Army Corps of Engineers, Washington D.C., Establishing a Temporary Open Burn and Open Detonation Site for Conventional Ordnance and Explosives Projects, EP 1110-1-17, 16 July 1999.

US Army Corps of Engineers, Washington D.C., Ordnance and Explosives Response, EM 1110-1-4009, 23 June 2000.

US Army Corps of Engineers, Washington D.C., Safety and Health Requirements Manual, EM 385-1-1, 03/09/96.

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APPENDIX A
SCOPE OF WORK

SCOPE OF WORK

for

ORDNANCE AND EXPLOSIVE REMOVAL ACTION

at

ORDNANCE OPERABLE UNIT (OOU) 3

and

OPTIONAL ITEMS OOU 11C & OOU 11D

FORMER CAMP CROFT

SPARTANBURG, SOUTH CAROLINA

17 September 2002

1.0 OBJECTIVE

The objective of this task order is to implement and perform a Removal Action (RA) at the Former Camp Croft in Spartanburg, South Carolina. The Contractor's proposal shall include all costs required to safely locate, identify, and dispose of all explosive hazards to depth from previously identified pits within Ordnance Operable Unit (OOU) 3.

The initial task order award will be for the intrusive excavation of several previously identified pits located within Grids 17 and 40 of OOU 3 followed by re-mapping of Grids 17 (1.082 acres), 40 (0.854 acres), and 35P4 (0.657 acres) using digital geophysical methods for Quality Control (QC) purposes and to verify removal activities were completed within the pits and grids prior to the Government's Quality Assurance (QA) activities. Refer to **Figure 1** for a map indicating the location of Grids 17, 40, and 35P4 of OOU 3. If additional anomalies are identified after geophysical mapping, the anomalies are to be intrusively investigated prior to turning the grids over to the Government for QA procedures.

Three (3) small pits in Grid 17 and one (1) small pit in Grid 40 remain to be cleared (overall grids were previously mapped using digital geophysical methods and intrusively excavated). Twelve (12) M15 white phosphorous grenades were excavated from one (1) of the pits in Grid

17 and 150 pounds of smoke canisters were excavated from the pit in Grid 40; however, additional excavation activities were halted to reevaluate safety measures and develop proper procedures to be implemented prior to continuing with the excavations.

Coordinates for the pits previously excavated within **Grid 17** are provided below:

Pit No.	Northing	Easting
1	1119968.8	1741861.3
2	1119948.2	1741846.3
3	1119940.3	1741859.3

Coordinates for the corners of the pit previously excavated within **Grid 40** are provided below:

Pit Corners	Northing	Easting
1	1120103.9424	1741688.6959
2	1120143.8686	1741666.6810
3	1120146.2687	1741678.0887
4	1120117.5102	1741700.6585

The Contractor shall separately price all tasks necessary to complete the Statement of Work (SOW) including any optional tasks necessary for other Areas listed below. The Contractor shall include total as well as unit prices for all categories of work such as a cost per acre for brush cutting, a cost per acre for geophysical mapping, a cost per acre for land surveying, etc.

Optional tasks for other Areas may be exercised at the future discretion of the Government on a priority basis not necessarily in the order listed below:

a. Mapping using digital geophysical methods with the intrusive investigation and clearance of approximately 9.48 acres within OOU 11C.

b. Mapping using digital geophysical methods with intrusive investigation and clearance of approximately 11.2 acres within OOU 11D.

c. Mapping using digital geophysical methods, intrusive investigation, and clearance of approximately twenty-four (24) acres within OOU 3 (fringe area between Wedgewood Subdivision and Creek Golf Club identified on **Figure 1** as Grids 23P, 24P, 25P, 26P, 42P, 27P, 28P, 29-1P, 29P, 30P, 31P, 32P, 33P, 35P3, 35P2, 35P1, GC-2, 40P, 37P, 41P, and GC-1).

2.0 INTRODUCTION

The work required under this Scope of Work (SOW) falls under the Defense Environmental Restoration Program (DERP) and the Formerly Used Defense Site (FUDS) program. Ordnance and explosives (OE) may exist on property that was formerly owned, used, or controlled by the Department of Defense (DOD).

2.1 Explosive ordnance is a safety hazard and may constitute an imminent and substantial endangerment to site personnel and the local populace, thus the applicable provisions of 29 CFR 1910.120 apply. During this RA, it is the Government's intent that the contractor destroy all OE encountered on-site. The Contractor's work must be performed in a manner consistent with the Comprehensive Environment Response, Compensation, and Liability Act (CERCLA) Section 104, Executive Order No. 12580, and the National Contingency Plan (NCP), Sections 300.120(d) and 300.400(e). All activities involving work in areas potentially containing unexploded ordnance (UXO) hazards shall be conducted in full compliance with CEHNC, USACE, DA, and DOD safety requirements regarding personnel, equipment, and procedures and may result in the on-site destruction of UXO.

2.2 Due to the inherent risk in this type of operation, the Contractor shall be limited to a 40-hour workweek: either five 8-hour days or four 10-hour days. UXO personnel shall not perform OE-related tasks for more than 10 hours per day. The Contractor shall provide a UXO Tech II for UXO avoidance escort operations in support of site preparation and surveying. This project does not require an on-site, full time Contract Manager.

2.3 The site is not suspected to contain Chemical Warfare Materiel (CWM); however, if suspect CWM is encountered during any phase of site activities, the Contractor shall immediately withdraw upwind from the work area, secure the site, and contact the Corps of Engineers, CEHNC OE Safety.

2.4 Definitions of applicable terms are found in Section C of the basic contract.

3.0 BACKGROUND

The Infantry Replacement Training Center in Spartanburg, South Carolina, was activated on January 10, 1941. The military reservation encompassed approximately 19,000 acres, which was subsequently declared excess to the War Assets Administration in 1947. Over the next three (3) years, the land was disposed of piecemeal by sale or quitclaim to organizations, business interests, and former owners. Approximately 7,000 acres of the former Camp Croft comprise Croft State Park. The remaining acreage is a mix of residential, farming, and business development.

3.1 Background and historical information may be found on the Internet at ***http://www.campcroft.com***. Environmental Science & Engineering, Inc. (ESE) completed two (2) Engineering Evaluation/Cost Analysis (EE/CA) reports (Phase I and Phase II) for various portions of Former Camp Croft. OOU 3 (Wedgewood subdivision) was previously investigated as part of the Phase I EE/CA and expanded to include additional areas during the Phase II EE/CA after discovery of Mark II hand grenades during a March 1997 removal action. Copies of the Phase I and Phase II EE/CA reports are available for review at the Huntsville Center and/or the designated repository located with the Spartanburg County Public Library.

3.2 UXB International has previously cleared ordnance from portions of OOU 3 under contract DACA87-97-D-0006, Task Order 0015. The Revised Final Explosives Safety Submission (ESS) dated January 4, 2000, indicates the Most Probable Munition (MPM) is the Mark II fragmentation grenade. The previous work areas and specific work completed by UXB are identified in the Final Removal Report dated April 2001. Copies of the Revised Final ESS and Final Removal Report, including all geophysical data collected during the investigation, are available for review at the Huntsville Center; however, the Contractor may not use any of the geophysical data collected for OOU 11C and OOU 11D because of the suspect quality of the data. The Contractor must use the UXB civil survey data to relocate the previously identified pits within Grids 17 and 40 of OOU 3; however, the Government does not guarantee the accuracy or completeness of the UXB data.

4.0 SPECIFIC REQUIREMENTS

This SOW is intended to complete previous clearance efforts within Grids 17 and 40 of OOU 3 performed by UXB beginning in 1999. The Contractor's proposal shall include all costs required to complete this RA. The initial investigation area is located within a residential housing area and borders a commercial golf course. The Contractor is expected to complete fieldwork related activities within the winter months to minimize brush clearing and loss of revenue to the golf course. Coordination of RA activities and evacuations with homeowner's and the golf course management is the Contractor's responsibility. The costs shall include, but not be limited to, items such as coordination of evacuations, development or use of engineering controls, location, excavation, and demolition of ordnance and related items, restoration of landscaping, etc. Please note, the cost for evacuations, compensation, and temporary housing for displaced residents will be the responsibility of the Government.

The Contractor shall perform activities required to remove all explosive hazards at selected areas of the site in accordance with Clearance to Depth and Clearance for Use criteria mandated by the signed Action Memorandums from the Engineering Evaluation/Cost Analysis (EE/CA) investigations. Please note, a clearance depth greater than four (4) feet may be necessary within the pits, which were previously identified within Grids 17 and 40 of OOU–3; therefore, appropriate safety measures shall be developed to comply with Occupational Safety and Health Administration (OSHA), USACE EM 385-1-1, and any other pertinent regulations for excavation activities greater than four (4) feet.

4.1 <u>(TASK 1) POST AWARD SITE VISIT</u>

This is a **FIRM FIXED PRICE** task order. A post award site visit will be conducted and is limited to three (3) days. The CEHNC Project Manager shall be notified of the proposed date fourteen (14) days in advance. An Abbreviated Site Safety and Health Plan (ASSHP) shall be submitted for review and approval prior to the site visit. A follow-up Contractor Site Visit Report is required to be submitted within five (5) days after the site visit.

4.2 (TASK 2) TECHNICAL PROJECT PLANNING (TPP) – NOT APPLICABLE

This task is not applicable for this Task Order; however, the Contractor will continue to work with local and state governments, regulatory officials, and all stakeholders to ensure everyone is informed and concurs with what is being done at the site. Costs for this work shall be incorporated into Task 12, Project Management.

4.3 (TASK 3) GEOPHYSICAL PROVE-OUT (GPO) – OPTIONAL

This is a **FIRM FIXED PRICE** task order. The Contractor shall perform a Geophysical Prove-Out (GPO) in accordance with **Appendix A** of this SOW. The Contractor shall submit "Draft" and "Final" versions of the GPO Plan in accordance with **Section 5.0 of this SOW**. The Contractor shall not begin field operations on the GPO plot until the Government has approved the GPO Plan. The Contractor shall coordinate with CEHNC to obtain inert ordnance items to seed the GPO test plot. If inert ordnance items are not available the Contractor shall provide approved surrogates. CEHNC reserves the right to place additional blind seed items within the test plot and should be kept informed of scheduled events. The Contractor shall coordinate the GPO schedule with CEHNC to allow CEHNC time to plant blind seed items. The Contractor shall submit "Draft" and "Final" versions of a follow up Geophysical Prove-Out (GPO) Letter Report for Government review and approval, which conforms to the requirements specified in **Appendix A**. The Contractor must allow at least thirty (30) days for Government review and approval of the GPO Letter Report and may not proceed with geophysical mapping until authorized to do so by the Government.

4.4 (TASK 4) REMOVAL ACTION WORK PLAN

This is a **FIRM FIXED PRICE** task order. The Contractor shall prepare a Removal Action Work Plan (WP) in accordance with Data Item Description (DID) OE-005-01, Type II Work Plan, which is applicable for all Areas of the site. The WP shall describe the specific work proposed in order to meet the objectives and requirements of this SOW. The WP shall propose **mapping using digital geophysical methods** for the optional areas identified above within

OOU 3, OOU 11C, and OOU 11D. The WP shall also describe (in specific terms) the policies, organization, objectives, functional activities, Site Specific Health and Safety Plan, Data Quality Objectives (DQO's), Geophysical Prove-Out (GPO) Plan, Geophysical Mapping and Reacquisition Plan, OE Investigation, Data Management and specific Contractor QC activities required to achieve the objectives for this project. A "*mission plan map*" that identifies the expected survey areas shall be included within the WP. Daily field progress will be plotted on this digital map during actual mapping operations to ensure compliance with the original WP and easily identify project progress and any major discrepancies between initial plan and the execution of the fieldwork.

The Contractor shall propose and justify methods and procedures that are well suited to the anticipated site conditions including the steep terrain within a small portion of OOU 11C. The Contractor shall consider technical requirements for site characterizations as well as safety, security, environmental regulations, engineering controls, evacuations, and road closures applicable to this site. The Contractor shall submit "Draft", "Draft Final", and "Final" versions of the WP in accordance with **Section 5.0 of this SOW**. The WP shall describe the specific work proposed in order to meet the objectives and requirements of this SOW. The previous WP prepared by UXB, dated August 1999, is available for review at the Huntsville Center. The WP shall include an Environmental Sampling and Analysis Plan, prepared in accordance with the requirements described in **Appendix B** and DID OE-005-10, and an Investigative Derived Waste Plan prepared in accordance with DID OE-005-13.

4.5 (TASK 5) BRUSH CLEARING

This is a **FIRM FIXED PRICE** task order. The Contractor shall provide in the proposal a **total price** for brush clearing and surface metal removal **within the currently selected Area** (using the acreage estimates provided) and a **price per acre** for additional surface metal removal and brush clearing activities (if necessary). The actual areas to undergo brush clearing should be validated by the Contractor during land surveying activities, but shall be estimated in the proposal using the acreage estimates provided above. **Please note, acreage estimates were not provided for the Areas included within the initial task order because these grids involve only clearance of the previously identified pits within grids 17 and 40, which should require**

only minimal brush clearing activities. The Contractor shall perform the minimum amount of brush clearing as necessary to perform project activities, but shall not remove any trees with a diameter greater than three (3) inches, without prior written approval from the Government.

4.6 (TASK 6) LOCATION SURVEYS AND MAPPING

This is a **FIRM FIXED PRICE** task order. The Contractor shall provide in the proposal a **total price** for land surveying activities **within the currently selected Area** (using the acreage estimates provided) and a **price per acre** for additional land surveying activities (if necessary). Previous survey coordinate information for the pits within Grids 17 and 40 of OOU 3 can be found in the UXB Final Removal Report. **Please note, acreage estimates were not provided for the Areas included within the initial task order because these grids involve only clearance of the previously identified pits within grids 17 and 40, which should require only minimal land surveying activities. The Contractor shall validate acreage totals for brush clearing, land surveying, digital geophysical mapping, and intrusive activities during this task.**

The Contractor shall perform location surveys as described in the approved WP and in accordance with CEHNC guidance contained in EM 1110-1-4009 and DID OE-005-07. All data submitted shall be in the Universal Transverse Mercator (UTM) coordinate system, which is a base 1,000 or 10,000-meter grid system. A South Carolina licensed Professional Land Surveyor will certify all surveying requirements, which include all control points, grid corners, and boundaries as required by the project. The easting and northing (x, y) for all control points, grid corners, and any boundaries or closures shall be presented in a certified letter or drawing, along with an electronic submittal of the same to CEHNC upon completion of field work. A minimum of 2 (two) control monuments shall be established or identified for this site. Survey data may be submitted by CD or electronically via email. A tabulated list shall be developed, which identifies or numbers each grid and gives the UTM coordinates of grid corners. The list shall also include all network reference points used in performing all surveys. The Contractor shall furnish control cards for all benchmarks used during and established for the project. All grid corners shall be marked with a wooden stake and flagging. Survey locations shall be listed in UTM coordinates and the data submitted in a Microsoft Excel 2000 Spreadsheet or other digital format approved by the Contracting Officer (CO). All survey data shall be included in the Final Report.

4.7 (TASK 7) GEOPHYSICAL INVESTIGATION AND EVALUATION - OPTIONAL

This is a **FIRM FIXED PRICE** task order. The Contractor shall provide in the proposal a **total price** for digital geophysical mapping activities **within the currently selected Area** (using the acreage estimates provided) and a **price per acre** for additional digital geophysical mapping activities (if necessary).

4.7.1 Investigation and Evaluation

The geophysical mapping shall be conducted in accordance with the WP and the requirements specified in **Appendix C**. The Contractor shall propose and discuss the methodology by which geophysical mapping shall occur. The Contractor shall produce geophysical maps of the site that show major geophysical features for any areas not previously mapped by digital geophysical methods. A map layer that includes physical (cultural) features overlaid onto the geophysical data results shall also be included. Items to be annotated on this map include, but are not limited to, all visible pipes and power lines, manhole covers, buildings, inaccessible areas such as fence lines, areas of bare rock, etc. All geophysical data, both raw and processed, shall be sent via overnight mail to CEHNC, on a CD ROM, within five (5) days of data collection. When a USACE geophysicist is on-site, the geophysical data shall be available to the geophysicist on a daily basis. Raw and final processed geophysical data shall be in column delineated ASCII files in the format X, Y, V1, V2… where X=Easting Coordinate, Y=Northing Coordinate, V1= top sensor reading, V2 = next lower (spatially) co-located sensor reading, etc. The data shall be provided in South Carolina State Plane Coordinates.

4.8 (TASK 8) ESTABLISHMENT AND MANAGEMENT OF GIS

This task is not applicable for this Task Order.

4.9 (TASK 9) EXPLOSIVE SAFETY SUBMISSION (ESS)

This is a **FIRM FIXED PRICE** task order. A Revised Final ESS, dated January 4, 2000, was approved for OOU 3 and included portions of OOU 11C and OOU 11D. An amendment to this document is required to support changes needed for additional work activities such as pit excavation, explosives storage and/or magazine location, etc. Use of the Revised Final ESS prepared by UXB is encouraged and is available for review at the Huntsville Center. Please note, Department of Defense Explosive Safety Board (DDESB) approval can take at least 120 days after CEHNC approval. The amended ESS shall be bound as a separate document and shall be submitted and approved prior to intrusive work.

4.10 (TASK 10) INTRUSIVE INVESTIGATIONS

(TASK 10A) INTRUSIVE INVESTIGATIONS - GRIDS 17, 40, and 35P4 of OOU 3

Considering the unknown nature of these grids, the items of concern, the depths required for excavation, and the activities required, this task will be a **TIME and MATERIALS** task order. Three (3) small pits in Grid 17 and one (1) small pit in Grid 40 remain to be cleared. Assume in the clearance effort for the pits one (1) week per pit for UXO operations. The Contractor is to provide in the proposal a summary of the work to be performed based upon institutional knowledge of the site, conditions to be encountered, and previous findings documented in the UXB Final Removal Report.

(TASK 10B) INTRUSIVE INVESTIGATIONS - OPTIONAL AREAS

This is a **FIRM FIXED PRICE** task order based on digging **379 anomalies** per acre **within the currently selected Area** (using the acreage estimates provided). The Contractor shall provide in the proposal **a total price and a unit price per acre** for the intrusive investigation and a **unit price for digging anomalies** for modification of the contract if acreage is added/removed or the total anomaly count is less than or exceeds the estimated average of 379 per acre (+/- 10% based upon 11,362 excavations in 30 acres previously investigated by UXB within OOU 3). Assume approximately two (2) percent of investigated anomalies will require destruction through the use of explosives.

4.10.1 Anomaly Reacquisition and Investigation

For areas where digital geophysical mapping is used, the Contractor shall reacquire all selected geophysical target anomalies on the dig sheets and utilize a precision surveying method to identify the location. The dig sheet shall include the location of the anomaly according to the survey standard established. The Contractor shall flag the actual field location of each identified anomaly shown on the dig sheet and mark the location with a non-metallic pin flag or by some other method approved by CEHNC. The Contractor shall ensure that the reacquired location and the geophysical data location for each anomaly are within the range of accuracy required by **Appendix C**.

The Contractor shall access anomalies selected for digging during the investigation. Using qualified UXO personnel, scheduled evacuations, and engineering controls, the Contractor shall investigate the specified anomalies according to the procedures identified in **Appendix C** and the approved WP. A Disposal Feasibility Letter Report should be submitted in accordance with Section C, Paragraph 4.3 of the basic contract and DID OE-040 if on-site disposal is not feasible.

4.10.2 OE Inspection and Procedures

The Contractor shall account for and process all OE and Range Residue for final disposition in accordance with **Appendix D** of this SOW.

4.10.3 Backfilling Excavations

All access/excavation/detonation holes shall be backfilled by the Contractor to their prior condition.

4.10.4 Quality Control

The Contractor shall develop a QC Program that shall ensure a quality product for all aspects of the project, which includes any work performed by a subcontractor on the project. The Contractors' QC procedures for all phases and types of work should be included in the WP. The Contractor shall ensure that documentation is maintained and provided in the final report that supports the QC process.

4.10.4.1 UXO Quality Control (QC) Specialist

The individual performing the UXO QC shall not be involved in the performance of other OE field tasks. Dual hat positions are not allowed for this site without prior written approval of the

Contracting Officer. The UXO QC Specialist shall meet the requirements as shown DID OE-025.

4.10.5 Quality Control/Quality Assurance

For QC/QA purposes, the Contractor shall find and remove ferrous items, which are equivalent (+/- ½ inch) in diameter to a Mark II hand grenade IAW Appendix C. With respect to the pits within Grid 17 of OOU-3, the Contractor shall find all ferrous items, which are equivalent (+/- ½ inch) in diameter to an M15 WP IAW Appendix C.

In addition to the QC process performed by the Contractor, the Government will conduct QA inspections on all phases and types of work performed. The Contractor shall provide one UXO Tech II to assist the Government Safety person in performing QA. The UXO Tech II will be used at the technical direction of the Government Safety person to measure coordinates in grids per dig lists provided by the Government Safety person, to do intrusive digging as technically directed by the Government Safety person, and/or to perform other types of assistance needed during the Government Safety person's QA check of Contractor grids. The Contractor shall assume this support will be based on 10% of the total acreage of the removal and that the time required per 100 foot by 100 foot grid will be one (1) hour. The inspections will be accomplished only after the Government has been notified in writing that the Contractor's QC activities have been completed. The Government reserves the right to perform QA inspections at any time during the project.

Quality failure is defined as the discovery, during QA inspections, of a ferrous item, which is (+/- ½ inch) of the diameter of the OE item(s) for the specific areas above at a depth less than given by Appendix C. Quality failure can also be defined in workmanship as not complying with the approved work plan or other accepted industry practices or define in safety as not complying with basic safety concepts and other industry safety practices. The ferrous item does not have to be OE related to result in grid failure. Failed grids shall be completely re-cleared IAW the approved work plan at no cost to the Government. The Government Safety person will perform QA again on the grid. This failure and re-sweep will be repeated until the grid passes Government QA inspection, again at the Contractors' expense. The Contractor shall provide full documentation detailing what failed the QA process, why it failed, and how the problem was corrected at no cost to the Government.

4.11 <u>(TASK 11) FINAL REMOVAL REPORT</u>

This is a **FIRM FIXED PRICE** task order. The Contractor shall prepare a site-specific Final Removal Report **for the currently selected Area** in accordance with DID OE-030. The Contractor shall submit “Draft”, “Draft Final”, and “Final” versions of the Final Removal Report in accordance with **Section 5.0 of this SOW**.

4.12 <u>(TASK 12) PROJECT MANAGEMENT</u>

This is a **FIRM FIXED PRICE** task order. The Contractor shall perform project management activities necessary to maintain project control, to include but not be limited to the following:

4.12.1 <u>Schedule</u> The Contractor shall develop and submit for approval, a comprehensive project schedule. The Contractor shall use the schedule to coordinate evacuations and other interruptions pertaining to the use of private property. The schedule shall be updated weekly in accordance with DID OE-085 Weekly Status Report with changes sent directly to the PM by e-mail in Microsoft Project. The Contractor is responsible for coordination and scheduling of all RA activities with homeowner’s and representatives of the golf course to avoid conflicts with scheduled activities.

4.12.2 <u>Work Task Proposal</u>

This task is not applicable for this Task Order.

4.12.3 <u>Public Meetings</u>

The Contractor shall be prepared to attend and participate in public meetings. The Contractor shall be prepared to make presentations and answer questions concerning project activities at the Former Camp Croft. The Contractor shall anticipate one (1) public meeting in the Spartanburg, South Carolina area.

4.12.4 <u>Reports/Minutes, Record of Meetings</u>

The Contractor shall prepare and submit a report/minutes of all meetings attended in accordance with DID OE-045.

4.12.5 Telephone Conversations/Correspondence Records

The Contractor shall keep a record of each telephone conversation and written correspondence concerning this Task Order in accordance with DID OE-055. A copy of this record shall be attached to the Weekly Status Report.

4.12.6 Monthly Status Report

The Contractor shall prepare and submit a monthly status report in accordance with DID OE-080 and include any other items required in the SOW.

4.12.7 Weekly Status Reports

The Contractor shall prepare and submit a weekly status report in accordance with DID OE-085 and include any other items required in the SOW.

4.13 (TASK 13) ENVIRONMENTAL SAMPLING AND CHEMICAL ANALYSIS

This is a **TIME and MATERIALS** task order. Environmental sampling shall be conducted on a limited basis to support the M15 WP grenade removal within the pits previously identified in Grid 17 of OOU 3. The Contractor shall implement the approved Environmental Sampling and Analysis Plan as necessary. For planning purposes, a maximum of ten (10) environmental samples shall be taken, which includes field quality control and background samples. Sampling shall be conducted in the pit where previous WP rounds were found and after removal of any additional WP rounds within the same pit or any other pit(s). General guidance for sampling shall be to sample for WP within the excavated area after removing all smoking soil. Analysis shall include WP by SW7580.

4.14 (TASK 14) INVESTIGATIVE DERIVED WASTE AND SOIL DISPOSAL

This is a **TIME and MATERIALS** task order. Investigative derived waste and soil disposal may be conducted on a limited basis to support the M15 WP grenade removal within the pit(s) previously identified in Grid 17 of OOU 3. The Contractor shall implement the approved investigative and derived waste plan as necessary.

4.15 (OPTIONAL TASK 15) INTRUSIVE INVESTIGATION WITHIN OOU 11C

The Contractor shall perform digital geophysical mapping followed by intrusive investigation and clearance of approximately 9.48 acres within OOU 11C in accordance with all applicable tasks outlined in this SOW. The proposal shall be **Firm Fixed Price** and submitted with the associated total and unit prices for each applicable task of the SOW. The original work plan will be utilized for this optional task. Refer to **Figure 2** for a map indicating the location of OOU 11C and previous grid coordinates used by UXB.

4.16 (OPTIONAL TASK 16) INTRUSIVE INVESTIGATION WITHIN OOU 11D

The Contractor shall perform digital geophysical mapping followed by intrusive investigation and clearance of approximately 11.2 acres within OOU 11D in accordance with all applicable tasks outlined in this SOW. The proposal shall be **Firm Fixed Price** and submitted with the associated total and unit prices for each applicable task of the SOW. The original work plan will be utilized for this optional task. Refer to **Figure 3** for a map indicating the location of OOU 11 D and previous grid coordinates used by UXB.

4.17 (OPTIONAL TASK 17) DIGITAL GEOPHYSICAL MAPPING AND INTRUSIVE INVESTIGATION WITHIN OOU 3

The Contractor shall perform digital geophysical mapping followed by intrusive investigation and clearance of approximately twenty-four (24) acres within OOU 3 (fringe area between Wedgewood Subdivision and Creek Golf Club identified on **Figure 1** as Grids 23P, 24P, 25P, 26P, 42P, 27P, 28P, 29-1P, 29P, 30P, 31P, 32P, 33P, 35P3, 35P2, 35P1, GC-2, 40P, 37P, 41P, and GC-1) in accordance with all applicable tasks outlined in this SOW. The proposal shall be **Firm Fixed Price** and submitted with the associated total and unit prices for each applicable task of the SOW. The original work plan will be utilized for this optional task.

5.0 SUBMITTALS AND CORRESPONDENCE

5.1 Format of Engineering Reports

Any and all reports and/or plans not covered by a specific DID shall be prepared according to the following guidelines. The front cover of the report or plan shall be prepared in accordance with Attachment 1 of DID OE-030 and shall bear the following statement in addition to other requirements. "*The views, opinions, and/or findings contained in the report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentations*". The cover shall also denote the version of the report/plan presented (e.g. Draft, Draft Final, or Final). When drawings are required, data may be combined to reduce the number of drawings. All drawings shall be of engineering quality in drafted form with sufficient detail to show interrelations of major features. The contents and format of the engineering reports shall be arranged in accordance with all pertinent guidance documents. The report/plan shall be typed on standard size of 8-1/2 inch by 11-inch white paper, with drawings other than the construction drawings folded, if necessary, to this size. Chapters shall be numbered sequentially. Within each chapter, the paragraphs shall be numbered sequentially starting with the chapter number. Within each chapter, any figures, tables, and charts shall be numbered sequentially starting with the chapter number. Appendices shall be lettered alphabetically and shall be identified and referenced in the text of the report/plan. Within each appendix, each page shall be numbered sequentially starting with the appendix letter. Every page of the report/plan shall contain a date footer, contract number, task order number, and version (e.g. draft, final, original, change 1, etc) of the report. The report/plan shall be legible and suitable for reproduction. The final version of the report/plan shall also be submitted on CD-ROM in accordance with the other paragraphs of Section 5.0. All data, including raw analytical and electronic data, generated under this task order are the property of the Department of Defense (DOD) and the government has unlimited rights regarding its use.

5.2 Computer Files

All final text files generated by the Contractor under this contract shall be furnished to the Contracting Officer in Microsoft Word 6.0 or higher software, IBM PC compatible format. Spreadsheets shall be in Microsoft EXCEL. All final CADD drawings shall be in Microstation 95 or higher. All GIS data shall be in ESRI (Arcview/Arcinfo) format.

5.3 HTML Deliverables

In addition to the paper and digital copies of submittals, the final version of any and all reports and/or plans shall be submitted, uncompressed, on CD ROM in hypertext markup language (HTML) along with a linked table of contents, linked tables, linked photographs, linked graphs and linked figures, all of which shall be suitable for viewing on the Internet.

5.4 Review Comments

Various reviewers will have the opportunity to review submittals made by the Contractor under this contract. The Contractor shall review all comments received through the CEHNC Project Manager and evaluate their appropriateness based upon their merit and the requirements of the SOW. The Contractor shall issue to the Project Manager (PM) a formal, annotated response to each in accordance with the established schedule in this SOW. The Contractor shall not non-concur with a comment without discussing the comment with the CEHNC PM. If the PM is not available then the Contractor shall contact the Technical Manager.

5.5 Identification of Responsible Personnel

Each report shall identify the specific members and title of the Contractor's staff and subcontractors that had significant and specific input into the preparation or review of the report.

5.6 Public Affairs

The Contractor shall not publicly disclose any data generated or reviewed under this contract. The Contractor shall refer all requests for information concerning site conditions to the local Corps of Engineers Public Affairs Office (Charleston District) with a copy furnished to the CEHNC PM. Reports and data generated under this contract are the property of the DOD and distribution to any other source by the Contractor, unless authorized by the Contracting Officer, is prohibited.

5.7 Submittals

The contractor shall furnish copies of the plans, maps, and reports as identified in Section 5.8, or as specified in this SOW, to each addressee listed below in the quantities indicated. The Contractor shall submit a CD, with each copy, of the Final version of all submittals (WP, Reports, Plans, etc) in accordance with Section 5.2. The Contractor shall submit 1 copy on CD of the Final Versions of all submittals (WP, Reports, Plans, etc) in accordance with Section 5.3. For purposes of the SOW all days are considered calendar days. In addition to the CDs required above, the column below shows recipients in which the Draft and Draft Final versions must be submitted to also. This shall also be in accordance with Section 5.2.

ADDRESSEE	COPIES	CD
Commander US Army Engineering and Support Center, Huntsville Attn: Mr. Bill Stephenson 4820 University Square Huntsville, AL 35816-1822	4	1
Commander US Army Corps of Engineers Charleston District Attn: Mr. Ronald Nesbit 69A Hagood Avenue Charleston, SC 29403-5107	4	1
Commander US Army Corps of Engineers, South Atlantic Attn: CESAD-PM-H (Ms. Sharon Taylor) 77 Forsyth Street Atlanta, GA 30336-6801	1 Final Hardcopy Transmittal	
Commander Headquarters, US Army Corps of Engineers Attn: CEMP-RF (Mr. Dale Moeller) 20 Massachusetts Avenue, NW Washington, DC 20314-1000	1 Final Hardcopy Transmittal	
Spartanburg County Public Library Reference Department 151 South Church Street Spartanburg, SC 29302	1 Final Hardcopy with CD	

5.8 <u>Submittals and Due Dates</u>

SUBMITTAL	DUE DATES
Site Visit Report	5 days after site visit

Draft ESS	TBD
Draft Final ESS	15 days after receipt of comments
Final ESS	15 days after receipt of comments
Draft Work Plan	TBD
Draft Final Work Plan	15 days after receipt of comments
Draft Final Work Plan	15 days after receipt of comments
Final Work Plan	15 days after receipt of comments
Draft GPO Plan	TBD
Final GPO Plan	15 days after receipt of comments
Draft GPO Report	15 days after completion of fieldwork
Final GPO Report	15 days after receipt of comments
Geophysical Dig Sheets & CD's of Raw and Processed Data	Within 5 days of data collection
Draft Removal Report	45 days after completion of fieldwork
Draft Final Removal Report	15 days after receipt of comments
Final Removal Report	15 days after receipt of comments
Final Electronic Copies	Provided with Final Removal Report with updated copy (if necessary) after Final Report approval

6.0 REFERENCES:

6.1 Refer to 'Basic Contract'.

6.2 29CFR 1910, Occupational Safety and Health Administration (OSHA) General Industry Standards

6.3 29CFR 1926, Construction Industry Standards

6.4 29CFR 1910.120/29CFR 1926.65 - Hazardous Waste Site Operations and Emergency Response

6.5 40CFR 300, National Contingency Plan

6.6 NIOSH/OSHA/USCG/EPA (DHHS(NIOSH) Publication #85-115) (OCT 85), Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities

6.7 Federal Acquisition Regulation (FAR) Clause 52.236.13, Accident Prevention

6.8 EM 385-1-1 (3 SEP 96), US Army Corps of Engineers Safety and Health Requirements Manual

6.9 EM 1110-1-4009 (23 June 2000) Engineering and Design – Ordnance and Explosives Response

6.10 EP 1110-1-18 (24 June 2000) Engineering and Design – Ordnance and Explosives Response

6.11 EP 385-1-95a 29 June 2001 Basic Safety Concepts and Considerations for Ordnance and Explosives Operations

6.12 EM 200-1-3, *Requirements for the Preparation of Sampling and Analysis Plans*, 01 February 2001

6.13 *Test Methods for Evaluating Solid Wastes*, U.S. Environmental Protection Agency (USEPA) Pub. No. SW- 846, Latest promulgated Ed.

6.14 Code of Federal Regulations. [n.d.] *Hazardous Waste Operations and Emergency Response*. 29 CFR 1910.120, Final Rule.

6.15 ER 1110-1-263, *U.S. Army Corps of Engineers Chemical Data Quality Management for Hazardous, Toxic, Radioactive Waste Remedial Activities*, 30 April 1998.

6.16 EM 200-1-3, *Requirements for the Preparation of Sampling and Analysis Plans,* 01 Feb 01.

6.17 *Engineering Evaluation Cost Analysis Former Camp Croft Army Training Facility (Phase 1)*, January 1996.

6.18 *Engineering Evaluation Cost Analysis Former Camp Croft Army Training Facility (Phase II)*, January 1998.

6.19 *Revised Final Conventional Explosives Safety Submission for Ordnance Removal Action*, December 1999.

6.20 *Final Engineering Evaluation Cost Analysis Action Memorandum (Phase 1)*, February 1996

6.21 *Final Engineering Evaluation Cost Analysis Action Memorandum (Phase 1I)*, April 1998.

6.22 *Final Work Plan for Ordnance Removal Action, Former Camp Croft, OOU-3, Wedgewood Subdivision*, August 1999.

6.23 *Final Removal Report Ordnance Removal Action, Former Camp Croft, OOU-3 A, B, and C; OOU-6; and OOU-11 C and D*, April 2001.

6.24 Data Item Descriptions

The following Data Item Descriptions are part of this contract and are available at the following:

http://www.hnd.usace.army.mil/oew/dids.asp

Data Item Descriptions

Number	Title
DID OE-005-01	Type II Work Plan
DID OE-005-02	Technical Management Plan
DID OE-005-03	Explosives Management Plan
DID OE-005-04	Explosives Siting Plan
DID OE-005-06	Site Safety and Health Plan
DID OE-005-07	Location Surveys and Mapping Plan
DID OE-005-08	Work, Data, and Cost Management Plan
DID OE-005-09	Property Management Plan
DID OE-005-10	Sampling and Analysis Plan
DID OE-005-11	Quality Control Plan
DID OE-005-12	Environmental Protection Plan
DID OE-005-13	Investigative Derived Waste Plan
DID OE-005-14	Geographical Information System Plan
DID OE-010	Engineering Evaluation/Cost Analysis (EE/CA) Report
DID OE-015	Accident/Incident Reports
DID OE-025	Personnel/Work Standards
DID OE-030	Site Specific Final Report
DID OE-040	Disposal Feasibility Report
DID OE-045	Report/Minutes, Record of Meetings
DID OE-055	Telephone Conversations/Correspondence Records

DID OE-080	Monthly Status Report
DID OE-085	Weekly Status Report
DID OE-090	Ordnance Filler Report
DID OE-100	Analysis of Institutional Controls

APPENDIX A

Geophysical Prove-Out (GPO) Plan and Report

Use/Relationship: The Geophysical Proveout (GPO) Plan will be used to provide details of the approach, methods, and operational procedures to be (1) employed to perform GPOs at OE sites and (2) documented as part of the Geophysical Investigation Plan. This Data Item Description contains instructions for preparing Geophysical Prove-Out Plans and Reports.

Requirements:

1. Purpose. The Contractor shall 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 data quality objectives for project performance goals.

2. GPO Work Plan. The elements described in the following sub-sections shall be addressed in the GPO Work Plan.

a. Test Plot Design. The proposed test plot layout shall be included in the GPO work plan.

(1) Prove-Out Grid Size and Location. Selection of the prove-out area should be based upon the technical and site-specific considerations developed and finalized during the TPP process and/or project team meetings, and follow anticipated layout for project data collection. It may be necessary to prepare more than one prove-out grid, mini-grid, or test strip if site conditions vary significantly. It may be advantageous to plan the prove-out location outside of areas where digging is restricted to UXO technicians and/or oversight by UXO technicians.

(2) Seed Items. A tabulated list, available in digital format, containing the seed items, ID numbers, proposed X, Y, Z locations, proposed inclination and declination (or survey information on the nose, tail, and center point of the item) shall be included. Inert UXO should be used whenever possible.

b. Site Preparation. Once a suitable site has been selected for the prove-out, some preparation may be necessary to allow accessibility with geophysical instruments. This may include vegetation removal and/or surface clearance. After this step, the test plot should duplicate, as closely as possible, the conditions under which the geophysical surveys will be conducted.

c. Location Surveying. The location of the test plot corners and seed items shall be surveyed by a professional land surveyor (PLS) to a horizontal accuracy of 2 cm and a vertical accuracy of 5cm. The center and both ends of seed items shall be surveyed. In addition, surface elevation shall be measured after seed item burial, to accurately determine depth below ground surface.

d. Pre-Seeding (Background) Geophysical Mapping. After a site has been selected and the surface prepared, pre-seeding geophysical surveys shall be performed with each detector type in order to determine and document base-line geophysical conditions at the site.

e. Anomaly Avoidance. The contractor shall use anomaly avoidance techniques to ensure the location of each excavation and corner marker/stake is clear of metallic anomalies before placing seed items or site corner markers. This includes utilizing the background geophysical data.

f. Seeding. In addition to the known seed items, blind seed items may be buried by the government, and/or the contractor's UXO QC Specialist, for quality control. The contractor shall allot ample time for burial of blind seed items and ensure that adequate excavating equipment is available to attain the seed item burial depths planned. Once placed, all seeded items and corner markers should be surveyed and photographed. The planned GPO target layout plan shall be updated to reflect the "as built" configuration. The seeded items should be painted blue and tagged with a non-biodegradable label identifying the items as inert and providing a contract reference, a point of contact address, phone number, and a target identifier.

g. Data Collection Variables. It is important to collect and analyze test plot data using the same equipment and procedures that are planned for field use. It is strongly recommended that key personnel from the GPO perform the production survey to minimize the learning curve and provide project continuity. Some data collection elements are subject to modification and evaluation and multiple geophysical surveys using each proposed geophysical instrument may be performed. These elements include: instrument height, instrument orientation and direction of travel, instrument channel selections, measurement interval along survey line, lane width, etc.

h. Data Analysis and Interpretation. All data collected at the prove-out grid from each geophysical instrument will be post-processed and analyzed. It is required that all data channels are analyzed to ensure the best methodology is established for each site. A dig-sheet, provided as **Attachment C of Appendix C**, of selected target anomalies shall be prepared and provided to the project team for comparison with seeded item locations.

i. Reacquisition. The contractor shall perform anomaly reacquisition and verification, and record these measurements on the dig-sheet. This should be done to the same extent and with the same equipment as planned for the production geophysical investigation. If the GPO location is situated in an area where digging of unknown targets is permitted (e.g. beyond project site boundaries), it may be advantageous, based upon the professional judgment of the project geophysicist, in concurrence with CEHNC, to excavate a limited number of unknown anomalies that are identified during the pre-seeding background surveys. It is anticipated that such information would be used to aid in characterizing false positive responses in the project area.

j. Data Evaluation.

(1) The geophysical data must be evaluated and scored so that the different geophysical approaches can be compared and ranked. Scoring criteria should include, as a minimum, the following: percent of seeded items detected (by class or size, and overall); number of unknown targets; production rate; cost per unit area; equipment durability and safety.

(2) No single geophysical system is likely to achieve maximum scores in all evaluated areas. Therefore, the evaluation team must determine which approach is likely to be most efficient for the site.

3. GPO Letter Report.

a. After the GPO field work has been completed, the contractor shall prepare a GPO Letter Report including the following:

(1) As-built drawing of the GPO plot;
(2) Pictures of the seed items;
(3) Color maps of the geophysical data;
(4) Summary of the GPO results;
(5) Proposed geophysical equipment, techniques, and methodologies; and
(6) Sufficient supporting information to justify the project team's recommendations, including manufacturer specifications for all recommended geophysical equipment, a definition of the expected target anomalies based upon the ASR or EE/CA, and any other pertinent data/information used in decision making.

b. A CD shall be delivered with the letter report containing the following files:

(1) The GPO Letter Report (Microsoft Word format);
(2) All raw and processed geophysical data. All data, except raw instrument data, shall be provided in column delineated ASCII files in the format X, Y, V1, V2,… where X=Easting Coordinate, Y=Northing Coordinate, V1= top sensor reading, V2= next lower (spatially) co-located sensor reading, etc.) All processed data files shall include data headers;

(3) Geophysical maps in their native format (Surfur®, Geosoft Oasis Montaj™, UHUNTER, OEGEO or OEGIS formats) and/or as raster bit-map images such as BMP, JPEG or GIF;
(4) Seed item location spreadsheet (Microsoft Excel format); and
(5) Spreadsheet (Microsoft Excel format) of contractor picks for each sensor type.
(6) Spreadsheet (Microsoft Excel format) of all control points, survey points and benchmarks established or used during the Location Surveying task.

<u>The Contractor may not proceed with production geophysical mapping until the Government approves the GPO results as provided in the GPO Letter Report.</u>

This Letter Report shall be included as an Appendix to future geophysical reports associated with the survey area.

APPENDIX B

<u>CHEMICAL ANALYSIS AND LABORATORY REQUIREMENTS.</u> The Environmental Sampling and Analysis plan shall be prepared in accordance with DID OE-005-10 and EM 200-1-3. The plan shall address each requirement as identified in ER 1110-1-263 and EM 200-1-3 and are available for review at: http://www.usace.army.mil/inet/usace-docs/eng-manuals/em.htm

<u>Laboratory Qualifications</u>. The analytical laboratory utilized by the Contractor must be validated by the Corps of Engineers' Hazardous, Toxic, and Radioactive Center of Expertise (HTRW-CX) and must hold applicable state certifications to perform the analytical methods required by this SOW. The lab shall be an EPA contract lab or be familiar with the Contract Laboratory Program (CLP) requirements and be able to perform CLP work. If an analytical laboratory is unavailable, the Contractor shall submit the collected samples to the following laboratory:

Robert P. (Bobby) Jones
Chemistry Team Leader
Environmental Chemistry Branch, EP-C
Environmental Laboratory, ERDC
3909 Halls Ferry Rd.
Vicksburg, MS 39180-6199
Phone: (601) 634-4098
FAX: (601) 634-2742
email: <u>Robert.P.Jones@erdc.usace</u>.

CEHNC will be responsible for coordination and costs associated with analysis of the Contractor collected/submitted samples.

<u>Coordination with Government Quality Assurance Laboratory.</u> The Contractor must provide coordination and quality assurance samples (collected and transported by the Contractor) to the Government Quality Assurance lab unless the Government lab is performing the analyses. There will be a 10% minimum of additional field sampling. The Government Quality Assurance samples shall be splits of the required field control samples. Each field control sample collected shall be divided equally, one portion sent to the Government Quality Assurance laboratory and the remainder sent to the Contractor's lab. The Government Quality Assurance samples shall include all sample matrices and analytical parameters. The Contractor shall provide the Government Quality Assurance lab a minimum of two weeks notice of sample shipment, unless an alternate notification requirement is proposed and accepted by the Contracting Officer. The Government shall identify the Government Quality Assurance lab. Results of the field control samples and associated laboratory QC shall be provided to the Government Quality Assurance lab.

Data Reporting Requirements. The Contractor shall provide data reporting elements for definitive data per Section I.13.4.2 of EM 200-1-3. The data shall be assembled in a package so that USEPA could validate the data in accordance with USEPA requirements. These data shall be included in the draft and final engineering reports. Data shall also be provided electronically by the Contractor.

Data Validation. The Contractor shall perform data validation on all analytical data collected and produced as a result of field and lab efforts. The validation shall be performed as required in approved Environmental Sampling and Analysis Plan. Persons performing the data validation shall have a minimum of 10 years plus directly relatable laboratory experience coupled with two years data review and two years data validation experience in accordance with current guidelines.

Data Quality. The Contractor shall provide a data quality of a level sufficient for the support project objectives as defined in the Environmental Sampling and Analysis Plan. The Contractor shall provide quality control of the various analytical task performed. The Contractor is responsible for achieving the data quality as defined in the Environmental Sampling and Analysis Plan. Analytical data that does not meet QA requirements shall be rejected by the Government and contract re-performance required at no additional cost to the Government.

APPENDIX C

GEOPHYSICAL INVESTIGATION PLAN

Applicable Forms: Attachment A – Field Data Sheet, Attachment B – Instrument Standardization Quality Control Requirements, Attachment C – Geophysical Dig Sheet and Target History, Attachment D – Geophysical Map Deliverable Format

Use/Relationship: The Geophysical Investigation Plan will be used to provide details of the approach, methods, and operational procedures to be employed to perform geophysical investigations at OE sites and includes instructions for preparing Work Plan chapters and data requirements when addressing geophysical investigations for OE projects. Additional references include EM 1110-1-4009, Ordnance and Explosives Response.

Requirements:

1. Unexploded Ordnance (UXO) Safety. During all initial fieldwork and all intrusive activities, the geophysical crew shall be accompanied by a UXO Technician II (or higher). The UXO Technician II shall conduct visual surveys for surface ordnance prior to the survey crew entering an area potentially containing UXO, and a magnetometer or electromagnetic survey of each intrusive activity site to ensure the site is anomaly free prior to the crew setting monuments or driving stakes. The UXO Technician II will not be required on a full time basis for most of the project, for non-intrusive activities.

2. Personnel Qualifications. All geophysical investigations shall be managed by a qualified geophysicist meeting the qualification requirements listed in DID OE-025.

3. Geophysical Investigation Plan Outline. The Contractor shall prepare a geophysical investigation plan in accordance with the following outline:

3.1 Site Description.

a. Geophysical Data Quality Objectives. Define target objectives and Site Specific Project constraints. Refer to **Appendix A of the SOW for Geophysical Prove-out (GPO)** requirements.

b. Specific Area(s) to be investigated, including a Survey Mission Plan Map.

c. Past, current and future use

d. Anticipated UXO type, composition and quantity

e. Depth anticipated

f. Digital Topographic Maps

g. Vegetation (Digital air photos if available)

h. Geologic conditions (including bedrock type, mineralization and depth)

i. Soil conditions - including soil type/composition, typical moisture content, and thickness. Include Soil Conservation Service (SCS) map if available.

j. Shallow groundwater conditions (including depth, mineralization, existence of perched tables, and seasonal & tidal variations)

k. Geophysical conditions, including background geophysical gradients, regional magnetic field intensity, inclination, declination, local variation.

l. Site Utilities

m. Man-made features potentially affecting geophysical investigations

n. Site-specific dynamic events such as tides, unusually strong winds, or other unusual factors affecting site operations

o. Overall Site Accessibility and Impediments

p. Potential Worker Hazards

3.2 Geophysical Investigation

a. Survey Type – Fixed Pattern, Transect, Meandering Path, Hybrid

b. Equipment
- Survey Platforms
- Detectors
- Navigation and Mapping System
  - Note- If GPS systems are used, correlate satellite availability with work/rest periods
- Data Processing System

c. Procedures. Refer to **Attachment A for Field Data Sheet**

d. Personnel – Identify key personnel and project team members with designated responsibilities and requirements

e. Production Rates

f. Data spatial density (define data in-line spacing and lane width)

3.3 Instrument Standardization. Refer to **Attachment B for requirements and acceptance criteria**.

3.4 Data Processing, Corrections and Analysis. Detail initial field processing, standard data analysis methods, advanced data analysis techniques that may be required by certain project specific conditions, anomaly selection and decision criteria.

a. Initial Field Processing
Data file QC review and correction
- Grid name and location
- Line numbers, survey direction, fiducial locations, start and end points
- Removal of data drop-outs, spikes and physical feature interference sources

b. Standard data analysis
- Diurnal correction (magnetic data)
- Positional offset correction
- Sensor bias, background leveling and/or standardization adjustment
- Sensor drift removal
- Latency Correction
- Heading error removal (magnetic data)
- Geophysical noise identification and removal (spatial, temporal, motional, terrain induced)
- Gridding method and search criteria
- Contour level selection with background shading and analysis

c. Advanced Data Processing, Digital Filtering and Enhancement (if applicable)
- Dipole match, or Analytic Signal calculation (magnetic data)
- adaptive (matched) filtering,
- Approximate magnetic volume/mass estimates (magnetic data)
- Approximate depth determination

- Time decay curve analysis (TDEM data)
- Amplitude and Phase response analysis (FDEM)
- Data Fusion
- Digital filtering and Enhancement (low pass, high pass, band pass, Convolution, Correlation, Non-linear, etc…)

d. Anomaly Selection and Decision Criteria

3.5 Dig Sheet Development. Refer to **Attachment C for form**.

3.6 Anomaly Reacquisition

3.7 Feed-Back Process (Comparison of dig-sheet predictions with ground-truth excavation results)

3.8 Quality Control

3.9 Corrective Measures

3.10 Records Management (Life Cycle Data Management, Resource loaded schedule in Microsoft Project 2000 format, Data transfer, and Data Storage)

3.11 Interim Reporting

3.12 Final Reports and Maps. Refer to Attachment D for format.

4. Geophysical Investigation Performance Goals.

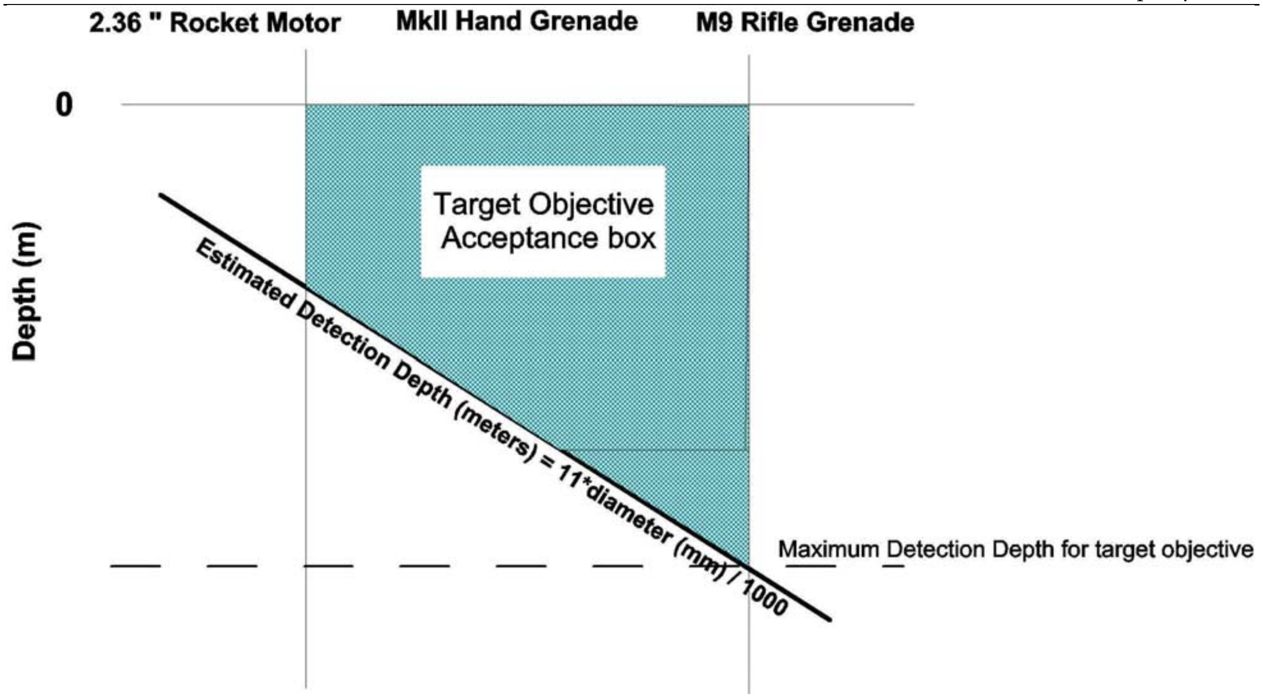
4.1 OE Detection.

a. A simplified expression for maximum depth of detection is calculated as:

Estimated Detection Depth (meters) = 11*diameter (mm) / 1000

b. Minimum OE diameter ("dia") must be determined on a project-specific basis. The contractor shall detect and remove all OE and OE look-alikes located within the target objective performance box (below).

c. Any unexcavated (missed) OE look alike item that has an intermediate principal axis (diameter of ordnance-like item) that fits within the target acceptance box , is considered to be Quality failure. The contractor will , at no expense to the Government, correct the Quality deficiency and resweep and perform QC on all affected area's again before re-submitting back to the Government for verification and acceptance.



d. If the contractor believes the target objective performance goals cannot be achieved at a particular site, then the contractor shall propose and document alternative goals for the Contracting Officer's consideration. The contractor will not be held liable for technically unachievable goals, as determined during the GPO and initial phase of field work.

4.2 Horizontal Accuracy. Horizontally, 95% of all excavated items must lie within a 35 cm. radius of their mapped surface location as marked in the field after reacquisition.

4.3 False Positives. If there are more than 15% "false positives" (anomalies reacquired by the Contractor result in no detectable metallic material recovered during excavations, calculated as a running average for the sector), a re-evaluation of the data, detection methods being utilized, and overall project Quality Control shall be performed at no cost to the Government. A written response explaining the reason for the excessive false positive results and a Corrective Action Plan, if appropriate, shall be submitted to the contracting officer within 10 days of identification of the situation.

5. Test Plot. The Contracting Officer may require that the Contractor demonstrate and document the capabilities of the proposed sensors, navigation equipment, data analysis, data management and associated equipment and personnel to operate as an integrated system capable of meeting project performance goals. When the Contracting Officer requires a site-specific geophysical prove-out, a GPO Work Plan that includes test plot design shall be prepared and implemented in accordance with accordance with **Appendix A of the SOW**. A letter report is required as a deliverable.

6. Geophysical Mapping Data.

6.1 The Contractor shall correlate all sensor data with navigational data based upon a local "third order" (1:5,000) monument or survey marker. If a suitable point is not available, the Contractor shall have a Professional Land Surveyor (PLS) establish a minimum of three (3) new monuments or survey markers with a minimum of "third order" accuracy. All sensor data shall be preprocessed for sensor offsets, diurnal magnetic variations, latency corrections, drift corrections, etc. and correlated with navigation data. Diurnal magnetic variations measured at a base-station must be collected at approximately the same frequency that readings are collected by instruments used by field crews. The approved geophysical mapping technology shall digitally capture the instrument readings into a file coincident with the grid coordinates. All raw and final processed data shall be delivered corrected and processed in ASCII files. Corrections such as for navigation, instrument bias, and diurnal magnetic shift shall be applied. All corrections shall be documented. Grids geophysically mapped shall be exactly coincident with the grid system used by the UXO removal action contractor and shall use exactly the same datum and coordinate system. However, the geophysical contractor may choose to provide geophysical data files in grids of up to 400 ft. x 400 ft. square. The data shall be presented in delineated fields as x, y, z, v1, v2, etc., where x and y are UTM Grid Plane Coordinates in Easting and Northing directions, z (elevation is an optional field in meters), and v1, v2, v3, etc., are the instrument readings. The last data field should be a time stamp. Each data field shall be separated by a comma or tab. No individual file may be more than 100 megabytes in size and no more than 600,000 lines long. Each grid of data shall be logically and sequentially named so that the file name can be easily correlated with the grid name used by other project personnel. The formats specified in this paragraph are REQUIRED to be exactly followed, although the contractor may choose to submit the data in additional formats as well. No later than 36 hours after collection, the Contractor shall furnish each day's data to USAESCH, via internet using FTP, E-mail attachment for small files under 5 Mb, digital compact disk (CD) or other approved method, for inspection. Such data is considered to be in draft form. The data shall be corrected for sensor offsets, diurnal variations, latency, heading error, and drift. The Contractor shall also provide a digital planimetric map, in Intergraph .DGN, Surfer .srf, ESRI ArcView or Geosoft format, and coincident with the location of the geophysical survey, so that each day's geophysical data set can be registered within the original mission plan survey map. Within 14 days of completion of survey activity the Contractor shall provide USAESCH all final geophysical maps, dig-sheets and supporting geophysical interpretations. All geophysical data shall be accompanied by a Microsoft Word 6.0 or higher file documenting the field activities associated with the data, and the processing performed. The Government will periodically perform validation checks to assure positional accuracy, proper instrument calibration or other analysis. Draft Data shall be provided within 24 hours of request to the government representative performing QA activities on the project.

6.2 Geophysical Data Analysis, Field Reacquisition and Reporting. The Contractor shall analyze the geophysical data and provide complete digital "dig-sheets" in Microsoft Excel spreadsheet format utilizing **Attachment C**. Microsoft Access ‘97(or higher) database tables that include pre-built queries for the required information are also acceptable.

6.3 Anomaly Reacquisition and Marking. The same Contractor that geophysically mapped and analyzed the survey area shall reacquire all geophysical anomalies identified for excavation on the dig sheets using the re-acquisition method tested by the Contractor and approved by CEHNC on the GPO. The Contractor shall flag (PVC flag with the unique identifier number recorded in indelible ink on the flag) the actual field location of each re-acquired anomaly shown on the "dig-sheet" and paint the ground (if feasible and allowable) at the flag location with high-visibility paint. Such reacquisition shall be carried out concurrently with other site activities and shall be completed no later than 14 days after geophysical field investigations are completed. If a longer than 14 day hiatus between the geophysical survey work and re-acquisition is expected, this should be so stated in the Resource loaded Project Schedule that is submitted for Government approval. Additionally, the Contractor will re-acquire 200 anomalies (the Government reserves the right to choose which 200 anomalies) to validate that the original geophysical survey location data is acceptable. The Contractor shall record and report on all discrepancies between final reacquired mapped locations of anomalies as shown on the dig-sheet, and actual locations of the excavated anomalies. The Contractor shall also report any anomalies that could not be reacquired.

6.4 Anomaly Excavation Reporting. The Contractor shall, in full accordance with the project work plan, excavate the reacquired anomalies in the field. The disposition and final location details of each anomaly shall be recorded on the final dig sheets, which shall be submitted to USAESCH within 14 days of completed excavations for that individual grid and included with the final report (refer to DID OE-030).

ATTACHMENT A

Field Data Sheet

☐ **QC checked by** ___________**Date:** ________ ☐ **QA checked by** ____________**Date:** ____________

Project Name: ______________________ **Project Location**: ___________________________

Geophysical Contractor: _____________ **Design Center POC:**_________________________

Project Geophysicist: ________________ **Site Geophysicist:** ___________________________

Survey Area ID: _________ **Date:** _________ **Field Team:** _______________________________

Survey Type: ☐Grid ☐Meandering Path ☐Transect ☐Other ______________

Coordinate System: ☐UTM ☐State Plane NAD ___ ☐Local ☐Other___ **Unit of Measure:** ☐ meters☐ feet

Sketch of Survey Area: **Approx. Scale:** _____________ **North Arrow:**

Terrain:

☐Level ☐Moderate Slope ☐Steep

☐Rolling ☐Ruts ☐Gullies

☐Rocky ☐Swampy ☐Dangerous

Tree Cover: **Tree Height:** ______

☐None ☐Light ☐Medium ☐Thick

Brush:

☐None ☐Light ☐Medium ☐Thick

Weather:

☐Sunny ☐Cloudy ☐Drizzle

☐Rain ☐Thunderstorms ☐Hail

☐Fog ☐Humid ☐Snow

Grid Corner Coordinates:

	UTM/State Plane	Local
SW	________, _________	________, _________
NW	________, _________	________, _________
NE	________, _________	________, _________
SE	________, _________	________, _________

	Start	End	File Name
Battery Voltage:	____	____	__________
Static Background Value:	____	____	__________
Static Response Value:	____	____	__________

Instrument Clock Drift: ___________________________

Raw Data File Name: _______________________ **Repeat Data File Name:** ___________________________

Geophysical Instrumentation: ___________________________________**Serial Number:** _________________

Base Station: ____**Serial Number**: _________________

Navigation Method: ____**Serial Number:** _________________

Additional Comments: ____

ATTACHMENT B

Instrument Standardization Quality Control Requirements

for

OE Digital Geophysical Mapping

To facilitate the detection of buried munitions, the U.S. Army Engineering and Support Center, Huntsville (USAESCH) has defined standard equipment tests and data quality requirements for its Ordnance and Explosives – Digital Geophysical Mapping (OE-DGM) contractors. USAESCH has found that it is imperative to perform and review QC tests before carrying out production geophysical work. This ensures that the geophysical system is functioning properly and optimized for the target objectives.

The most common instruments in use today for metallic OE detection are magnetometers, and electromagnetic metal detectors. This document will identify the USAESCH required QC tests and acceptance criteria for these types of instruments.

1.0 QC Steps/Tests
The required equipment tests and frequency of testing are summarized in Table 1.

Table 1: QC Test Frequency

Test #	Test Description	Specific detector	Power on	Beginning of Day	Beginning & End of Day	1st Day of Project for each operator	1 Line per Grid or 100 ft. per Linear Mile
1	Equipment Warm-up		X				
2	Record Sensor Positions			X			
3	Personnel Test			X			
4	Vibration Test (Cable Shake)			X			
5	Static Background and Static Spike				X		
6	Azimuthal Test	Magnetometer Only				X	
7	Height Optimization					X	
8	6 Line Test					X	
9	Octant Test - (Heading Error Test)	Magnetometer Only				X	
10	Repeat Lines						X

1.1 Equipment/Electronics Warm-up
Purpose: Minimize sensor drift to allow instrument electronics time to reach operating temperature. Most instruments need a few minutes to warm up before data collection begins. Follow the manufacturer's instructions or, if none are given, observe the data readings until they stabilize.

Acceptance Criteria: Equipment Specific (typically 5 minutes).

1.2 Record Relative Sensor Positions
Purpose: Document relative navigation and sensor offsets, detector separation, and detector heights above the ground surface. This will ensure that detector offset corrections and gradient calculations can be done correctly and that the surveys are repeatable.

Acceptance Criteria: +/- One inch (2.54 cm)

1.3 Personnel Test

Purpose: Ensure survey personnel have removed all potential interference sources from their "bodies". Common interference sources are ballpoint pens in the operator's pocket and steel-toed boots or large metallic belt buckles, which can produce data anomalies similar to OE targets. All personnel who will be coming within close proximity of the sensor during survey operations must approach the sensor and have a second person monitor and record the results.

Acceptance Criteria: EM61 +/- 2mV, Mag +/- 3nT

1.4 Vibration Test (Cable Shake)

Purpose: Identify and replace shorting cables and broken pin-outs on connectors. With the instrument held in a static position and collecting data, shake all cables to test for shorts and broken pin-outs. An assistant is helpful to observe any changes in instrument response. If shorts are found, the cable should be immediately repaired or replaced. After repair, cables need to be rigorously tested before use.

Acceptance Criteria: Data Profile does not exhibit data spike responses.

1.5 Static Background and Static Standard Response (Spike) Test

Purpose: Quantify instrument background readings, electronic drift, locate potential interference spikes in the time domain, and determine impulse response and repeatability of the instrument to a standard test item. A standard 2" diameter steel trailer ball (Uniball- available from U-haul) is the preferred test item, as it is easily acquired and transported. Improper instrument function, the presence of local sources of ambient noise (such as EM transmissions from high-voltage electric lines), and instability in the earth's magnetic field (as during a magnetic storm) are all potential causes of inconsistent, non-repeatable readings. A minimum of three minutes static background collection after instrument warm-up, followed by a 1-minute standard (spike) test followed by a 1-minute static background data is required. The operator must review the readings to confirm their stability prior to continuing with the geophysical survey.

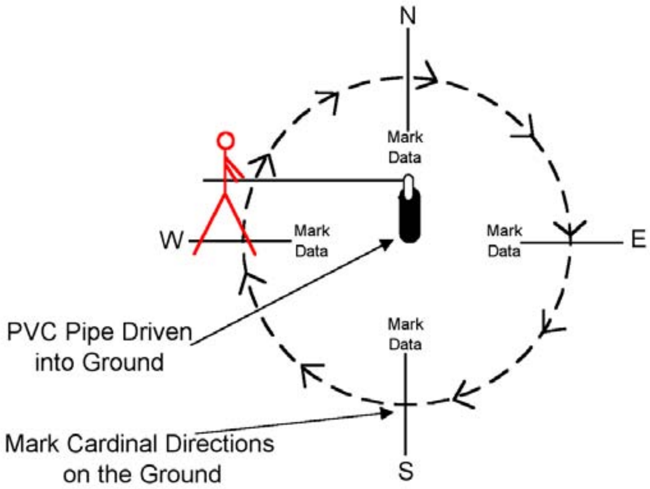
Acceptance Criteria: Static Background Test: EM61 +/- 2.5 mV, Mag +/- 1nT Static Spike Test: EM61 and Mag +/- 20% of standard item response, after background correction.

1.6 Azimuthal Test (Magnetometer sensor systems only)

Purpose: Optimize sensor orientation to avoid optically pumped magnetometer sensor "Dead Zones". This test is performed to document the differences in readings based on sensor orientation with respect to the earth's local magnetic field. An illustration of the Azimuthal Test is given in **Figure 1**. A variety of sensor orientations should be evaluated, to minimize the observed deviation in amplitude, and reduce chances of encountering magnetic "dead zones" for cesium vapor magnetometers.

Acceptance Criteria: Sensor Orientation that minimizes the observed deviation in amplitude and is devoid of drop-outs.

Figure 1



1.7 Height Optimization

Purpose: Determine the sensor height that optimizes the target signal-to-noise ratio and maintains adequate sensitivity. This test is most often applied to magnetics, and for the GEM-3 instrument. It could also be used for an EM-61 used in harness or "litter" mode. A line is established with at least one test object along its length. Data is collected with the instrument using a minimum of three different sensor heights, and the height that best meets the objectives is selected.

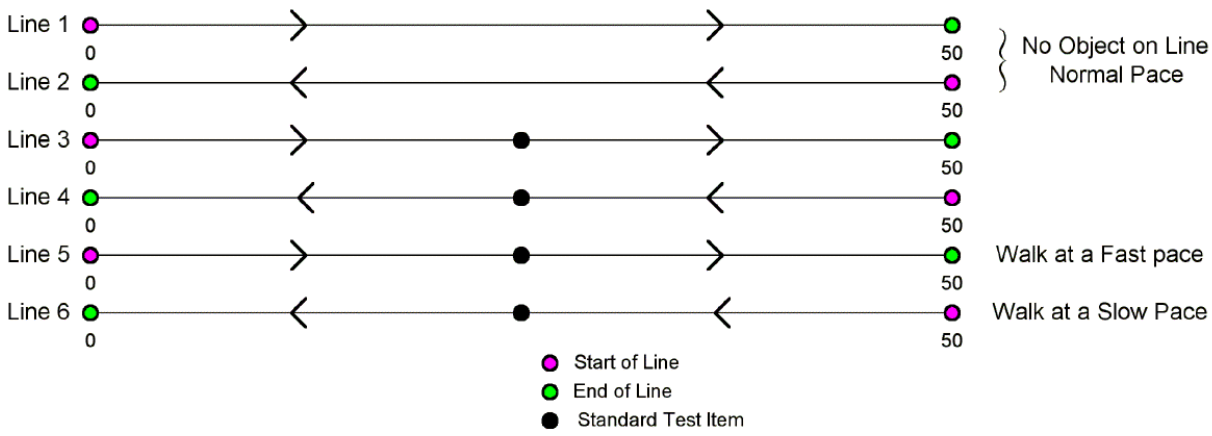
Acceptance Criteria: Maximum signal-to-noise ratio that reliably detects smallest target objective.

1.8 Six Line Test

Purpose: Document latency, heading effects, repeatability of response amplitude, and positional accuracy. This test should be performed in an area relatively clear of anomalous response. The test line will be well marked to facilitate data collection over the exact same line each time the test is performed in accordance with **Figure 2**. Background response over the test line is established in Lines 1 and 2. A standard test item, such as a steel trailer hitch ball will be used for Lines 3 through 6. Heading effects, repeatability of response amplitude, positional accuracy, and latency are evaluated.

Acceptance Criteria: Repeatability of response amplitude +/-20%, Positional Accuracy +/- 20cm

Figure 2



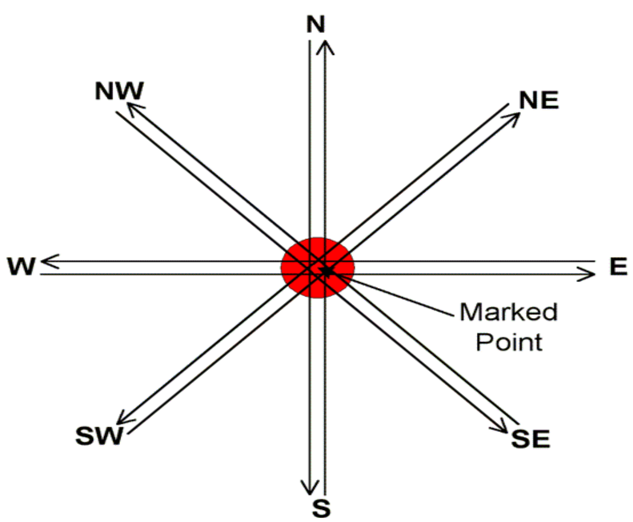
1.9 Octant Test (Heading Error Test for Magnetometer systems)

Purpose: Determine Heading effects (systematic shift based on direction of travel along the survey line). A magnetometer's response to ferromagnetic objects varies slightly according to the orientation of the sensor in relation to the console electronics and the operator. It is recommended that test be performed for all equipment and operator combinations.

A total of eight lines of magnetic data are collected, passing over the same central point. The arrangement of lines for the test is illustrated in **Figure 3**. The difference in the response over the central point documents heading effects.

Acceptance Criteria: Document heading error for post-processing correction.

Figure 3



1.10 Repeat Data

Purpose: Determine positional and geophysical data repeatability. One line per grid, or 100 feet per mile for transect or meandering path surveys, will be repeated before and after the survey. This repeat line should have the test standard placed at approximately the halfway point in an area lacking anomalous responses. The repeat line will be located at least 10 feet outside of the grid/transect/meandering path and parallel to the direction of travel.

When viewed in profile and compared to original data, repeat data provides a means of evaluating the ability of the instrument to respond consistently, and evaluates the positional accuracy of the data. Errors in positional repeatability outside acceptable tolerances indicate a problem in the method of navigation or navigational equipment operation. Errors outside acceptable tolerances for the amplitude repeatability response indicate a problem in the detector system or in the ability of the operator to perform an adequate survey.

Acceptance Criteria: Repeatability of response amplitude +/-20%, Positional Accuracy +/- 20cm

ATTACHMENT C

ATTACHMENT D

Geophysical Map Deliverable Format

The results of the geophysical investigation will be submitted to the Corps as follows.

Dig list (in ASCII or Excel format) of selected targets shall include the target location given in the referenced coordinate system, the represented amplitude of response based on selection criteria, and any comments or details regarding target properties. Refer to **Attachment C**. The targets will be posted (spatially located) directly on the graphics rendered geophysical map.

a. The following notes and instructions provide directions for creating geophysical maps for OE projects. The "Blocks" listed below correspond to the areas identified in **Figure D-1**. Maps will include all of the following basic map features in addition to any other necessary site information.

(1) General

(a) Map scales should be even multiples of the base units presented in the map. Example: for scales based on one inch being equal to X number of feet, the scale should be an even multiple of 12, e.g. 1:120 (or one inch = 120 inches = 10 feet)

(b) Map sizes should be designed to fit standard printer or plotter sizes. Preferred paper sizes for small maps are letter (8.5"x11") and tabloid (11"x17"). For larger maps, the preferred sizes are C1 (24" x 36") or smaller.

(2) Block 1: Title Block

(a) Use this area to provide Figure number, the map Title and sub-title (e.g. instrument and type/component) and the location of the information being presented (e.g. site/area name and property/grid ID).

(b) The fonts used here should be large.

(3) Block 2: Map Display Area

(a) Grid ticks or grid lines should be visible and labeled, though these can be in small fonts to allow for as large an area as possible being reserved for the display of information

(b) The use of surrounds/frames is not required, and may be omitted to maximize the area reserved for the display of information.

(c) All symbols associated with anomalies and known cultural features should be identified. Abbreviated ID's may be used, though an explanation of the abbreviating method should be included in the legend notes (e.g. anomaly ID S1G1-001, anomaly #1 from grid 1 of sector 1, could be abbreviated to simply the number 1 on the map)

(4) Block 3: Legend

(a) The legend should include all objects/symbols shown on the map.

(b) The following symbol conventions are preferred:

- Open, unfilled circles for locations of anomalies picked from the data
- Polygons with dashed lines for bounding areas with multiple/overlapping anomalies (e.g. used to identify area of a suspected burial pit)
- "X" symbol for locations of known surface features
- All other symbols should conform to either the Civil or Surveying and Mapping sections of the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE).

(c) Color scale bars should use a color scheme that clearly differentiates between anomalies and background readings. Background values should be plotted in white or gray, so as not to distract the viewer. A classic "cold to hot" color scale should be used with negative values plotted in blue and high positive values plotted in Red. The range of values should be "fixed" so that the same color scale is utilized across the site. The region of major interest is almost always near the detection/background limit, not the maximum or minimum values of the data set. A standard color scale for both the Geosoft, Oasis Montaj and Golden softwares Surfer mapping packages are available upon request form CEHNC.

(d) Clearly label the scale as the "Map Scale".

(5) Block 4: Project Area Index Map

(a) Use this area to show direction arrows, including true north, magnetic north, and grid north

(b) Subject to client approval, the Index Map area may be omitted to provide more area for Area 3 (the Legend) and/or Area 2 (the Map Display Area).

(c) Clearly label the scale as the "Index Map Scale"

(6) Block 5: Project Information Block

(a) Use this area to include pertinent project information. The minimum requirements are to have boxes for the following information:

- Client
- Project
- Contractor
- Map creator
- Map approver
- Date map was created
- Map file name

- Scale

(b) The map file name should include the full path and file extension.

(c) The scale should match that shown in the legend.

(7) Block 6: Logos

(a) Include one of the USACE Castle logo in the lower right corner of the page

(b) The words U.S. Army Engineering & Support Center, Huntsville should be visible below the castle logo

(8) For submittals, the contractor will provide maps in editable form (if available, e.g. Geosoft .map or Surfer .plt formats) and map images in a common image format, such as JPEG, for viewing without the software used to produce the maps.

b. Site maps showing the location of the data and relevant physical/cultural features in addition to the basic map features. Often physical features can cause a response in the geophysical data. Fixed location features are also useful for relocating grids established with a local coordinate system. The digital files must be in a format compatible with GIS (ArcView) software.

c. Additional site information to support mapping should be provided if available.

(1) Details of several methods of positioning using site information can be used. If a local grid system is used, physical feature maps created in the field during data acquisition noting the location of the features with reference to the local grid coordinates must be included.

(2) Additional GPS data to identify points or features of interest. If GPS is used to shoot in points and/or boundaries of cultural features this can be presented with gridded RTK GPS geophysical data.

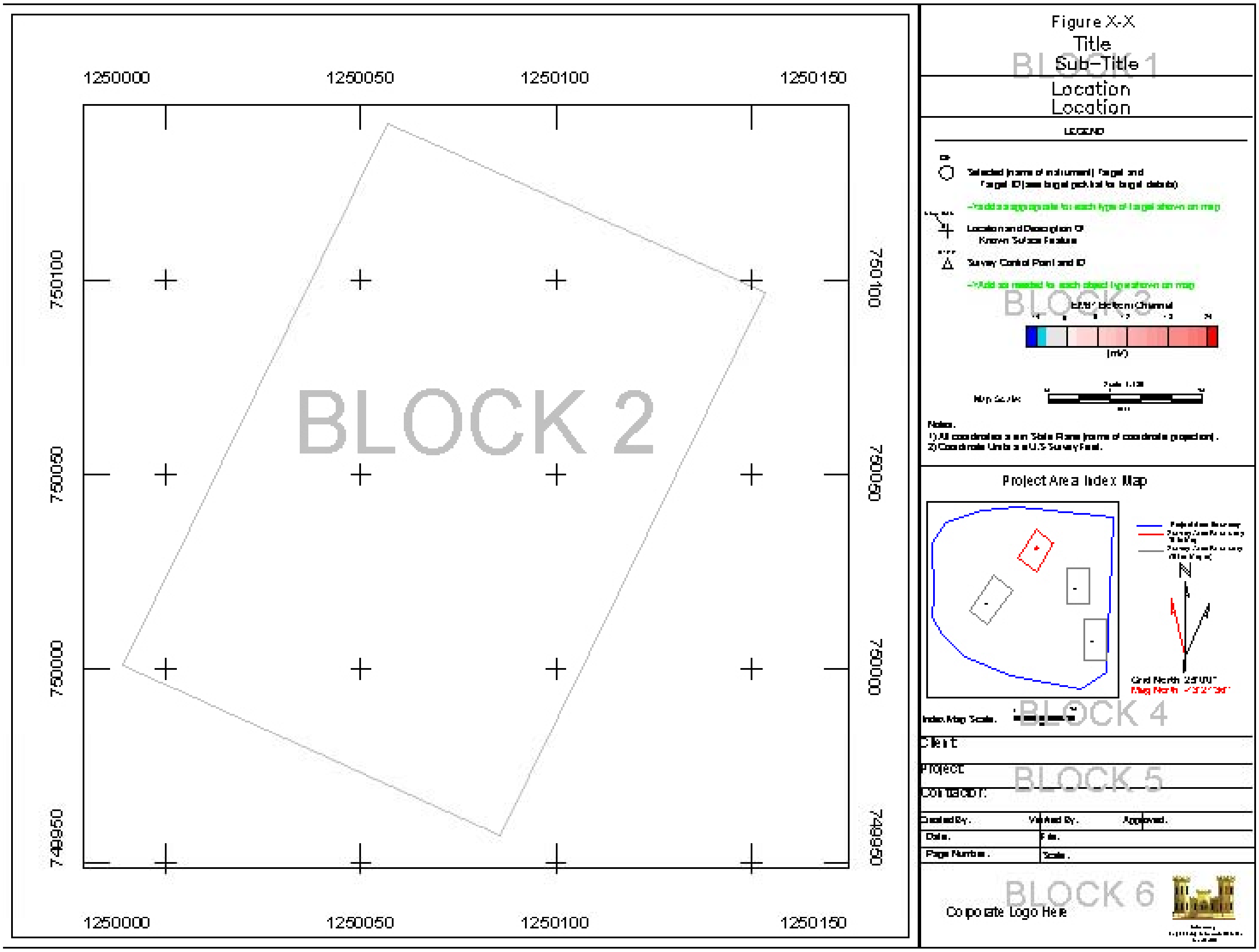
(3) Georeferenced aerial photographs of the site can be presented or superimposed with geophysical data when positioned with GPS or surveyed corners. Broad scale surface features can sometimes be matched with geophysical anomalies, combining two highly informative visual representations of the site.

(4) Known cultural features with anomalous responses in the geophysical data should be marked out on the maps and noted within the accompanying report text.

(5) Presentation of digital elevation models.

(6) Additional geologic information or geophysical data collected using other methods. This information is useful for broad scale interpretation of data collected at buried munitions sites. Geologic background responses may be visible in the geophysical data and are more easily identified with additional site information.

Figure D-1



Example Map Showing features to be included in Geophysical Maps

APPENDIX D

CEHNC-OE

Corps of Engineers Contractors OE Scrap/Range Residue Inspection, Certification, and Final Disposition Procedures

I. OE Scrap/Range Residue Inspection – Contractor Responsibilities and Procedures

1. U.S. Army Corps of Engineers (USACE) contractors executing projects will comply with the following procedures for processing OE Scrap/Range Residue for final disposition as scrap metal. The objective of these procedures is to ensure that an inspection procedure of the exterior and interior surfaces of all recovered items is in place to ensure these items do not present an explosive hazard. These USACE contractor responsibilities and procedures will be contained in the project work plan.

a. Unexploded Ordnance (UXO) Sweep Personnel will only mark suspected items and will not be allowed to perform any assessment of a suspect item to determine its status.

b. Unexploded Ordnance (UXO) Tech I will only tentatively identify a located item as scrap or OE.

c. UXO Technician II will:

(1) Inspect each item as it is recovered and determine the following:

- Is the item a UXO or a component of a military munition?
- Does the item contain explosives or other dangerous materials?
- Does the item require detonation?
- Does the item require demilitarization (demil) or venting to expose internal fillers?

(2) Segregate items requiring demil or venting procedures from those items ready for certification.

(3) Items found to contain dangerous fillers will be process in accordance with applicable procedures.

d. UXO Technician III will:

(1) Inspect recovered items to determine if free of dangerous fillers.

(2) Supervise detonation of items found to contain dangerous fillers and venting/demil procedures.

(3) Supervise the consolidation of recovered scrap metal for containerization and sealing.

e. UXO Quality Control (QC) Specialist will:

(1) Conduct daily audits of the procedures used by UXO teams and individuals for processing OE Scrap/Range Residue.

(2) (2) Perform and document a minimum of 10% random sampling of all scrap metal collected from the various teams to ensure no items of a dangerous or explosives nature are identified as scrap metal.

(3) Perform these random checks to satisfy that OE Scrap/Range Residue is free from any explosive hazards, necessary for completion of the Requisition and Turn-in Document, DD Form 1348-1A.

f. UXO Site Safety Officer (UXOSO) will:

(1) Ensure the specific procedures and responsibilities for processing OE Scrap/Range Residue for certification as scrap metal are being followed, performed safely, consistent with applicable regulations, and in accordance with the USACE-approved project work plan.

(2) Perform random checks of processed OE Scrap/Range Residue scrap to ensure items being identified as scrap are free from any explosive hazards.

g. Senior UXO Supervisor will:

(1) Be responsible for ensuring work and Quality Control (QC) Plans specify the procedures and responsibilities for processing OE Scrap/Range Residue for the final disposition as scrap metal.

(2) Ensure a Requisition and Turn-in Document, DD Form 1348-1A is completed for all scrap metal to be transferred for final disposition.

(3) Perform random checks to satisfy that the OE or range residue is free from explosive hazards, necessary to complete the DD 1348-1A.

(4) Certify all scrap metal generated from OE Scrap/Range Residue as free of explosive hazards.

(1)

(5) Be responsible for ensuring that these inspected materials are secured in a closed, labeled and sealed container and documented as follows;

(6)

- The container will be closed and clearly labeled on the outside with the following information: The first container will be labeled with a unique identification that will start with **USACE/Installation Name/Contractor's Name/0001/Seal's unique identification** and continue sequentially.

.

- The container will be closed in such a manner that a seal must be broken in order to open the container. A seal will bear the same unique identification as the container or the container will be clearly marked with the seal's identification if different that the container.

- A documented description of the container will be provide by the contractor with the following information for each container: contents, weight of container, location where OE Scrap/Range Residue was obtained, name of contractor, names of certifying and verifying individuals, unique container identification, and seal identification, if required [see paragraph I. 1.g. (5)]. These documents will also be provided by the contractor in a separate section of the final report.

II. OE Scrap/Range Residue Certification and Verification

1. The contractor will ensure that scrap metal generated from OE or Range Clearance is properly inspected in accordance with the procedures in I. above. Only personnel who are qualified UXO personnel per USACE's

Contract Data Item Description (DID) OE-025 will perform these inspections. The Senior UXO Supervisor will certify and the USACE's OE Safety Specialist will verify that the scrap metal is free of explosive hazards.

2. DD form 1348-1A will be used as certification/verification documentation. All DD 1348-1A must clearly show the typed or printed names of the contractor's Senior UXO Supervisor and the USACE's OE Safety Specialist, organization, signature, and contractor's home office and field office phone number(s) of the persons certifying and verifying the scrap metal.

   a. Local directives and agreements may supplement these procedures. Coordination with the local concerns will identify any desired or requested supplementation to these procedures

.

   b. In addition to the data elements required and any locally agreed to directives, the DD 1348-1A must clearly indicate the following for scrap metal:

      (1) Basic material content (Type of metal; e.g., steel or mixed)

      (2) Estimated weight

      (3) Unique identification of each of the containers and seals stated as being turned over.

      (4) Location where OE Scrap/Range Residue was obtained.

      (5) Seal identification, if different from the unique identification of the sealed container.

   c. The following certification/verification will be entered on each DD 1348-1A for turn over of scrap and will be signed by the Senior UXO Supervisor and the USACE OE Safety Specialist.

   "This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of explosive hazards."

III. Maintaining The Chain Of Custody And Final Disposition

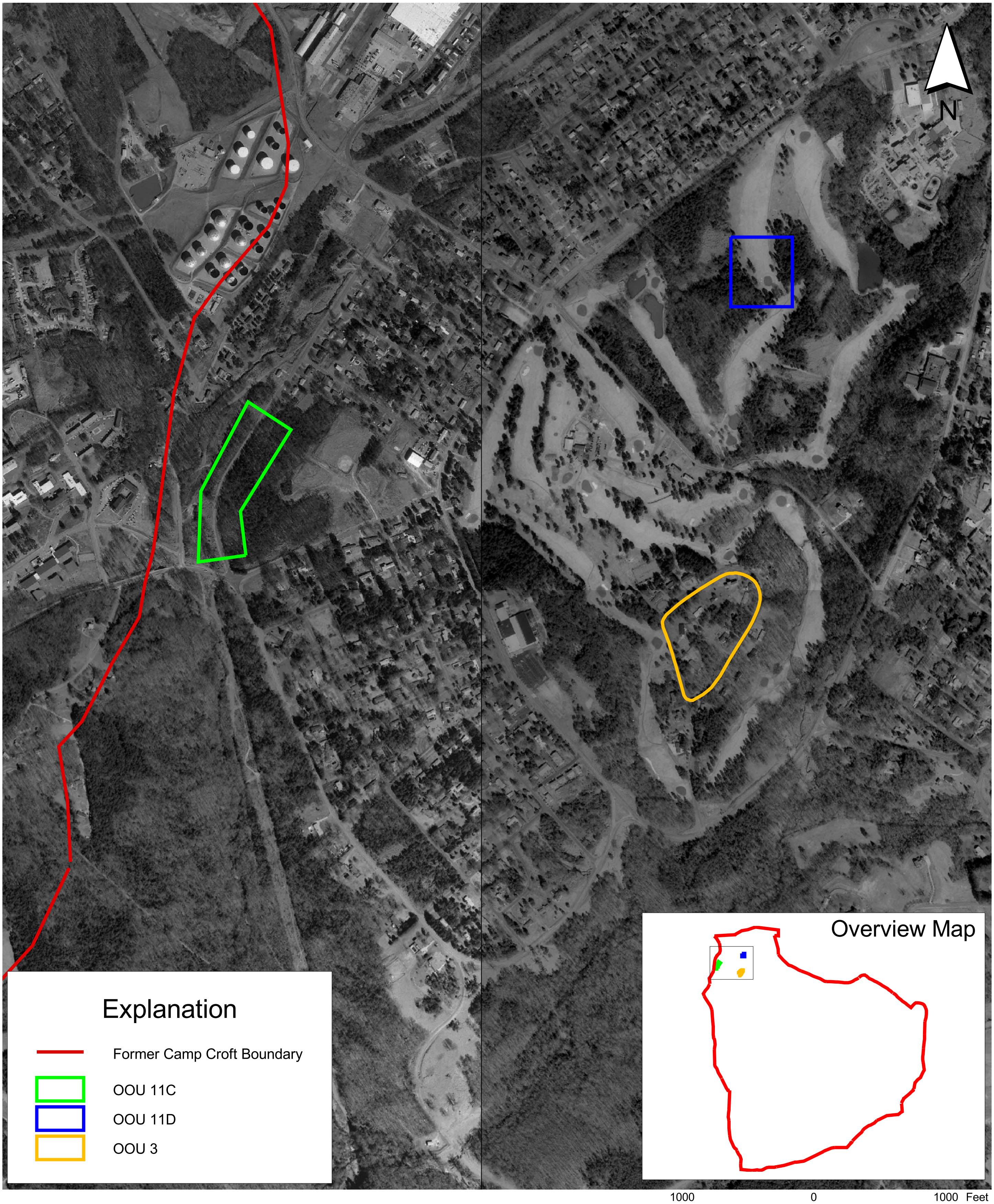
The contractor, in coordination with the Corps of Engineers, will arrange for maintaining the chain of custody and final disposition of the certified and verified material. The certified and verified material will only be released to an organization that will:

a. Upon receiving the unopened labeled containers, each with its unique identified un-broken seal ensuring a continued chained of custody, and, after reviewing and concurring with all the provided supporting documentation, sign as having received and agreeing with the provided documentation that the sealed containers contained no explosive hazards when received. This will be signed on company letterhead and state that the contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content.

b. Send notification and supporting documentation to the sealed container-generating contractor that the sealed containers have been smelted and are now only identifiable by their basic content.

c. This document will be incorporated by the contractor into the final report as documentation supporting the final disposition of this scrap metal.

APPENDIX B
SITE MAPS



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FORMER CAMP CROFT
PROJECT AREAS

PROJECT #:	PAGE #:	DATE:	DRAWN BY:	CHECKED BY:	FIGURE:
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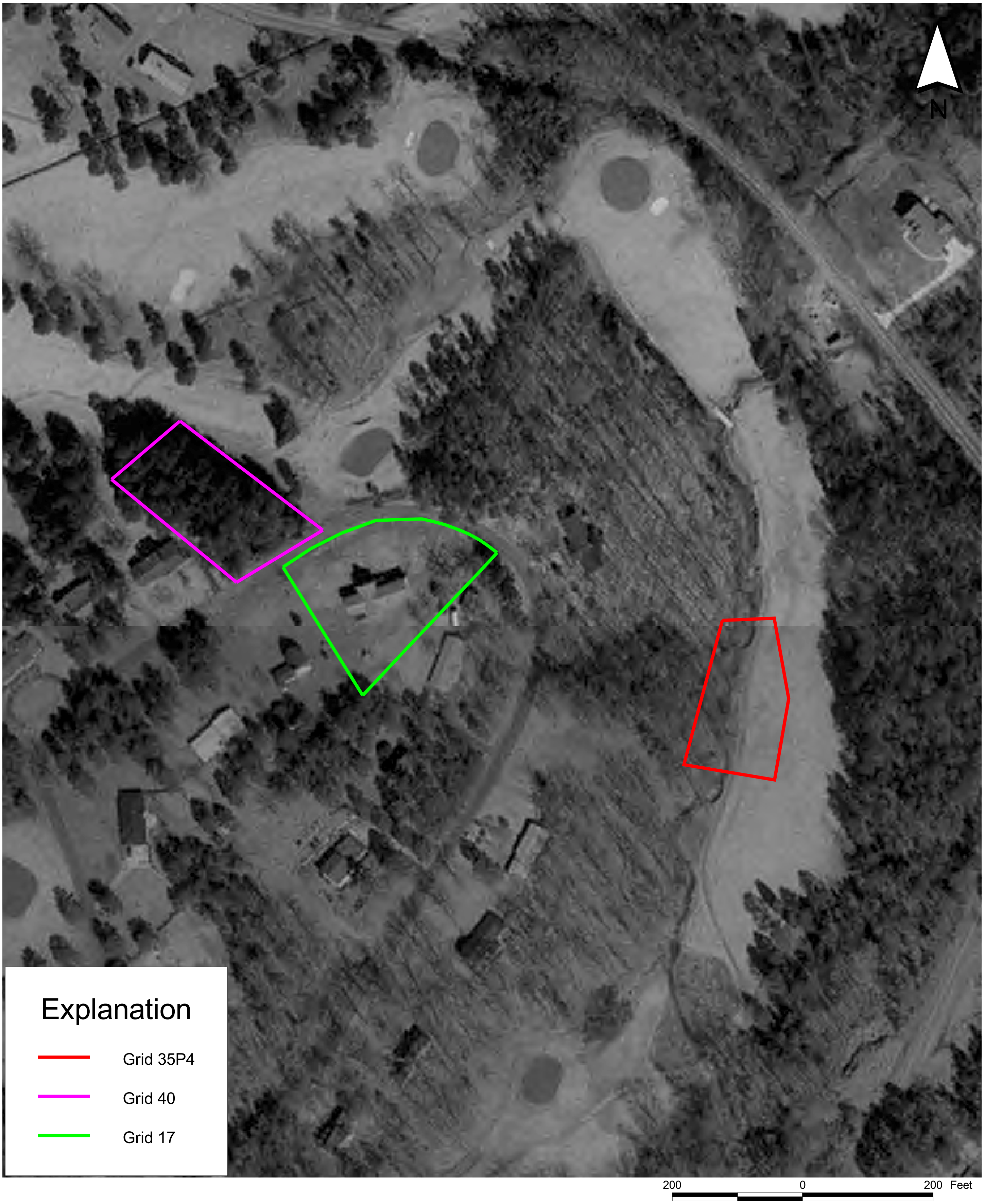

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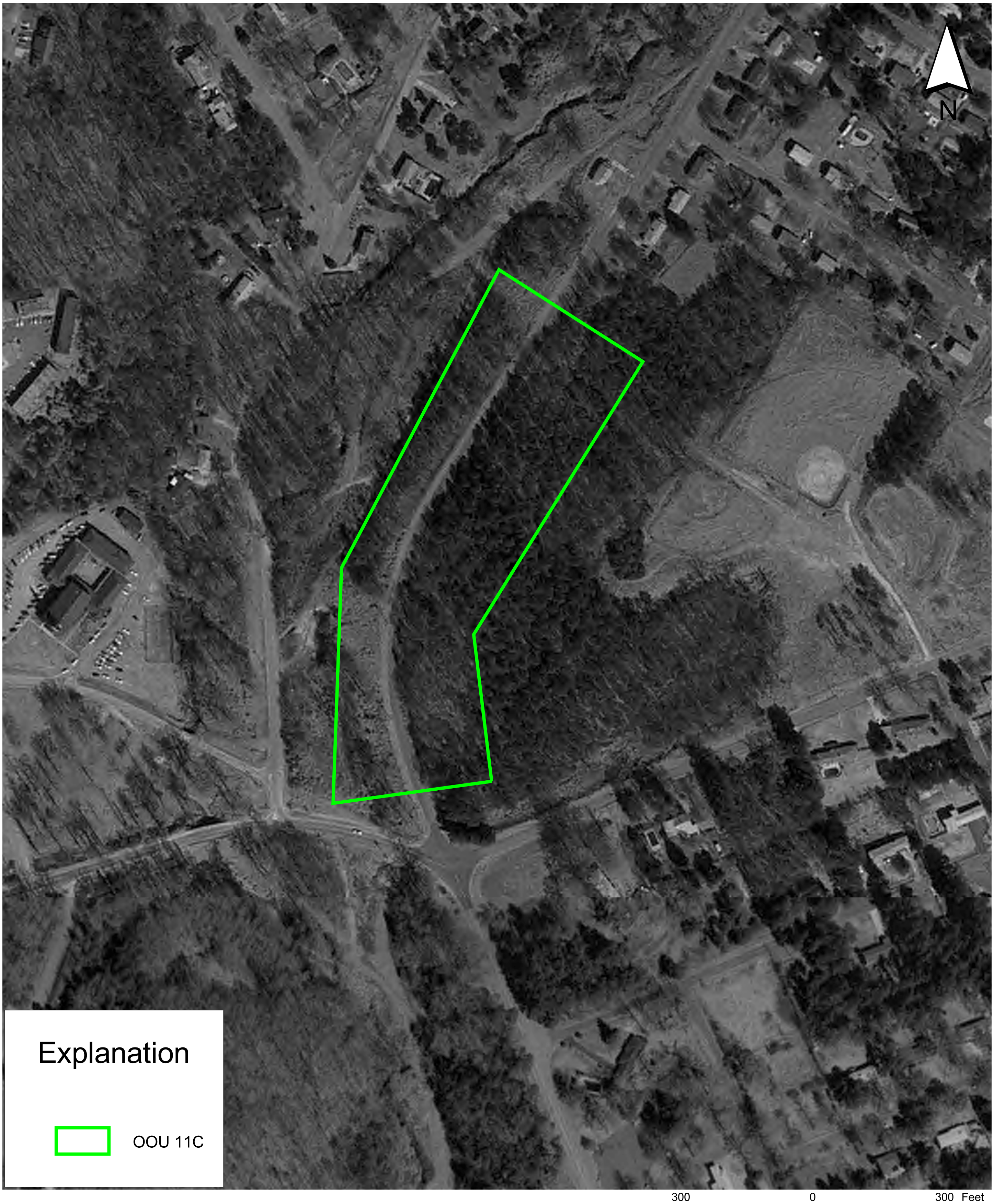

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FORMER CAMP CROFT
OOU 11C

PROJECT #:	PAGE #:	DATE:	DRAWN BY:	CHECKED BY:	FIGURE:
ZE036000		SEP 2003	TBB	SCM	B-3

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FORMER CAMP CROFT
OOU 11D

PROJECT #:	PAGE #:	DATE:	DRAWN BY:	CHECKED BY:	FIGURE:
ZE036000		SEP 2003	TBB	SCM	B-4

200 0 200 400 Feet

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FORMER CAMP CROFT
OOU 3 BUFFER AREA

PROJECT #:	PAGE #:	DATE:	DRAWN BY:	CHECKED BY:	FIGURE:
ZE036000		SEP 2003	TBB	SCM	B-5

Note: Imagery supplied by Spartanburg County, SC (1996)

400 0 400 800 Feet

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FORMER CAMP CROFT
QUANTITY-DISTANCE MAP

PROJECT #:	PAGE #:	DATE:	DRAWN BY:	REVIEWD BY:	FIGURE:
ZE036000		AUG 2003	TBB	MLW	B-6

- OE AREAS - OO3 AREAS A, B, AND C; OOU11C AND OOU11D
- MAXIMUM SAFETY DISTANCE (MSD) (BASED ON A MK II GRENADE) IS 650 FEET
- OE REMOVAL DEPTH - 4 FEET
- USE OF THE AREA AFTER REMOVAL ACTION - REMAIN RESIDENTIAL

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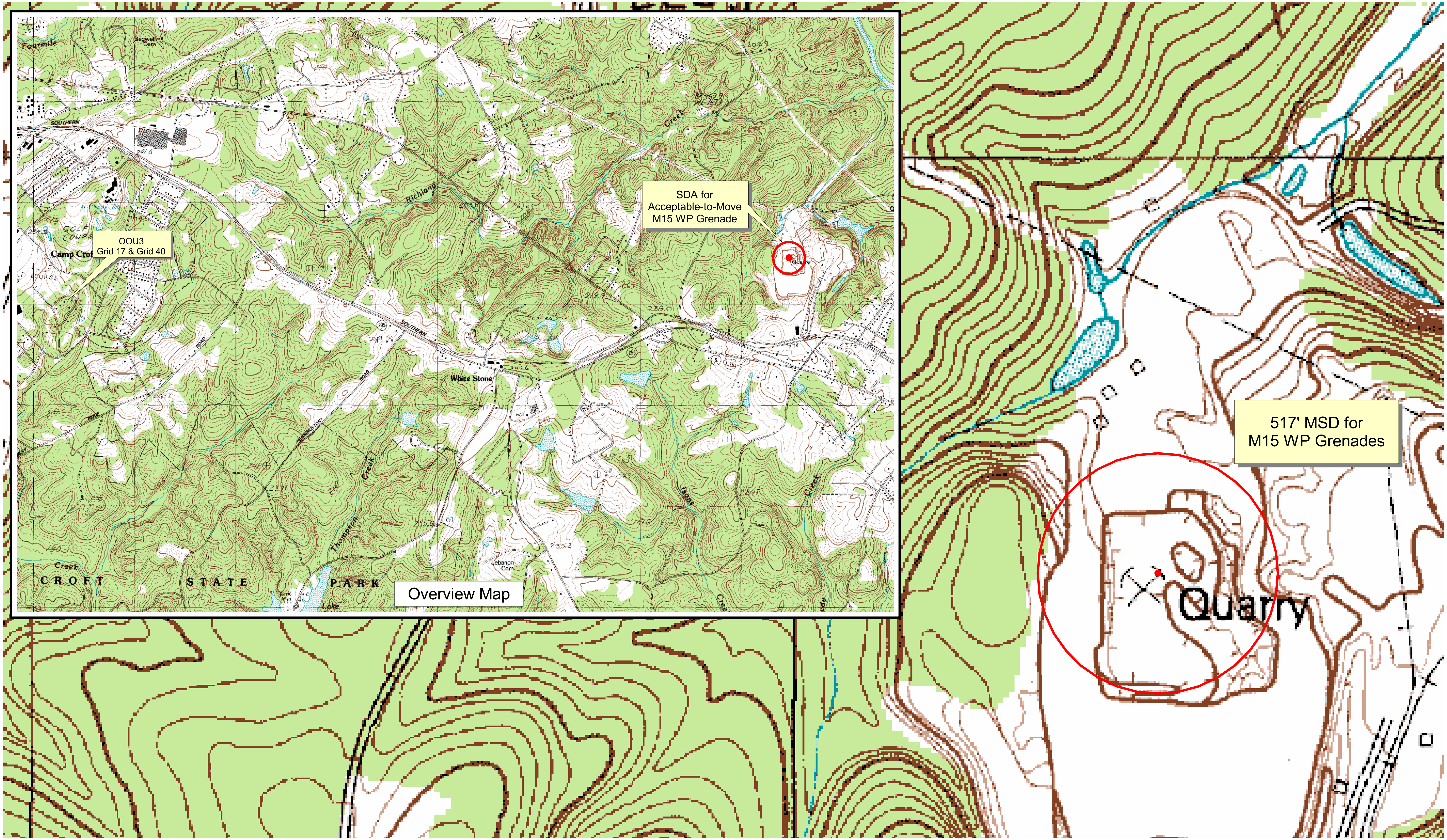
	PROJECT #: ZE036000	PAGE #:	DATE: AUG 2003	DRAWN BY: TBB	CHECKED BY: MLW	FIGURE: B-7



400 0 400 800 Feet

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PROJECT #:	PAGE #:	DATE:	DRAWN BY:	CHECKED BY:	FIGURE:
ZE036000		AUG 2003	TBB	MLW	B-8

APPENDIX C
POINTS OF CONTACT

Former Camp Croft – Spartanburg, South Carolina
Local Points of Contact

Spartanburg County Sheriff's Department
Mr. John Dyas
(864) 596-2616

City of Spartanburg Police Department
(864) 596-2098

City of Spartanburg Fire Department
(864) 596-2083

Spartanburg Regional Hospital
(864) 579-2016

Croft State Natural Area Superintendent
Mr. Gerry Perry
(864) 585-1283

APPENDIX D
SITE SAFETY AND HEALTH PLAN

SITE SAFETY AND HEALTH PLAN

SITE NAME:	Former Camp Croft	
SITE LOCATION:	Spartanburg, South Carolina	
PURPOSE OF VISIT:	OE Removal Action	
SSHP PREPARED BY:	Michael Winningham, Project Manager (UXO Database #0327)	
OFFICE/COMPANY:	ZAPATAENGINEERING, P.A.	
ADDRESS:	1100 Kenilworth Avenue, Charlotte, NC 28204	
TELEPHONE:	704-358-8240	
DATE PREPARED:	February 13, 2004	
SSHP REVIEWED/APPROVED BY:	John A. Soyak, MSPH, CIH	DATE: 2/16/04
SAFETY OFFICE: USAESCH		DATE:
		DATE:

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ATTACHMENTS

1.0 SITE SAFETY AND HEALTH PLAN (SSHP)

1.1 INTRODUCTION

1.1.1 This SSHP establishes the responsibilities, requirements, and procedures for the protection of personnel during OE removal activities at OOU 3, OOU 11C, and OOU 11D, Former Camp Croft, Spartanburg, South Carolina. The purpose of this plan is to provide the field teams with a safe working environment during field activities. Specifically, the SSHP is developed to prevent and minimize personal injuries and illnesses and physical damage to equipment, supplies, and property.

1.1.2 The Occupational Safety and Health Administration (OSHA) requires employers involved in hazardous waste activities to comply with Title 29 (OSHA) of the Code of Federal Regulations (CFR), Part 1926, Section 65 (29 CFR 1926.65), Hazardous Waste Operations and Emergency Response. Employers involved in construction activities are also required to comply with all provisions of 29 CFR 1926, Safety and Health Regulations for Construction, where applicable. This document complies with OSHA standards; the U.S. Army Corps of Engineers (USACE Safety and Health Requirements Manual (EM 385-1-1) and Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities (ER-385-1-92); the NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site and local health requirements. Working conditions may necessitate modification of this plan. No deviations from this plan may be implemented without the prior notification and approval of the ZAPATAENGINEERING Certified Industrial Hygienist (CIH) and the Corps of Engineers, Huntsville Center (CEHNC).

1.1.3 This project is a coordinated work effort between the CEHNC and ZAPATAENGINEERING. All on-site personnel are required to employ safe work practices at all times and comply with this SSHP. In addition, ZAPATAENGINEERING maintains a written safety program at the Corporate Office that complies with the provisions of 29 CFR 1926.65 (b)1-(b)4.

1.1.4 This SSHP is tailored to the working environment anticipated at the Former Camp Croft, Spartanburg, South Carolina, with full consideration given to the level of effort required to accomplish the tasks as outlined in the Scope of Work (SOW) and the anticipated hazards associated with on-site operations. The SSHP describes the procedures and control measures to protect personnel from these hazards. Adherence to these procedures will significantly reduce, but not eliminate, the potential for occupational injury and illness. Should operational circumstances substantially differ from those described and/or anticipated, operations shall be temporarily terminated by the ZAPATAENGINEERING UXOSO until the suspect hazards are evaluated and appropriate health, safety, and operational precautions are implemented.

1.1.5 A copy of this SSHP will be available at the site for review by all on-site personnel and will be maintained by the UXO QCS/SO. In addition, a copy of the SSHP will be provided to each subcontractor prior to initial entry onto the site.

1.2 HEALTH AND SAFETY PROGRAM (HSP)

1.2.1 Introduction

ZAPATAENGINEERING places the highest priority on a safe working environment. To substantiate its commitment, ZAPATAENGINEERING has developed and implemented a Corporate Health and Safety Program (HSP) that provides general health and safety guidance to:

- Qualified individuals performing Unexploded Ordnance (UXO) operations.
- Qualified individuals performing HTRW operations.
- Approved visitors to a site potentially containing UXO or HTRW.

1.2.2 Regulatory Compliance

1.2.2.1 ZAPATAENGINEERING's HSP complies with federal, state, and local laws, statutes, directives, and ordinances that relate to worker safety and health, and the protection of the environment, including but not limited to 29 CFR 1926, Occupational Safety and Health Administration (OSHA) standards for Construction and 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response.

1.2.2.2 The ZAPATAENGINEERING Corporate Safety and Health Program is available for review upon request.

2.0 STAFF ORGANIZATION, QUALIFICATION, AND RESPONSIBILITIES

Direction and administration of our safety program is a corporate responsibility; implementation is the overall and direct responsibility of the project managers, who will provide the guidance, support, and resources necessary to promote compliance with all aspects of the safety program. The functional organizational structure for our technical operations and health and safety issues is depicted in the Technical Management Plan, Section 2.6, Figure 2-1.

2.1 RESPONSIBILITIES

This section outlines the responsibilities of these key personnel associated with compliance with this chapter. Other positions and responsibilities are found in the Technical Management Plan, Section 2.6.

2.1.1 Vice President of Ordnance and Explosives Program

2.1.1.1 Technical Responsibilities

- Advises the Contracting Officer of progress and promptly implements CEHNC-approved and authorized changes.
- Communicates and directs instructions for scoping, negotiating, or modifying delivery order costs and schedules.
- Coordinates and manages all aspects of the project.
- Ensures resource availability (personnel, facilities, and equipment).
- Oversees task identification and resolutions.
- Achieves the contractual cost and schedule targets.
- Coordinates the preparation of detailed work order specifications and schedules.
- Implements project quality procedures.

2.1.1.2 Safety and Health Responsibilities

- Oversees implementation of safety and health procedures.

2.1.2 Certified Industrial Hygienist (CIH)

The project CIH is certified by the American Board of Industrial Hygiene (ABIH) and experienced in hazardous waste site operations. In coordination with ZAPATAENGINEERING Senior Management and reporting to the Vice President of OE Programs, he develops, implements, and oversees ZAPATAENGINEERING's Health and Safety Program and Site-Specific Safety and Health Plans. The CIH will:

- Give final approval of the SSHP.
- Ensure compliance with all parts of this program.
- Provide or direct site monitoring.
- Provide instruction and oversight of site monitoring, as required.
- Review site safety logs and air monitoring logs/interpret air sampling results.
- Evaluate, draft, and authorize any changes to the SSHP.
- Assist as liaison with government officials regarding safety and health-related site matters.
- Maintain frequent communications with Project Manager regarding site activities.

- Perform periodic site visits (coordinated through the CEHNC Project Manager) after mobilization to ensure compliance with SSHP, if required.

2.1.3 UXO Quality Control Specialist/Safety Officer (UXO QCS/SO)

Has the on-site responsibility and authority to modify and/or halt work when necessitated by an emergency, and to remove personnel from the site if working conditions that may affect on-site/off-site safety or health change. Is the primary point of contact for any on-site emergency. The UXO QCS/SO will implement any modifications to the approved SSHP for review by the corporate CIH in coordination with the team management and the CEHNC Safety Officer.

- Present on-site during all active work activities.
- Contribute to the QC plan.
- Implement the QC plan in the field.
- Conduct QC audits.
- Conduct initial site entry briefings and daily tailgate safety meetings.
- Provide oversight of all site activities.
- Verify that all tasks are conducted in a safe manner by conducting daily inspections of all site activities.
- Has authority to stop any operation that threatens the health or safety of site personnel or the surrounding populace or has the potential for a significant adverse impact on the environment.
- Post amendments to the SSHP as on-site activities and events change in coordination with the ZAPATAENGINEERING Project Manager, Safety and Health Manager and the CEHNC Safety Officer.
- Consult with the Safety and Health Manager to resolve site health and safety issues.
- Work with the ZAPATAENGINEERING Project Manager on a daily basis but reports directly to the Safety and Health Manager on all health and safety-related issues.
- Attend coordination and planning meetings with CEHNC and subcontractors.
- Coordinate site security activities.
- Ensure that all work performed on-site is conducted in accordance with the SSHP.
- Direct site emergency response activities and is responsible for implementing the SSHP Emergency Response Procedures (ERP).

2.1.4 Project Manager

Refer to Technical Management Plan, paragraph 2.6.3.1.

2.1.5 Senior UXO Supervisor (SUXOS)

Refer to Technical Management Plan, paragraph 2.6.3.3.

2.1.6 Subcontractors

2.1.6.1 GPL Laboratories, LLLP

GPL Laboratories, LLLP (GPL) under subcontract with ZAPATAENGINEERING will analyzed all environmental samples collected during this task order. GPL will not subcontract any environmental samples to other laboratories without prior notice to ZAPATAENGINEERING and CEHNC.

2.1.6.2 Clean Harbors, Inc.

Clean Harbors, Inc. under subcontract with ZAPATAENGINEERING is the Treatment, Storage and Disposal Facility (TSDF) responsible for handling, transporting and disposing of IDW generated under this task order. Upon receiving analytical results from the various IDW waste streams, Clean Harbors, Inc. will assist ZAPATAENGINEERING, and CEHNC to assign a waste classification for proper transport and disposal at their Deer Park, Texas facility.

2.2 PERSONNEL QUALIFICATIONS

All assigned personnel are trained, qualified, and experienced. Resumes for selected personnel are located in Appendix H of this Work Plan.

3.0 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

3.1 SITE DESCRIPTION

The Former Camp Croft was located five miles southeast of Spartanburg, South Carolina. The OOUs 3, 11C, and 11D encompass a total of approximately 48 acres and are comprised of the Wedgewood Subdivision, a private residential area and nearby land. OOU 3 areas of concern include approximately 24 acres. OOU 11C contains approximately 9.48 acres. OOU 11D contains approximately 11.2 acres. An overall site map of Camp Croft and the projects sites can be seen in Figure B-1 in Appendix B.

3.2 RESULTS OF PREVIOUS STUDIES

3.2.1 UXO Hazards

3.2.1.1 OOU 3 is located in the former cantonment area, north of the current Camp Croft State Park (Figure B-2 in Appendix B). Practice grenades, ordnance related scrap, and 2.36-inch rocket fragments that may have been overshot from another local firing range were found in OOU 3 during the Phase I Engineering Evaluation/Cost Analysis (EE/CA) investigation conducted in 1997. During a removal action conducted in March 1997, seven Mark (MK) II fragmentation grenades were recovered, as well as numerous practice hand grenades and grenade parts, suggesting that this area may have been a former hand grenade practice area. The previous work areas and specific work completed by UXB are identified in the Final Removal Report dated April 2001, stated that three (3) small pits in Grid 17 and one (1) small pit in Grid 40 remain to be cleared (overall grids were previously mapped using digital geophysical methods and intrusively excavated). Twelve (12) M15 white phosphorous grenades were excavated from one (1) of the pits in Grid 17 and 150 pounds of smoke canisters were excavated from the pit in Grid 40; however, additional excavation activities were halted to reevaluate safety measures and develop proper procedures to be implemented prior to continuing with the excavations.

3.2.1.2 OOU 11C is located west of Cedar Springs Drive, due northwest of OOU3 (Figure B-3 in Appendix B). OOU 11C is privately owned and is an undeveloped, moderately wooded property. M9 rifle grenade fragments have been found at depths of 13 inches below ground surface. OOU 11C is in a residential area adjacent to Kelsey Creek where other ordnance items, including MK II hand grenades, have been found.

3.2.1.3 OOU 11D is located between Keltner Avenue and East Croft Circle, north of OOU3 (Figure B-4 in Appendix B). The area is privately owned and developed for use as a golf course. The area is a suspected former grenade range. Some of the outlining area around OOU 11D is wooded and may require some brush clearing. Practice grenades at depths of three inches have been recovered in OOU 11D.

3.2.2 Recovered Chemical Warfare Material (RCWM) Hazards

3.2.2.1 A review of the available documentation provides no evidence to suggest that Recovered Chemical Warfare Materiel (RCWM) were deployed or stored at the site. In the past, it was an acceptable practice to bury expended training residue. Because of these practices, site personnel will remain vigilant for possible riot control and other hazardous materials. In the unlikely event that RCWM is encountered during operations, all work will immediately cease. Site personnel will withdraw along cleared paths upwind from the discovery. A team consisting of a minimum of two personnel will secure the area to prevent unauthorized access. Personnel should position themselves as far upwind as possible while still maintaining security of the area. Site personnel will stand-by for follow-on instructions from the CEHNC Contracting Officer (CO).

3.2.3 Radiological Hazards

A review of the Scope of Work and available documentation indicates that there are no radiological hazards associated with this site.

3.3 SITE HISTORY

Refer to Introduction, paragraph 1.3.

3.4 TOPOGRAPHY

Refer to Introduction, paragraph 1.4.

3.5 PROJECT DESCRIPTION

3.5.1 Tasks to be performed

3.5.1.1 Table D-1 lists the tasks summary of events to be performed during the on-site operations. The proposed schedule for fieldwork is located in the Work, Data, and Cost Management Plan of the Work Plan.

3.5.1.2 A description of the expected hazards associated with these tasks is included in the Hazard Assessment and Risk Analysis located in Attachment A of the SSHP.

TABLE D-1 SUMMARY OF EVENTS

EVENT	PURPOSE
Brush Clearing and Surface Clearance	Surface clearance of OE, OE-related scrap, non-OE-related scrap, and removal of brush for future operations.
Geophysical Survey and Prove-out	Location of sub-surface anomalies.
Excavation	Identification of sub-surface anomalies.
Disposition/Disposal	All UXOs identified during excavation will be disposed of by detonation. All OE scrap greater than one square inch in size will be removed and disposed of in accordance with the SOW.
Sampling	Environmental sampling of the M15 WP Grenade pit.

3.6 WORK PERFORMANCE TIME FRAME

Initial tasks are planned to commence in April 2004 and be complete by May 2004. Optional tasks will be scheduled based on availability of funds.

4.0 HAZARD ANALYSIS AND RISK ASSESSMENT

4.1 ON-SITE HAZARDS

4.1.1 Based upon a review of available information, personnel can expect to encounter the hazards identified in Table D-2, On-Site Hazards.

TABLE D-2 ON-SITE HAZARDS

Hazard	Concentration Range	Media	On-Site Location	Estimated Quantity/ Volume
Ordnance				
Based on historical documentation the following UXO may be present at the AOC (OOU 3): MKII fragmentation grenades, M15 WP grenades, and M9 rifle grenades	Unknown	Unknown	Unknown	Unknown
Chemical				
White phosphorus (WP) and Hexachloroethane (HC) smoke are the primary contaminants of concern at the site. Combustible gases, hydrogen sulfide, oxygen, volatile organic compounds, and dust will be monitored using portable instrumentation. Based on a review of the Scope of Work and available archive search report documentation, this is a not a suspected Chemical Warfare Materiel (CWM) site and contains no other buried hazardous chemicals except for white phosphorus and Hexachloroethane (HC) smoke.				
Physical				
Heat/cold stress, tornado, thunderstorm, lightning, exertion, repetitive motion, slips, trips, and falls, cuts, noise, and excavation hazards such as entrapment and crushing.				
Radiological				
Based on a review of the Scope of Work and available archive search report documentation, there are no radiological hazards associated with this site.				
Biological				
Based on research conducted at Camp Croft, the following species of plants and animals may pose a potential safety hazard: Rattle Snake, Copperhead Snake, Water Moccasin Snake, Eastern Coral Snake, Scorpion, Black Widow Spider, Brown Recluse Spider, Ticks, Poison Oak, Sumac, Ivy. No biological warfare materiel is associated with this site.				

4.1.2 All known or potential chemical, physical, safety, biological, and chemical hazards that may pose a threat to the health and safety of site workers have, to the extent possible, been identified and the risk of exposure assessed to ensure workers are adequately informed and protected. Emphasis has been placed on identifying situations and tasks that have known or may create Immediately Dangerous to Life or Health (IDLH) conditions, or any other condition with the potential for serious safety or health effects.

4.1.3 Evaluation of work site characteristics and hazards is an ongoing process, and on-site personnel will play a major role in continuing this evaluation throughout the duration of the project. All site workers must be vigilant in identifying and informing their supervisor of hazards. This section will be modified whenever new hazards are encountered.

4.2 ACTIVITY HAZARD ANALYSIS

4.2.1 The following major phases of the work are to be performed during investigational activities at the site. An Activity Hazardous Analysis has been developed for each major work phase identifying the tasks, potential health and safety hazards, and control measures to be implemented to eliminate or reduce the hazards to an acceptable level. Biological hazards are prevalent at this site and precautions will be implemented as described in Section 4.6, Biological Hazards.

4.2.2 The anticipated hazards and the risks are discussed in this section and summarized in the Certification of Activity Hazard Analysis Forms located in Attachment A to this appendix—task-specific evaluations of the known or potential hazards associated with performing individual tasks within the SOW. These forms ensure compliance with OSHA standard 29 CFR 1910.132, which requires assessment of tasks and operational hazards where personal protective equipment (PPE) is required to protect personnel. Each form contains task-specific information related to hazard control and mitigation, including specific engineering control measures; specific standard operating procedures; equipment requirements; specialized training requirements; and the PPE requirements.

4.2.3 Mobilization

Site mobilization activities will be conducted and supervised by the ZAPATAENGINEERING UXO QCS/SO in coordination with supporting U.S. Army organizations. Site mobilization will include the following activities (Activity Hazard Analysis, Attachment A):

- Reconfirm the location of the excavation coordinates.
- Utility locating.
- Identification and establishment of a specified and marked location for vehicle parking within the support zone.
- Establishment of a logistical area within the support zone for equipment storage.
- Set up potable water supply.
- Placement of Port-A-John(s), hand washing facilities, non-hazardous waste receptacles with tight closing lids, and potable water containers with disposable paper cups within the site support zone.

4.2.4 Brush Clearing

Selected brush removal will be conducted as required, using mechanical equipment or manually, as conditions dictate. Cut brush will be removed only from the immediate work area so as to not interfere with the OE removal action. Selected brush removal may be required to gain access to an anomaly or discovered UXO. The CEHNC onsite Safety Representative will be informed prior to any action that would result in damage to any planted bush or shrub. If possible, brush that is planted in a landscaped yard or park area will be pruned instead of removed to allow access to the UXO.

4.2.5 Surface Clearance

Surface clearance operations will be conducted in support of brush clearing and geophysical operations. The surface clearance team will carefully identify and mark anomalies identified during the surface clearance using standard sweep line techniques. The sweep line will sweep the grid in alternating north and south oriented lanes, identifying potential OE items and recovering OE-related scrap. All surface clearance operations will be performed under the general supervision of the on-site SUXOS. The UXO Technician II, working under the direct supervision of the UXO Technician III, will identify and mark the target anomalies with crossed pin flags or stakes with flagging tape.

4.2.6 Geophysical Prove-out and Investigation

Initial activities include conducting an intrusive excavation in several previously identified pits located in Grid 17 (approximately 1.1 acres) and Grid 40 (approximately 0.9 acres) of OOU 3. Following this removal action, ZAPATAENGINEERING will perform DGM in Grids 17, 40, and Grid 35P4 (approximately 0.7 acres), for quality control and to ensure adequacy of the current and previous removal actions in these areas. Optional tasks that may be authorized in the future at the discretion of the Government on a priority basis, include:

- Geophysical Mapping and intrusive investigation/clearance of 9.48 acres in OOU 11C,
- Geophysical Mapping and intrusive investigation/clearance of 11.2 acres in OOU 11D,
- Geophysical Mapping and intrusive investigation/clearance of 24.0 acres in OOU 3, between the Wedgewood Subdivision and the Creek Golf Club.

4.2.7 Excavation

4.2.7.1 Prior to any intrusive operation, the exclusion zone must be clear of all non-UXO qualified personnel. ZAPATAENGINEERING will coordinate the Removal Action activities and excavations with homeowner's and golf course management. Non-UXO qualified personnel will not be allowed back into the exclusion zone until all intrusive activities within that zone are complete. NOTE: Due to the close proximity of homes, it is possible for a home to be within the exclusion zones of intrusive operations taking place on several housing lots. Every effort will be made to minimize the disruption to residents of the community consistent with safety concerns. Once established, the exclusion zone will remain in effect until all intrusive and disposal activities within the zone boundaries have been completed. Once activities within the zone have been concluded, the SUXOS will direct closure of the zone, opening the area to normal activities.

4.2.7.2 Grid 35P4, OOU 11C, and OOU 11D - The UXO Team will excavate down to each anomaly and perform Explosive Ordnance Reconnaissance (EOR) procedures, assessing all suspect OE to determine their condition and potential hazards. Depths of initial excavations will not exceed four feet.

- Qualified UXO personnel will perform excavations so that identification procedures can be conducted. If the anomaly cannot be uncovered within the specified depth, the UXO Team will conspicuously mark the site with yellow flagging material and continue. The on-site CEHNC Safety Specialist will determine if deeper excavation is required.
- Engineering controls described in the Work Plan will be utilized during intrusive operation within Grid 17.
- If the subsurface contact proves to be non-UXO, it will be removed and the hole rechecked with the agreed-to geophysical instrument. If the hole is "clean," it will be refilled and tamped and recovered with the removed grid cover. If the contact is a UXO, it will be marked with a red pin flag for disposal as required.
- Each UXO will have its condition determined by qualified UXO personnel. UXO whose condition cannot be positively determined or is determined to be unsafe to move will be “blown-in-place”. Once the UXO is gone (removed or detonated) the hole will be rechecked with a geophysical instrument to ensure it is clear of anomalies.
- All access/excavation/detonation holes will be backfilled. Reseeding/sodding with indigenous grass will occur as directed in the SOW. If possible, UXO personnel will replace the sod ‘plug’ that was initially removed at the start of the excavation.

4.2.7.3 Grid 17 and Grid 40 - The UXO Team will excavate down to each anomaly and perform Explosive Ordnance Reconnaissance (EOR) procedures, assessing all suspect OE to determine their condition and potential hazards.

4.2.7.4 ZAPATAENGINEERING will conduct a clearance to depth in three small pits in Grid 17 and one pit in Grid 40. We assume a clearance effort of one week per pit for UXO operations. In the event that clearance depths of the pits exceed four feet, ZAPATAENGINEERING will develop safety measures in compliance with OSHA, CEHNC EM 385-1-1, and other pertinent regulations.

4.2.7.5 The Most Probable Munition (MPM) fragmentation distance for M15 White Phosphorus grenade is 517 feet, which will require the local residents to be evacuated as well as use of engineering controls. Engineering controls will consist of a portable canopy with adjustable legs, which will be positioned over the pit(s). For additional safety, the canopy will be covered with a fire resistant tarp (top and both sides, with the ends being open). The Croft Fire Department will stand ready to assist just outside of the fragmentation distance during intrusive operations (at no cost). As necessary, homes nearest the pits will be wetted down with a controlled spray by the local fire department. Residents within the fragmentation arc will be evacuated.

4.2.7.6 Based on aerial photographs, it appears that two residential homes are within the immediate vicinity of Grid 17. The CEHNC Guide for Selection and Siting of Barricades for Selected Unexploded Ordnance (HNC-ED-CS-S-96-8 R1 dtd Sep 97) used to determine the best methodology and calculations for providing a level of property protection to the nearby and surrounding residences. A barricade made of sufficient thickness (e.g., 0.09” of steel or 0.22” of aluminum), sized and sited in accordance with HNC-ED-CS-S-96-8 was determined to be the best method of defeating the fragmentation of the M15 WP grenade. Either a plate barricade design or a shed structure design will be used to mitigate the fragmentation hazard associated with Grid 17. Costs and practicability will be the determining factor on which design is used.

4.2.8 Barricade Siting

4.2.8.1 Plate Barricade Design - Barricades will be placed between the excavation and the structures and no closer than one foot of the pit area being excavated. A total of five barricades will be used during the excavation of the pits. Three barricades will be placed on the southern end of the pit and two barricades will be placed on the western edge of the pit in Grid 17. A minimum of one inch will be overlapped between barricades. This will provide an 11’ 8” x 10’ on the southern side and a 7’ 10” x 10’ on the western side. In the event that landscape exceeds a slope pitch of 10%, barricades will be leveled and stabilized using local engineered solutions such as sandbags and blocking materials. Barricades will be manufactured to allow movement by the excavation equipment.

4.2.8.2 Shed Structure Design - The shed will be of sufficient size to encompass the three pits within Grid 17 and still allow for safe excavation activities. The shed barricade will be a three-sided barricade with the open-end facing away from any nearby residents. The barricades will be leveled and stabilized using local engineered solutions such as sandbags and blocking materials. Barricades will be manufactured to allow movement by the excavation equipment.

4.2.9 Excavation

4.2.9.1 The pit will be excavated using a backhoe. If the backhoe cannot gain access to the backyard, the pits will be excavated by hand. The backhoe will be located outside of the engineering controls and the operator will extend the boom of the backhoe and excavate the pit in 12-inch lifts. Prior to removal of the 12-inch lifts of soil, the area will be magged to ensure OE is not within the area to be excavated. Excavation will commence at the point furthest from both houses and work towards them in a forward and to the right direction. Excavation will continue until there is no further evidence of UXO/OE or OE related scrap items. Spoils from each lift will be placed onto geotextile and manually searched by hand by the UXO Technicians for OE items. This process will be repeated for each lift until entire contents of the pit(s) have been excavated. Additionally a five-gallon bucket filled with water will be position adjacent to the excavation site in the event a smoking M15 grenade is encountered, which will be submerge into the water as quickly and gently as possible. Additionally acceptable-to-move M15 grenades will also be submerged in five-gallon buckets of water for transport to the disposal area. Grid 17 will be geophysically mapped as a Quality Control check per Task 7 of the SOW, and the anomalies will be reacquired. Spoils determined to contain white phosphorus will be disposed of as Investigated Derived Waste (IDW), per Task 14 of the SOW. Non-contaminated spoils will be returned to the pit at the conclusion of the removal action.

4.2.9.2 Recovered M15 WP grenades will be transferred to the Spartanburg Sheriff’s Department Bomb Squad for disposal as has been done in the past. The submerged M15 WP grenades will be transferred to the Bomb Squad in five-gallon plastic buckets and they will transport it to their safe disposal area. The transfer will be documented on a DD Form 1348-A1 stating the quantity and to whom they were transferred to, and the date. This documentation will be included in the

Final Report. In accordance with the calculation sheets a 517-foot minimal separation distance for all personnel will be maintained from the disposal site while demolition activities are being performed. The Spartanburg Sheriff's Bomb Squad will be responsible for evacuation and maintaining the safety zone. If require ZAPATAENGINEERING will support the Spartanburg Sheriff's Bomb Squad in maintaining perimeter security and other duties as assigned by the Bomb Squad.

4.2.9.3 The excavation will be backfilled with a mix of the soil that was removed for the pit and sand. The sand mix will establish the boundaries of the pits that were excavated. Once each section is excavated, the barricades will be repositioned prior to excavation of the next section of the pit. This process will position the excavator on or in areas free of UXO/OE items (outside of the pit area or in areas that have been previously cleared) thereby affording an additional level of safety. Additionally, in order to afford a level of protection to the equipment operator operating the excavator, the exposed areas of the excavator will be covered using "Lexan" (3.78") or the equivalent thickness of Plexiglas (approx 2.5").

4.2.9.4 Grid 40

The Project Team will conduct a subsurface OE Removal Action in one small pit within Grid 40 of OOU 3. The subsurface clearance will be conducted using an UXO team consisting of UXO Technicians. This site does not have a most-probable-munition (MPM) fragmentation distance as no UXO or OE-related scrap was recovered during the previous investigation. Only 105mm smoke canisters (Hexachlorathane Zinc) were recovered; therefore, engineering controls will not be required for this site and the pit will be excavated with an extended boom backhoe (preferred method) or excavated by hand if the backhoe cannot access the area. The spoils will be placed onto geotextile and visually searched by hand by the UXO Technicians for OE items. This process will be repeated until entire contents of the pit have been excavated. Grid 40 will be geophysically mapped as a Quality Control check per Task 7 of the SOW, and the anomalies will be reacquired. Non-contaminated spoils will be returned to the pit at the conclusion of the removal action. Any recovered 105mm smoke canisters will be package, transported, and disposed of by incineration utilizing Clean Harbors, Inc. in accordance with the Work Plan.

4.2.9.5 Grid 35P4

ZAPATAENGINEERING will not totally rely on the previous contractors data for completeness of the previous removal effort. As such, we will conduct a subsurface OE removal to a depth of detection on approximately 0.657 acres to ensure completeness of the previously conducted removal. Grid 35P4 will be geophysically mapped as a Quality Control check per Task 7 of the SOW, and the anomalies will be reacquired. The MPM fragmentation distance for a MKII grenade is 650 feet, which will be plotted onto a map to determine where the fragmentation distance would fall. Since this area is in a residential area, engineering controls (i.e., miniature open-front barricades) will be required. As this area has been cleared under a separate removal action, we estimate seven target items for removal.

4.2.10 Environmental Sampling

Environmental Sampling will be conducted in accordance with Appendix E.

4.2.11 Backfilling Operations

Once the contaminated soil is removed, and analytical results indicating the extent of contamination has been removed are accepted by CEHNC, the pit will be backfilled with the material removed as overburden. Compaction will take place in 6" lifts using two passes of a walk-behind vibratory compactor.

4.2.12 Demobilization

Site demobilization activities will be conducted and supervised by the ZAPATAENGINEERING UXO QCS/SO in coordination with supporting U.S. Army organizations. Site demobilization will include the following activities:

1. Final grading of excavation surface.
2. Seed excavation surface.
3. Demobilize excavator.
4. Clean up and remove equipment from logistical area.
5. Remove potable water supply from site.
6. Remove Port-A-John(s), hand washing facilities, non-hazardous waste receptacles, and potable water containers from the site.

4.3 ON-SITE HAZARDS AND PREVENTATIVE MEASURES

4.3.1 Chemical Hazards

4.3.1.1 Chemical Warfare Materiel (CWM)

A review of the available documentation provides no evidence to suggest that Chemical Warfare Materiel (CWM) were deployed or stored at the site. In the past, it was an acceptable practice to bury expended training residue. Because of these practices, site personnel will remain vigilant for possible riot control and other hazardous materials. In the unlikely event that CWM is encountered during operations, all work will immediately cease. Site personnel will withdraw along cleared paths upwind from the discovery. A team consisting of a minimum of two personnel will secure the area to prevent unauthorized access. Personnel should position themselves as far upwind as possible while still maintaining security of the area.

4.3.1.2 White Phosphorus (WP)

4.3.1.2.1 White phosphorus is the primary contaminant of concern at Grid 17. It is a white to yellow transparent crystalline solid with a waxy appearance and a molecular formula of P_4. It is highly flammable and may spontaneously ignite on contact with air producing irritating or toxic fumes (phosphorus oxide) in a fire. It reacts with oxygen and water to form strong acids and combines with metals like copper to form dark-colored inactive salts. Table D-3 lists the physical and chemical properties of white phosphorus.

TABLE D-3 WHITE PHOSPHORUS PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical Properties	
Property	**Value**
Chemical Formula	P_4
Molecular Weight	124.11
Physical State	White or pale yellow, translucent, crystalline solid with a waxy consistency.
Boiling Point	280^{o}C
Vapor Pressure	0.026 mm Hg @ 20^{o}C (68^{o}F)
Solubility in Water	Insoluble in water
Freezing Point	44^{o}C
Flashpoint	Ignites spontaneously in air or above 30^{o}C

4.3.1.2.2 White phosphorus is a poison, which can be absorbed into the body by inhalation of its vapor, by skin contact, and by ingestion. If combustion occurs within an excavation, white phosphorus smoke will remove the oxygen from the air and render the air unfit to support life. Long-term absorption, particularly through the lungs and the gastrointestinal tract, can cause poisoning, which leads to weakness, anemia, loss of appetite, gastrointestinal weakness, and pallor. Table D-5 lists exposure symptoms and toxicological information.

4.3.1.2.3 Eating or drinking less than one teaspoon of white phosphorus can cause vomiting; stomach cramps; liver, heart, or kidney damage; drowsiness; and even death. Being burned with white phosphorus can cause heart, liver, and kidney damage. Breathing white phosphorus may damage lungs and throat.

4.3.1.2.4 White phosphorus can cause changes in the long bones; seriously affected bones can become brittle, leading to spontaneous fractures. White phosphorus is especially hazardous to the eyes and can severely damage them. High concentrations of the vapors are irritating to the nose, throat, lungs, skin, eyes, and mucus membranes.

4.3.1.2.5 Breathing white phosphorous can cause coughing and the development of a condition known as phossy jaw (poor wound healing in the mouth and a breakdown of the jawbone). The most common symptom of exposure to white phosphorus is necrosis of the jaw. Exposure to white phosphorus can also cause nausea, jaundice, anemia, cachexia, dental pain, and excess saliva.

4.3.1.2.6 White phosphorous can cause thermal injury and hygroscopic damage by absorbing water from surrounding tissues. White phosphorus particles can burn on the surface of the skin or penetrate deep into tissues when carried on shrapnel particles. Local destruction of tissues continues as long as white phosphorus is exposed to oxygen.

4.3.1.2.7 The American Conference of Governmental Industrial Hygienists (ACGIH) within their 2003 Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) has established an 8-hour Time Weighted Average (TWA) of 0.1 mg/m^3. The National Institute of Occupational Safety and Health (NIOSH) has established an Immediately Dangerous to Life and Health (IDLH) level of 5 mg/m^3 (NIOSH, 1997). A dust monitor will be used to monitor airborne particulates while excavating. If the dust monitor readings exceed the 8-hour TWA for white phosphorus, all personnel will evacuate to an upwind rally point that is at least 300 feet from the excavation and the UXO QCS/SO shall monitor the rally point to verify that white phosphorus smoke particulates are below the 8-hour TWA. Dust suppression will be utilized to control any airborne particulates. Work will not resume without consulting the ZAPATAENGINEERING Safety and Health Manager, and dust monitoring readings drop below the 8-hour TWA.

4.3.1.2.8 If white phosphorus is encountered and it combusts and/or smokes, all personnel will evacuate to an upwind rally point that is at least 517 feet from the work site and the UXO QCS/SO shall monitor the rally point to verify that white phosphorus smoke particulates are below the 8-hour TWA.

4.3.1.3 Hexachloroethane-ZincOxide (HC) Smoke

4.3.1.3.1 Hexachloroethane-ZincOxide (HC) Smoke is the primary contaminant of concern at Grid 40. It is a combination of hexachloroethane (47%), aluminum powder (6%), and zinc oxide (47%). On burning, the mixture produces zinc chloride, which rapidly absorbs moisture from the air to form a grayish white smoke. The more humid the air, the more dense the HC smoke. This smoke can be dispersed by grenades, candles, pots, artillery shells, and special air bombs. HC smoke has a sweetish, acrid odor, even at moderate concentrations. Table D-4 lists the physical and chemical properties of hexachloroethane-zincoxide.

TABLE D-4 HEXACHLOROETHANE-ZINCOXIDE PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical Properties	
Property	**Value**
Chemical Formula	$Al+ZnO+C_2Cl_6$
Molecular Weight	NA
Physical State	Solid, grayish in color.
Boiling Point	None
Solubility in Water	May decompose if wet
Freezing Point	None

4.3.1.3.2 HC smoke can elicit nose, throat, and chest irritation, cough, and slight nausea in some individuals. At high concentrations, severe respiratory distress is present which may be fatal. Table D-5 lists exposure symptoms and toxicological information.

4.3.1.3.3 Pathology. Primary damage is largely confined to the upper respiratory tract and is due to the irritant and corrosive action of zinc chloride. Hyperemia of the larynx, trachea, and large bronchi occur, along with functional narrowing of the smaller air passages. In severe exposures, chemical pneumonia with some pulmonary edema appears. Growth of cuboidal epithelium from the bronchioles into the alveoli (sometimes completely lining or filling the alveoli) is often seen in fatal cases, with widespread evidences of anoxia (bronchiolitis fibrosa obliterans).

4.3.1.3.4 Symptoms. Case reports of accidental exposure to moderate and high concentrations of HC smoke have shown a syndrome, which includes delayed onset of more severe symptoms and slow resolution. The immediate signs or symptoms include tightness in the chest, sore throat or hoarseness, and cough. At higher exposure levels there is paroxysmal coughing, nausea, and retching. With supportive therapy, these symptoms disappear rapidly and the patient appears normal within 6 hours. The onset of fever, rapid pulse rate, malaise, shortness of breath, retrosternal pain, abdominal cramps, and cyanosis can occur up to 48 hours after exposure. Chest x-rays associated with severe exposures have demonstrated a dense, diffuse, infiltrative process present in one or both lung field(s). Repeat chest x-ray films will show progression of the infiltrate even though the physical examination of the chest is normal. Final resolution of the infiltrate may be delayed for a month or longer, even though the patient is asymptomatic during this period. In fatal cases, shock and respiratory insufficiency, as well as infection, are the causes of death.

4.3.1.3.5 Treatment by Medical Physicians. The early symptoms due to bronchial constriction may be relieved by the subcutaneous injection of 0.5 mg (0.5 ml of a 1:1000 solution) of epinephrine hydrochloride, repeated in 20 to 30 minutes if necessary. Aspirin will help relieve general discomfort. If exposure has been heavy, administer British Anti-Lewisite (BAL) in oil intramuscularly (IM). The dose and procedure are the same as for arsenical vesicants, except that injections are continued for 48 hours at 4-hour intervals. Therapeutic efficacy of BAL in oil has been challenged. Steroid therapy has been considered efficacious and oxygen therapy required.

4.3.1.3.6 Prognosis. The prognosis is related entirely to the extent of the pulmonary damage. All exposed individuals should be kept under observation for at least 48 hours. Most individuals recover in a few days. At moderate exposures, some symptoms may persist for 1 to 2 weeks. In severe exposures, survivors may have reduced pulmonary function for some months after exposure. The severely exposed patient may progressively develop marked dyspnea, cyanosis, and die.

TABLE D-5 POTENTIAL CONCERN, EXPOSURE SYMPTOMS, AND TOXICOLOGICAL INFORMATION

Chemical Name	CAS	PEL/TLV 8-Hr Time-Weighted Average	STEL (ppm)	Exposure Symptoms and Toxicological Information
White Phosphorus	7723-14-0	0.1 mg/m^3	NE	**Symptoms:** eyes and respiratory system irritant; eye and skin burns; abdominal pain; nausea; jaundice; anemia; cachexia; dental

		(OSHA) 0.1 mg/m^3 (ACGIH)		pain; salivation; jaw pain; swelling. **Target Organs**: eyes, skin, respiratory system, liver, kidneys, jaw, teeth, blood.
Hexachloroethane-ZincOxide	67-72-1 1314-13-2	10 mg/m^3 15 mg/m^3 (OSHA) total dust 5mg/m^3 resp. dust	None	**Symptoms:** immediate signs or symptoms include tightness in the chest, sore throat or hoarseness, and cough. At higher exposure levels there is paroxysmal coughing, nausea, and retching. **Target Organs**: eyes and respiratory system.

CAS = Chemical Abstract System
PEL = OSHA Permissible Exposure Limit
TLV = 2003 American Conference of Governmental Industrial Hygienists Threshold Limit Values and Biological Exposure Indices
ppm = Parts per million
STEL = Short-Term Exposure Limit as a 15-minute time-weighted average
NE = Not Established

4.4 PHYSICAL HAZARDS

4.4.1 Heat/Cold Stress

Heat/Cold Stress disorders and monitoring procedures are detailed in Section 15 of this plan.

4.4.2 Tornado

4.4.2.1 A tornado appears as a rotating, funnel-shaped cloud that spins like a top – striking the ground with winds that can exceed 200 miles per hour. While they can occur at any time of the year, tornadoes appear most often in the late afternoons of April, May, and June.

4.4.2.2 A "Tornado Watch" means that tornadoes, severe thunderstorms, or both are possible. Stay tuned to area radio/television reports and keep a watch on the sky. A "Tornado Warning" means that tornadoes have been sighted; take immediate shelter.

4.4.2.3 When a tornado is sighted:

- Take immediate shelter and stay away from windows, doors, and outside walls.
- Go to the lowest interior level of a building and seek shelter under a study table.
- If in a vehicle, immediately exit and seek more substantial shelter.
- If there is no shelter nearby lie flat in the nearest ditch, ravine, or culvert with your hands shielding your head.

4.4.3 Thunderstorm

4.4.3.1 Severe thunderstorms are one of the most common natural hazards.

4.4.3.2 Large hail can cause serious injury, so avoid the outdoors while a storm is in progress. Shelter vehicles to prevent costly damage.

4.4.3.3 Flash floods often occur without warning following heavy upstream rainfall. Drainage canals, streambeds, canyons, or areas downstream from a dam are potential flood areas. Monitor current weather conditions and review evacuation plans. Roads and trails that parallel existing drainage systems may be swept away by floodwaters. When a flash flood warning is issued, or you realize a flash flood is coming, go to high ground immediately, don't drive through already flooded areas, and do not attempt to cross a flowing stream on foot where the water is above your knees.

4.4.4 Lightning

4.4.4.1 Electrical storms occur during the spring, summer, and fall. Since the storms are often fast moving, field personnel should watch for indications of electrical storms (forecasts should be covered in the morning safety briefing).

4.4.4.2 The distance to an electrical storm can be estimated by observing the interval between the lightning flash and the sound of the thunder. Since sound travels approximately 1,100 feet per second, an interval of five seconds corresponds to a storm distance of approximately 1-mile.

4.4.4.3 If caught in the open by an electrical storm, all personnel will immediately seek shelter in their vehicle. In the event that their vehicle is inaccessible, personnel should follow these rules:

- Move to a topographically low area, away from tall objects and conductors (trees, transformers, fences, pipelines, power lines, metal sheds) and wait for the storm to leave the area.
- If you feel your hair stand on end (an indicator that lightning is about to strike), drop to your knees and bend forward, putting your hands on your knees. Do not lie flat on the ground.

4.4.5 Exertion

Each day and more often if environmental conditions warrant the UXOSO will establish a work/rest regimen that is conducive to the on-site conditions in accordance with the SSHP. Personnel are to adhere to this regimen to alleviate impacts from over exertion.

4.4.6 Repetitive Motion

4.4.6.1 Repetitive motion injuries or, more specifically, occupationally related motion disorders, are now common problems. Numerous terms, including cumulative trauma disorder (CTD), overuse syndrome, repetitive stress injury, and repetition strain injury, have been used to describe this disorder. In the United States, CTD is the preferred label.

4.4.6.2 Many different symptoms can arise from the accumulation of small injuries or stresses to the body. CTD is not so much a disease as it is a response to excessive demands that we place on our bodies - without giving them adequate time to recover between. CTD results form a combination of muscle tension, repetitive motion, over use, and incorrect motion.

4.4.6.3 Forward head posture is one of the leading risk factors for CTD. It is also known as slouching, or rounded-shoulders. In this posture, the weight of the head is no longer being carried directly over the spine. Instead, the head is moved forward ahead of the spine. This mechanically increases the weight of the head on the neck by about 300 percent. The rounding forward of the shoulders produces a stretch weakness of the posture muscles of the upper back which must also work to hold the head upright. Therefore, the load on these muscles is dramatically increased while their strength is significantly decreased. This can lead to several chronic muscle problems in the upper back.

4.4.6.4 When the upper back is rounded forward, the head must bend backward slightly on the neck to restore level vision. This can cause pressure to the soft tissues at the base of the skull and can lead to chronic headaches.

4.4.6.5 The forward posture of the head on the neck causes the muscles under the chin to be pulled tight, which can pull the jaw back, causing pressure and irritation in the joint where the jaw attaches to the skull. Forward head posture also moves the shoulder joint from the side of the body toward the front of the body, causing pressure on the shoulder joint tendons, risking shoulder tendentious. Finally, this position of the head on the neck can cause the lateral neck muscles to shorten, causing pressure on the nerves and blood vessels passing through these muscles on their way to the working arm.

4.4.6.6 Another commonly overlooked but very significant CTD risk factor is lack of upper extremity support. Some tasks require the holding of arms up slightly all day, fighting gravity. This is hard work for the neck and shoulder muscles and magnifies the stresses described for forward head posture. One of the best ways to reduce excessive work fatigue and forward head posture stresses is to arrange the work so that there is some space available for the arms to rest, even if only for a split second. This can greatly reduce the physical work of sustained posture.

4.4.6.7 Posture plays a significant role in CTD. Slouching with the spine or leaning with the head puts the body out of balance and causes the limbs to be stretched or bent awkwardly. The neutral spine position starts with the three natural curves of the spine - the inward curve of the neck (cervical) region, the outward curve of the mid back (thoracic) region, and the inward curve of the lower back (lumbar) region. Too much bending (flexing) or straightening (extension) in either the cervical or lumbar region takes the spine out of its neutral position and increases the risk of injury.

4.4.6.8 In summary, to avoid CTD, exercise the following precautions:

- Instead of leaning with the head, rotate the upper body forward at the hips.
- Instead of slouching, rotate the upper body forward at the hips.
- Instead of bending or lifting with a flexed lumbar spine, rotate the upper body forward at the hips.
- Take breaks as required.
- Don't be a statue.
- Avoid caffeine and tobacco.

4.5 SAFETY HAZARDS

4.5.1 UXO

4.5.1.1 Safety is a primary concern. The most obvious safety requirements are to protect personnel, the general public, and the environment from the effects of fire, blast, noise, fragmentation, premature detonation, and toxic releases.

4.5.1.2 UXO escort is required for non-UXO personnel in areas that have not been previously cleared of UXO. Non-UXO personnel will follow the directions of their UXO escort.

4.5.1.3 Refer to the following sections of this plan for safety precautions related to:

- UXO Safety –Section 16.5 UXO Safety
- Intrusive/Excavation Safety – Section 16.3 Excavation Safety
- UXO Disposition Safety – Section 16.4 UXO Disposition Safety

4.5.2 Slips, Trips, and Falls

Protruding objects, careless movements, and placement of materials on pathways can cause slips, trips, and falls. To prevent these injuries:

- Be alert to obstacles in your path
- Maintain proper footing
- Remove tripping hazards, when encountered
- Maintain three points of contact when working on elevated equipment (If working on elevated equipment above 6', fall protection must be incorporated per OSHA 29 CFR 1926, subpart M)
- Stay at least two feet away from the edge of any excavation

4.5.3 Cuts

4.5.3.1 Personnel shall wear, inspect, and maintain designated PPE equipment and supplies. Personnel shall ensure cutting devices are properly stored when not in use.

4.5.3.2 The following shall be used to control minor bleeding:

- Wear surgical gloves or some other barrier, place sterile gauze/cloth over the bleeding area and apply direct pressure. Do not removed blood-soaked bandage; add more to the top.
- If bleeding persists, elevate the area to help reduce blood flow and continue applying direct pressure to the bleeding area.
- If bleeding still continues, apply pressure at a pressure point (brachial or femural) and continue with direct pressure over the wound.
- Seek medical attention.

4.6 BIOLOGICAL HAZARDS

4.6.1 Spiders

Use extreme caution when lifting manhole covers, sumps, etc., since spiders are typically found in these areas.

4.6.1.1 Black Widow Spider (Latrodectus Mactans)

4.6.1.1.1 Signs and Symptoms—Determining whether a Black Widow Spider has bitten a person is difficult. The victim will experience:

- A sharp pinprick of the spider's bite may be felt, although some victims are not even aware of the bite. In no more than 15 minutes, a dull, numbing pain develops in the bitten area.
- A faint red bite mark appears.

- Muscle stiffness and cramps—usually affecting the abdomen when the bite is in the lower part of the body or legs, and affecting the shoulders, back, or chest when the bite is on the upper body or arms.
- Headache, chills, fever, heavy sweating, dizziness, nausea, vomiting, and severe abdominal pain.

4.6.1.1.2 First Aid

- If possible, catch the spider to confirm its identity. Even if the body is crushed, save it for identification.
- Clean the bitten area with soap and water or rubbing alcohol. Do not apply a constricting band because the black widow venom's action is swift; there is little to be gained by trying to slow absorption with a constriction band.
- To relieve pain, place an ice pack over the bite.
- Keep the victim quiet and monitor breathing
- Seek immediate medical attention.

4.6.1.2 Brown Recluse or Violin Spider (Lox Osceles Reclusa)

4.6.1.2.1 This is a brown spider that resides primarily in the Midwest. Its color markings are light tan to brown with a violin-shaped figure on its back. With legs extended it is approximately the size of a quarter.

4.6.1.2.2 Signs and Symptoms

- The initial pain may be slight enough to be overlooked.
- A blister at the bite site, along with redness and swelling, appears after several hours.
- Pain, which may remain mild but can become severe, develops within two to eight hours at the bite sight.
- Fever, weakness, vomiting, joint pain, and a rash may occur.
- An ulcer forms within a week; gangrene may develop in some cases.

4.6.1.2.3 First Aid

- If possible, catch the spider to confirm its identity. Even if the body is crushed, save it.
- Clean the bitten area with soap and water or rubbing alcohol.
- To relieve pain, place an ice pack over the bite.
- Keep the victim quiet and monitor breathing.
- Seek immediate medical attention.

4.6.1.3 Ticks

4.6.1.3.1 Lyme Disease is caused by a bacterium, which may be transmitted by the bite of a tick. Ticks carrying Lyme Disease may be found throughout the U. S. living in grassy and wooded areas, and feeding on mammals such as mice, shrews, birds, raccoons, opossums, deer, and humans. Not all ticks are infected with the bacterium. When an infected tick bites, the bacterium is passed into the bloodstream of the host, where it multiplies. If detected early, Lyme Disease can be treated with antibiotics.

4.6.1.3.2 Remove ticks with small tweezers. Do not squeeze the tick's body. Grasp it where the mouth parts enter the skin and tug gently, but firmly, until it releases its hold on the skin. Save the tick in a jar labeled with the date, body location of the bite, and the place where it may have been acquired. Wipe the bite with antiseptic and seek medical attention as soon as possible.

4.6.1.3.3 The illness typically occurs in the summer months and is characterized by a slowly expanding red rash that develops a few days to a few weeks after the bite of an infected tick. The illness can be accompanied by flu-like symptoms, headache, stiff neck, fever, muscle aches, and/or general malaise. At this stage, treatment by a physician is usually effective; but if left alone, these early symptoms may disappear and more serious problems may follow. The most common late symptom of the untreated disease is arthritis; other problems include meningitis, neurological, and cardiac abnormalities. NOTE: some people do not get the characteristic rash but progress directly to the later manifestations. Treatment of follow-on symptoms is more difficult than early symptoms and is not always successful.

4.6.1.3.4 Rocky Mountain Spotted Fever is another tick borne disease. Nearly all cases of infection occur in the spring and summer, generally several days after exposure to infected ticks. The onset of illness is abrupt and often accompanied by high fever, headache, chills, and severe weakness. After the fourth day of fever, victims develop a spotted pink rash that usually starts on the hands and feet and gradually extends to most of the body. Early detection and treatment significantly reduces the severity of illness. The disease responds to antibiotic therapy with tetracycline or chloramphenicol.

4.6.1.3.5 Precautions:

- Wear long pants and long sleeved shirts that fit tightly at the ankles and wrists; tape cuffs if necessary.
- Wear light colored clothing so ticks can be easily spotted.
- The UXOSO will supply insect repellent containing "DEET" and also permethrin to all field personnel. “DEET” should be used on exposed skin surfaces [except eyes and lips] and permethrin to field clothing. Apply and use following manufacturers instructions.
- Inspect head and body thoroughly when you return from the field.
- Remove any ticks by tugging with tweezers. Do not squeeze or crush the tick.

4.6.2 Poison Ivy/Poison Oak/Poison Sumac

4.6.2.1 Poison Ivy, Poison Oak, and Poison Sumac may cause severe skin reaction on contact. The plants are poisonous to the touch, frequently producing severe inflammation and blisters. These are woody shrubs or vines, and the leaves are arranged in an alternate pattern on the vine.

4.6.2.2 These plants grow throughout the United States, and they are woody shrubs or vines that sometimes run horizontally and underground for several yards. Their most distinctive features are their leaves, which are composed of three leaflets that are 1-2 inches long and pointed at the tip (Figure D-1). They may be toothed, smooth, or lobed, all occurring on the same plant. In the fall, the foliage turns bright red or reddish yellow.

4.6.2.3 These plants have greenish-white flowers and clustered berries.

FIGURE D-1 POISON IVY/POISON OAK/POISON SUMAC

Poison Ivy	Poison Oak	Poison Sumac
		

4.6.3 Snakes and Reptiles

4.6.3.1 Venomous Snakes

4.6.3.1.1 Several varieties of venomous snakes are indigenous to the work area including rattlesnake, copperhead, eastern coral snake, and water moccasin (also called cotton mouth snake). Venoms are complex poisons that vary greatly in composition and potency among species and individuals. With the exception of coloration and the rattlesnakes' rattles, most venomous snakes share some common physical characteristics including a triangular shaped head, a facial pit, elliptical pupils and foldable fangs. Please see Table D-6 for snake identification features.

4.6.3.1.2 A snakebite is usually characterized by pain and swelling at the site of the bite and a general skin discoloration. The manifestations of the bite include general weakness, rapid pulse, nausea and vomiting, and shortness of breath.

TABLE D-6 SNAKE IDENTIFICATION FEATURES

Feature	Poisonous	Non-Poisonous
Eye Pupils	Elliptical, or cat-like	Round
Sensing Pits	Pit between the eyelids and nostrils	No pit between the eyelids and nostrils
Teeth	Two enlarged teeth (fangs) in front of the upper jaw	All teeth are approximately the same size
Scales	Form a single row on the underside and below the tail	Arranged in a double row on the underside of the tail
Head	Head much wider than the neck	Head slightly wider than the neck
Tail	Single anal plate	Divided anal plate

4.6.3.1.3 Get the victim to the hospital and professional medical care. Meanwhile, the following first aid measures should be taken:

- Calm and reassure the patient. Keep the patient as still as possible and do not allow him to run, or move about unnecessarily.
- Remove any constricting items, such as jewelry, from the affected limb.
- When practical immobilize the affected limb at approximately heart level or below.
- The victim should remain in a comfortable prone position and body temperature should be stabilized to minimize shock.
- The bitten area may be washed with soap and water and blotted dry with sterile gauze, dressings, and bandages.
- Transport to a medical facility for evaluation and treatment. Do not delay evacuation.

4.6.3.1.4 Prevention of Snakebite—The best snakebite treatment is to avoid getting bitten. The following suggestions will help in this process:

- Watch where you sit, and where you put your hands and feet.
- Avoid rock piles, stacks of old boards, and brush in wooded areas. If movement is necessary, use a remote means to initially relocate the material. Prior to entering a heavily wooded or brush area, look and listen carefully.
- Never handle "dead" snakes; they may not be completely dead.
- Do not attempt to capture or kill snakes.

5.0 TRAINING

All personnel will receive safety and health indoctrination, site-specific training, and continuing training to enable them to perform their assigned tasks safely and efficiently. Applicable training certificates for on-site personnel will be maintained on-site and available to the Contracting Officer for review.

5.1 WORKER GENERAL TRAINING REQUIREMENTS

5.1.1 All ZAPATAENGINEERING employees, subcontractors, and visitors at the site who may be exposed to hazardous substances, health hazards, or safety hazards will receive site-specific training before they are permitted to engage in site operations. Personnel will not be permitted to participate in or supervise field activities until they have been trained to a level required by their specific job function and responsibility.

5.1.2 Subcontractor personnel and visitors to the ZAPATAENGINEERING UXO QCS/SO prior to entering the site will present certification for completion of a 40-hour hazardous site workers course and an 8-hour annual re-certification, as appropriate. This certification will be maintained on- site for the duration of the project. Individuals without proper records of their training will not be permitted to work on-site.

5.1.1 Initial Training Requirements

General site workers engaged in hazardous substance removal or other activities that expose or potentially expose workers to hazardous substances and health hazards will receive a minimum of 40 hours of OSHA 1926.65 off-site instruction, as well as a minimum of three (3) days actual field experience under the direct supervision of a trained, experienced supervisor.

5.1.2 Supervisor Training

On-site management and supervisors directly responsible for, or who supervise employees engaged in hazardous waste operations will receive OSHA 1926.65, 40-hour initial training, three days of supervised field experience, and at least eight additional hours of specialized supervisory training.

5.1.3 Refresher Training

Employees, managers, and supervisors will receive eight hours of refresher training annually.

5.1.4 Site-Specific Training

A site safety and health briefing will be carried out by the UXOSO prior to personnel beginning work at the site. This will consist of a review of the specific hazards of concern, risks, symptoms of exposure, and an overview of the SSHP to include:

- Requirements and responsibilities for accident prevention and maintaining safe and healthful work environments;
- General safety and health policy and procedures and pertinent provisions of the SSHP;
- Employee and supervisor responsibilities for reporting all accidents;
- Provisions for medical facilities and emergency response, and procedures for obtaining medical treatment or emergency assistance;

- Procedures for reporting and correcting unsafe conditions or practices;
- Job hazards and the means to control/eliminate those hazards, including applicable Activity Hazard Analyses;
- Names of the UXO QCS/SO, Corporate Health and Safety Manager, and Site Manager responsible for project health and safety;
- Safety, health, and other hazards present on the project site;
- Use and training in the PPE to be used on the project site;
- Safe use of engineering controls and equipment on the project site;
- Medical surveillance requirements for the project site including recognition of symptoms and signs indicative of overexposure to identified hazards; and
- Spill containment procedures to be used at the project site.

5.1.5 Daily Safety Training Sessions

Daily on-site training sessions will be conducted by the UXO QCS/SO for site personnel prior to the start of each day’s activities. The training will address safety and health procedures; work practices; any changes in the SSHP, activity hazard analyses, work tasks, or schedule; results of the previous week's air monitoring; and review of safety discrepancies and accidents. Should an operational change affecting on-site fieldwork be made, a meeting prior to implementation of the change will be convened to explain safety and health procedures. Site-specific training sessions for new personnel, visitors, and suppliers will be conducted by the UXO QCS/SO.

5.1.6 Hazard Communication

The ZAPATAENGINEERING UXOSO will be responsible for implementing a Hazard Communication Program at the project site (29 CFR 1926.59). The following elements will be addressed, as a minimum:

- Maintain a current inventory of all potentially hazardous commercial chemical products brought on site by subcontractors.
- Material Safety Data Sheets (MSDSs) will be provided to the ZAPATAENGINEERING SSHO for all commercial chemical products brought onto the site by subcontractors.
- The MSDSs will be reviewed by the ZAPATAENGINEERING SSHO to verify correct use and appropriate issue of PPE as applicable. The MSDSs will be discussed at the next day’s tailgate safety meeting with site personnel (29 CFR 1926.59).

All containers of commercial chemical products brought onto the site will have manufacturer’s labels, will be in plain view, and identify container contents and warnings.

5.1.7 CPR and First Aid Certifications

The Project Manager and UXOSO are certified in CPR and first aid by the American Red Cross. At least two certified personnel will be on-site at all times.

6.0 PERSONNEL PROTECTIVE EQUIPMENT (PPE)

6.0.1 This section addresses 29 CFR 1926.65, 29 CFR 1910.134, and 29 CFR 1910.132 as incorporated by reference. In general, engineering controls and administrative controls will be instituted before PPE. Level D PPE is anticipated for site activities to include safety shoes/boots, hard hats when overhead hazards exists, impact safety glasses or goggles during eye hazardous operations, hearing protection devices, ear plugs and/or muffs during noise hazardous operations. When excavating WP M 15 grenades, Nomex Coveralls, work gloves (cotton, leather, or asbestos), and a face shield will be utilized. In addition, a five-gallon bucket with water, mud, and wet sand will be positioned near the excavation site.

6.0.2 Personnel will be physically able, medically qualified, and trained to wear the PPE required at the project site. Personnel will be proficient in proper PPE wear, maintenance, inspection, and testing. They must be knowledgeable of the PPE limitations and reduced performance levels.

6.0.3 Protective equipment must be maintained in a serviceable condition at all times. Defective equipment will not be used. Before being stored or reissued to another person, equipment must be leaned, disinfected, inspected, and repaired (if necessary) by ZAPATAENGINEERING UXO QCS/SO.

6.0.4 PPE will be selected to reduce contaminant levels below published occupational exposure limits, e.g., OSHA Permissible Exposure Limits (PELs) or ACGIH threshold Limit Values (TVLs). The goal is to keep potential exposure levels as low as reasonably achievable. The work site as described in the SOW is a Non-CWM project, and as such a Level D protection will be initiated upon arrival (i.e. work boots and long pants). It is not anticipated that respiratory protection will be required during this project. If site conditions change and warrant an upgrade, personnel will stop work, evacuate the area, and the UXO QCS/SO (in conjunction with the CIH and in consultation with the CEHNC On-Site Safety Specialist) will direct required PPE upgrades.

6.1 EMPLOYEE-PROVIDED EQUIPMENT

Employee-provided equipment must meet or exceed the standards ZAPATAENGINEERING is required to meet at the job site.

7.0 MEDICAL SURVEILLANCE

7.0.1 All on-site personnel will participate in medical surveillance, in accordance with 29 CFR 1926.65(f) and 29 CFR 1910.120. The program will consist of a baseline examination and an annual re-examination.

7.0.2 Medical examinations will be conducted under the supervision of a licensed physician who is board eligible in Occupational Medicine by the American Board of Preventive Medicine.

7.0.3 ZAPATAENGINEERING and the physician shall determine the minimum content and frequency of the medical examinations/tests, based upon probable site conditions, potential occupational exposures, and required protective equipment.

7.0.4 The written opinion of the attending physician will be maintained on-site and made available to the Contracting Officer for review.

8.0 RADIATION MONITORING

A review of the Scope of Work and available documentation indicates that there are no radiation hazards associated with this site.

9.0 ENVIRONMENTAL AND PERSONAL MONITORING

9.1 AIR MONITORING

9.1.1 Air monitoring will be conducted during all excavation activities within Grid 17.

9.1.2 The ZAPATAENGINEERING UXO QCS/SO will conduct monitoring. Air monitoring will be conducted to determine:

- Airborne concentrations of contaminants and adequacy of PPE and other control measures.
- Need for additional site controls.
- Airborne concentrations of contaminants that may potentially affect the public.

9.2 AIR MONITORING METHODS

9.2.1 CWM

CWM will not be monitored since there is no evidence that it is present at this site.

9.2.2 White Phosphorus/Dust Monitoring

The ZAPATAENGINEERING UXO QCS/SO will perform monitoring for airborne particulates during soil sifting operations using a direct reading particulate dust monitor (PDM)

9.2.3 Hexachloroethane-ZincOxide (HC) Monitoring

Airborne concentrations of HC smoke is not anticipated and will not be monitored for by ZAPATAENGINEERING.

9.3 AIR MONITORING LOCATIONS

9.3.1 Air monitoring will be monitored by the UXO QCS/SO initially at the start of each work cycle, at the end of each work cycle, and during operations at the discretion of the UXO QCS/SO for airborne dust during soil excavation operations.

9.4 AIR MONITORING EQUIPMENT

9.4.1 The ZAPATAENGINEERING UXO QCS/SO will conduct air monitoring at the excavation location using a direct reading dust monitor.

9.4.2 All monitoring instrumentation will be “field calibrated” by the UXO QCS/SO daily prior to the start of site activities according to the manufacturer’s specifications and the results entered on the Daily Instrument Calibration Check Sheet. Field calibration will be performed during use if the instrument malfunctions or at the discretion of the UXO QCS/SO. Monitoring results will be entered on the field notebook. At the conclusion of each day’s excavation activities, the UXO QCS/SO will monitor the location prior to securing the site.

9.5 ACTION LEVELS

9.5.1 The airborne concentration as published by American Conference of Governmental Industrial Hygienist (ACGIH) within their 2003 edition of Threshold Limit Values (TLV) for Chemical Substances and Physical Agents was used to establish the action levels for white phosphorus. See Table D-7.

TABLE D-7 AIRBORNE WHITE PHOSPHORUS ACTION LEVELS

Lower Explosive Limit Action Levels	
Meter Reading	**White Phosphorus Action Levels**
0-0.1 mg/m^3	No Hazard, Continue Operations
>0.1 mg/m^3	Potential White Phosphorus Smoke Hazard. Safely Terminate Operation and Evacuate the Immediate Work Area, UXO QCS/SO Investigate Hazard Potential

9.6 METEOROLOGICAL MONITORING

Meteorological monitoring will consist of the UXO QCS/SO using a portable emergency weather radio at the work site.

10.0 SITE CONTROL

The goal of this section is to outline the requirements needed to protect on site personnel, the environment, and the general public from task hazards, and exposures to hazardous conditions. The effectiveness of these procedures shall be assessed by the UXO QCS/SO as each task is conducted, and reassessed if new site information becomes available. If it becomes necessary, the ZAPATAENGINEERING SUXOS and CIH will amend the control procedures in this section.

10.1 WORK ZONE DELINEATION AND ACCESS POINTS

Operations will be conducted at Grid 17 and Grid 40 excavation. Once work zones are established, access points will be designated and announced at the morning safety meetings.

10.2 SITE WORK ZONES

Work zones will be delineated by caution tape or construction fence to control the flow of personnel and equipment between zones and to reduce the spread of hazardous materials to clean areas. These work zones also ensure that personnel are properly protected against the hazards and work activities and that contamination is confined to identified areas. Site work will be conducted within three distinctly marked areas: exclusion zone, contamination reduction zone, and the support zone. Figure D-2 shows a generalized site layout that includes the three work zones.

10.2.1 Exclusion Zone (EZ)

The excavation location boundary (20 feet by 20 feet) are defined as the EZ. The EZ boundary or hotline will be physically marked using caution tape or construction fence supported by wooden or metal poles. Access to the EZ will be controlled by the UXO QCS/SO.

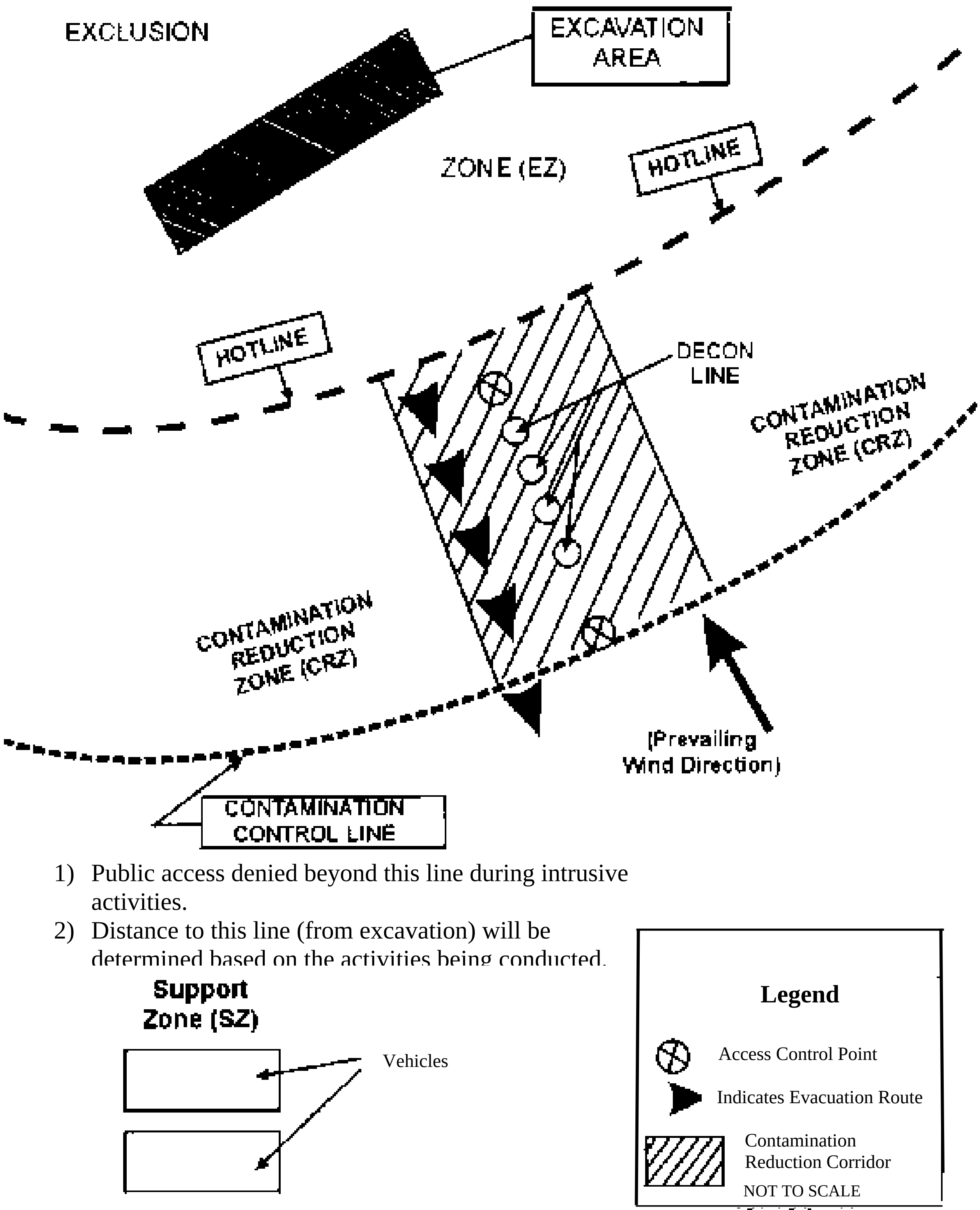
10.2.2 Contamination Reduction Zone (CRZ)

The CRZ is the transition zone between the EZ and Support Zone. This zone provides an area to prevent or reduce the transfer of hazardous materials that may have been picked up by personnel or equipment leaving the EZ. The heavy equipment and emergency personnel decontamination station (EPDS) will be located within the CRZ. The EPDS will consist of buckets of soap and water with brushes and/or sponges.

10.2.3 Support Zone (SZ)

The SZ is the non-contaminated area outside of the CRZ. A Port-A-John, hand washing facilities and temporary storage of clean drums will be located within this area.

FIGURE D-2 SITE WORK ZONES – GENERALIZED



10.3 ON-SITE COMMUNICATIONS

The on-site communications system will be handheld (5-watt) portable radios and cellular telephones.

10.4 OFF-SITE COMMUNICATIONS

Off-site communications will consist of the existing public telephone system in the hotel office and cellular telephones. This hotel facility is equipped with multiple telephone lines and facsimile capability. A cellular telephone will complement the hard-line telephone communications.

10.5 ACCESS CONTROL

The UXO team will report unauthorized personnel within the work area to the UXO QCS/SO. The UXO QCS/SO may request assistance from the local Police (See Table D-8 for emergency numbers) to remove the unauthorized personnel from the work area. In order to access a work area, authorized visitors must participate in a site-specific safety briefing and sign the visitor log prior to entering the work area. Intrusive operations must cease prior to visitor entry to the work area.

10.6 SECURITY

Field personnel will be alert to anyone entering without proper authorization and shall adhere to the guidelines stated in this document.

11.0 PERSONNEL AND EQUIPMENT DECONTAMINATION

11.1 PROCEDURES FOR HEAVY EQUIPMENT DECONTAMINATION

The excavator bucket will be decontaminated using sprayers prior to leaving the project site. In order to contain this decontamination water, the bucket will be positioned just above a 350-gallon tote used to contain water pumped from the excavation pit. Disposable equipment intended for one-time use will not be decontaminated after use, but will be packaged for appropriate disposal. Decontamination procedures are outlined below.

11.2 SOIL EQUIPMENT DECONTAMINATION

11.2.1 All sampling equipment that comes into contact with potentially contaminated media will be decontaminated. After addressing possible white phosphorus contamination, the following decontamination procedure will be utilized:

1. Non-phosphate detergent and tap-water (bottled water) wash, using a brush if necessary
2. Tap-water rinse
3. Isopropyl alcohol rinse
4. De-ionized/distilled water rinse 2x
5. Air dry. (Decontaminated sampling equipment will be wrapped in aluminum foil after decontamination and drying, if they are not to be immediately used.)

11.2.2 Decontamination will occur prior to and after each use of a piece of equipment. ZAPATAENGINEERING staff will decontaminate all sampling devices used, including trowels and augers.

11.3 PERSONNEL DECONTAMINATION

It is not anticipated that on-site personnel will come into contact with white phosphorus. However, if personnel are exposed to white phosphorus, they will be decontaminated prior to going to the hospital via an Emergency Personnel Decontamination Station (EPDS).

11.3.1 Emergency Decontamination and First Aid Procedures for White Phosphorus Contaminated Personnel

11.3.1.1 Inhalation

Move victim to fresh air immediately; perform artificial respiration if breathing has stopped; keep affected victim warm and at rest; seek medical attention immediately.

11.3.1.2 Eye Contact

Wash eyes with copious amounts of water immediately lifting the lower and upper lids occasionally; do not wear contact lenses when working with white phosphorus; seek medical attention immediately.

11.3.1.3 Skin Contact

Flush contaminated skin with water immediately; remove the clothing immediately and flush the skin with water. Contaminated personnel will have all burning or smoking white phosphorus scrapped off their skin. Personnel will then undergo a final scrub of soap and water. The burn location will be covered with a sterile water-based gel dressing until medical attention is obtained to prevent any remaining white phosphorus from burning. If the dressing starts to dry out, another dressing will be placed over the existing dressing.

11.3.1.4 Ingestion

If victim is conscious, give victim copious amounts of water immediately; induce vomiting after victim has swallowed the water; do not make unconscious person vomit; seek medical attention immediately.

12.0 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

Personnel must be prepared to immediately respond to emergency situations, and all required equipment must be readily available, in proper working order, and ready for use. To ensure rapid, effective response to an emergency, these emergency response and contingency procedures (developed in accordance with 29 CFR 1910.120 and 29 CFR 1926.65) shall be implemented prior to and during operations.

12.1 PRE-EMERGENCY PLANNING AND PROCEDURES

The following will ensure appropriate pre-emergency planning and procedures are in place:

- Upon mobilization, weekly, and during the morning safety meetings, personnel will be briefed by the UXO QCS/SO on:
  - Location of the nearest means of off-site communications
  - Evacuation routes (these will change as the project progresses)
  - Assembly points (these will change as the project progresses)
  - Location of directions to the hospital – posted in the break areas and maintained in the designated emergency vehicle and all personnel vehicles
  - Emergency telephone numbers (posted in all vehicles)
  - First Aid and PPE equipment shall be readily available

12.2 PERSONNEL ROLES, LINES OF AUTHORITY, COMMUNICATIONS

12.2.1 Immediate control will reduce jeopardizing on-site personnel and the surrounding community. The UXO QCS/SO will assume the responsibilities of the On Scene Incident Commander (OSIC). If the UXO QCS/SO is unavailable or incapacitated, the SUXOS will assume the role. The OSIC will direct all on-site and off-site response personnel and the level of response being dictated by the severity of the situation.

12.2.2 Communications consist of a combination of hand-held radios, commercial telephones, and cellular telephones.

12.3 EMERGENCY CONTACTS

Table D-8 is a list of Emergency Telephone Numbers that will be posted in all site vehicles and available for all personnel in case of an emergency.

12.4 EMERGENCY RECOGNITION AND PREVENTION

At the morning safety meetings, employees will be briefed on new developments, tasks, hazards, hazard recognition, and appropriate prevention procedures. These meetings will include:

- Tasks to be performed
- Specific hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, concentration limits, or other danger signals
- Transportation routes along which hazardous substances move
- Additional hazards as a direct result of site activities, and prevention and control techniques
- Emergency procedures

12.5 SITE EVACUATION

12.5.1 Criteria

The UXO QCS/SO will determine the need to evacuate the Work Site based on the following criteria:

- Discovery of suspected CWM
- Change in site conditions that would require an upgrade of PPE beyond Level D
- Smoke, fire, and/or explosion

12.6 EMERGENCY ALERTING PROCEDURES

Emergency notification will normally be conducted via hand-held radios. The following air horn system will supplement the radio notification system.

- Three short blasts on the air horn – immediately evacuate the site and proceed to the designated place of refuge.
- One long blast (approximately 30 seconds) – "all clear" signal indicating that personnel can once again re-enter the site.

TABLE D-8 EMERGENCY TELEPHONE NUMBERS

AGENCY	NAME	TELEPHONE NUMBER
Emergency		
Fire Department Non-Emergency	No Contact Name	911 or 864-596-2076
SHERIFF DEPARTMENT NON-EMERGENCY	John Dyas	911 or 864-596-2616
Environmental		
Environmental Agencies Federal	U.S. Environmental Protection Agency	1-800-535-0202
Environmental Agencies State	South Carolina Department of Health and Environmental Control (DHEC)	803-898-3432
Medical		
Spartanburg Regional Medical Center Non-Emergency	No Contact Name	911 or 864-560-6000
ZAPATAENGINEERING Occupational Physician	Dr. David M. Peterson	Ofc: 704-330-1700
U. S. Army Corps of Engineers		
Client Project Manager	Mr. Plyler McManus Army Corps of Engineers, Huntsville, AL	Ofc: 256-895-1709 Fax: 1378 Cell: 256-895-1709
Client Contracting Officer	Ms. Lydia Tadesse Army Corps of Engineers, Huntsville, AL	Ofc: 256-895-1289
U. S. Army Engineering and Support Center, Huntsville	(Contact via CEHNC Safety)	**REGULAR HOURS** (256) 895-1582, 1510

AGENCY	NAME	TELEPHONE NUMBER
ZAPATAENGINEERING		
ZAPATAENGINEERING Project Manager	Mr. Michael Winningham	(704) 358-8240
CIH	Mr. John A. Soyak	(828) 698-1728
ZAPATAENGINEERING Office		704-358-8240 1-800-803-3338 **EMERGENCY**
Explosive Ordnance Disposal (EOD)		
748th Ordnance Co. (EOD) Fort Jackson, SC	Officer-in-Charge	803-751-5126
Other		
South Carolina Highway Patrol	No Contact Name	864-587-4700
Oil Spill Federal	National Response Center	1-800-424-8802
Poison Center	No Contact Name	800-962-1253
Report Suspected burial sites Discovery of actual/ Suspected CWM	PM, Non-Stockpile Chemical Materiel Programs (NSCMP) Army Operations Center Hdqrtrs, Department of Army	1-800-488-6868 (via CEHNC Safety) 697-0218 (via CEHNC Safety) (703) 697-5690 (via CEHNC Safety)

12.7 EMERGENCY EQUIPMENT

12.7.1 Each ZAPATAENGINEERING field vehicle will be supplied with at least one 2A: 10B:C fire extinguisher (5 pounds).

12.7.2 First aid kits that comply with 29 CFR 1910.151, ANSI Z308.1, and EM 385-1-1, paragraph. 03.B will be located on site. Kits will be inspected on a weekly basis and missing components immediately replaced.

12.7.3 A bucket of water will be positioned next to the excavation in the event one of the M15 WP grenades start leaking WP and smoking.

12.8 PLACE OF REFUGE

12.8.1 In the unlikely event that an evacuation is required, personnel will immediately proceed upwind to the designated rally point. At this refuge, personnel accountability will be taken by the UXO QCS/SO, as well as personnel interviews to assure no one has sustained injuries as a result of the accident or incident. Once all personnel are accounted for, the UXO QCS/SO will assess the situation and outline the actions to be taken.

12.8.2 The refuge will have the following equipment for localized emergencies not requiring site evacuation:

- Communications network
- Emergency personal protection equipment

- First-aid supplies
- Fire extinguisher

12.9 EVACUATION ROUTES

Evacuation routes will vary depending upon the location of the affected teams and the scope and severity of the emergency. Daily, the UXO QCS/SO will brief all personnel on-site concerning the applicable evacuation route for that day.

12.10 MEDICAL TREATMENT OF INJURED PERSONNEL

In the unlikely event that treatment of injured personnel is required, the procedures listed in Table D-9 will be followed; some can be conducted simultaneously. The UXO QCS/SO must assess the situation and outline the appropriate response prior to emergency response/rescue.

12.11 DOCUMENTATION

Documentation related to the emergency shall be recorded in an accurate, authentic, and complete fashion by the UXO QCS/SO. Documentation shall be recorded as soon as possible after the emergency to ensure it is recorded while the events are vivid in the minds of the personnel involved. The information will include:

- A chronological record of events;
- A listing of the personnel involved, including personnel on-site, site personnel who responded, personnel in charge, and off-site groups or agencies that responded;
- A listing of the actions taken to minimize the effects of or mitigate the emergency;
- The results of air monitoring conducted during the emergency, and if applicable, results of environmental samples;
- An assessment of the potential exposures received by site personnel and the surrounding public;
- A record of the injuries or illnesses, which occurred as a result of the emergency.

12.12 COMMENCEMENT OF NORMAL OPERATIONS

Site operations can commence when all federal, state, and local regulatory agencies have been notified and when the site and personnel are prepared and equipped to respond to another emergency. The following activities must be conducted prior to commencing operations:

- The ZAPATAENGINEERING Project Manager will notify the following agencies, as appropriate to the emergency:
- OSHA - any fatalities or five or more personnel are hospitalized
- The UXO QCS/SO will restock and clean all equipment and supplies utilized or damaged in the emergency
- The President of ZAPATAENGINEERING will request an accident investigation to determine the cause of the emergency and what preventative measures can be implemented to ensure a similar emergency does not occur again
- ZAPATAENGINEERING safety and health personnel, in conjunction with the UXO QCS/SO and CEHNC, shall conduct an emergency response critique to assess the effectiveness of the emergency response procedures, and identify areas requiring improvement
- The UXO QCS/SO shall complete the USACE Accident Investigation Report (ENG Form 3394) and ZAPATAENGINEERING's Employee Injury/Property Damage Report Form

- The UXO QCS/SO, in conjunction with the CIH, shall review and revise, as needed, the site operational and emergency response procedures, and if necessary, update the SSHP to reflect the new procedures

TABLE D-9 GENERAL EMERGENCY RESPONSE PROCEDURES

Enforce the Buddy System: No one will enter a potentially hazardous area without a partner; personnel in the EZ should be in line-of-sight or in communication with the UXO QCS/SO or assigned appointee. ***Survey Casualties***: Locate all victims and assess their condition; determine resources needed for stabilization and transport. ***Assess Existing and Potential Hazards and Determine:*** • Whether and how to respond • The need for evacuation of site personnel and off-site population • The resources needed for evacuation and response ***Contact the required off/on-site personnel or facilities:*** Ambulance, fire department, police department, etc. ***Allocate Resources:*** On-site personnel/equipment to rescue and initiate incident response operations ***Control:*** Assist in preventing the spread of the emergency, i.e., cover hole with tarp/plastic or wood, control fire, secure site, etc. ***Extricate:*** Remove or assist victims from the area. ***Decontaminate:*** • In the unlikely event that personnel come into contact with white phosphorus, they will be decontaminated before going to the hospital. See Section 11.3 for decontamination procedures. ***Stabilize:*** • Administer any medical procedures that are necessary before the victims can be moved • Stabilize or permanently fix the hazardous condition • Attend to what caused the emergency and anything damaged or endangered by the emergency (e.g., drums, tanks) ***Transport:*** No one will be transported without being decontaminated; minimize chemical contamination of the transport vehicle, ambulance, and hospital personnel, except when delay will pose an immediate threat to the victim's life or health. ***Casualty Logging:*** Record the victim's name, time, destination, and condition upon transport ***Evacuate:*** Relocate personnel a safe distance upwind of the incident; monitor incident for significant changes – hazards may diminish (permitting re-entry), or increase (requiring public evacuation) ***Casualty Tracking:*** Record disposition, condition, and location

12.13 ROUTE DIRECTIONS TO THE NEAREST PRE-NOTIFIED MEDICAL FACILITY

Directions to the Spartanburg Regional Medical Center are located in Table D-10. Refer to Attachment B for Hospital Route Map.

TABLE D-10 HOSPITAL DIRECTIONS

Name	Spartanburg Regional Medical Center
Location	Spartanburg, South Carolina
Telephone Number	864-560-6000
Directions	From OOU-3 • Proceed south on Wedgewood Drive approximately .25 miles and turn left on East Croft Circle. • Continue on East Croft Circle approximately 50 miles to Hwy 34 (Southport Road) and turn left. • Proceed on Hwy 34 approximately 3.5 miles and turn right on Hwy 5 • Proceed on Hwy 56 approximately 5 miles until it joins with Hwy 22 Turn right on Hwy 22 • Proceed 2.5 miles on Hwy 221 until it splits into Hwy 56 and Hwy 9. Take the right fork (Hwy 9). • Proceed on Hwy 9 for approximately 1 mile. Medical center will be on the right hand side. • Map added as Attachment 2 to this section of the SSHP.

12.14 HAZARD COMMUNICATION

12.14.1 The UXO QCS/SO will maintain a current inventory of all potentially hazardous chemicals brought onto the site along with a copy of the Material Safety Data Sheets (MSDS). This inventory will be updated as new chemicals are introduced at the site. It is the UXO QCS/SO's responsibility to maintain the MSDS for reference by all on-site personnel. Each subcontractor will be responsible for supplying MSDS to the UXO QCS/SO for all hazardous materials prior to their introduction onto the site.

12.14.2 The UXO QCS/SO will communicate hazard information to on-site personnel during the daily and weekly safety sessions. This training will include location and familiarization of MSDS on all hazardous chemicals used on the project site, instruction on the proper care and use of the hazardous chemicals, and container labeling. When new hazardous chemicals are brought onto the work site, the UXO QCS/SO will discuss the new MSDS with site personnel during the daily safety sessions.

12.15 COMMUNITY ALERT PROGRAM

There are no HTW and/or CWM hazards associated with this site, and since all residents will be evacuated and the golf course will be closed within the Minimal Separation Distance (517-feet) for the physical hazards (fragmentation) during intrusive activities there is no requirement for a Community Alert Program.

13.0 PERSONNEL ENTRY INTO EXCAVATIONS

13.0.1 Personnel will only enter the excavation after all known white phosphorus contamination has been removed. Personnel will enter the excavation to collect confirmatory soil samples from the bottom and sides and to compact the fill after the removal is complete. Prior to personnel entering the excavation, the excavation will be dewatered if necessary.

13.0.2 Excavation safety measures to be taken at the site are located in Section 16.3 of this appendix and are in compliance with OSHA (29 CFR 1910.146 and 29 CFR 1926, Subpart B) and USACE EM 385-1-1.

14.0 SPILL CONTAINMENT

14.0.1 The ZAPATAENGINEERING UXO QCS/SO will oversee cleanup operations in the event of a spill of contaminated waste from excavation activities. All scrap metal, soil, debris and IDW will be visually inspected and placed into containers. If a drum containing a liquid waste is punctured, the liquid will be absorbed and the absorbent material placed into another drum for testing to determine the disposal method.

14.0.2 Safety cans or other approved portable service containers for flammable liquids having a flash point at or below 73^{o}F will be painted red with a yellow band around the can and the name of the contents conspicuously painted or stenciled on the container in yellow.

14.0.3 Prior to handling a drum or container, the UXO QCS/SO must assure that the drums or containers meet the required OSHA, NFPA, EPA (40 CFR 264 - 265 and 300) and Department of Transportation regulations (49 CFR 171 - 178), and are properly inspected and labeled.

14.0.4 To the extent feasible, the moving of drums or containers will be kept to a minimum.

15.0 HEAT STRESS MONITORING

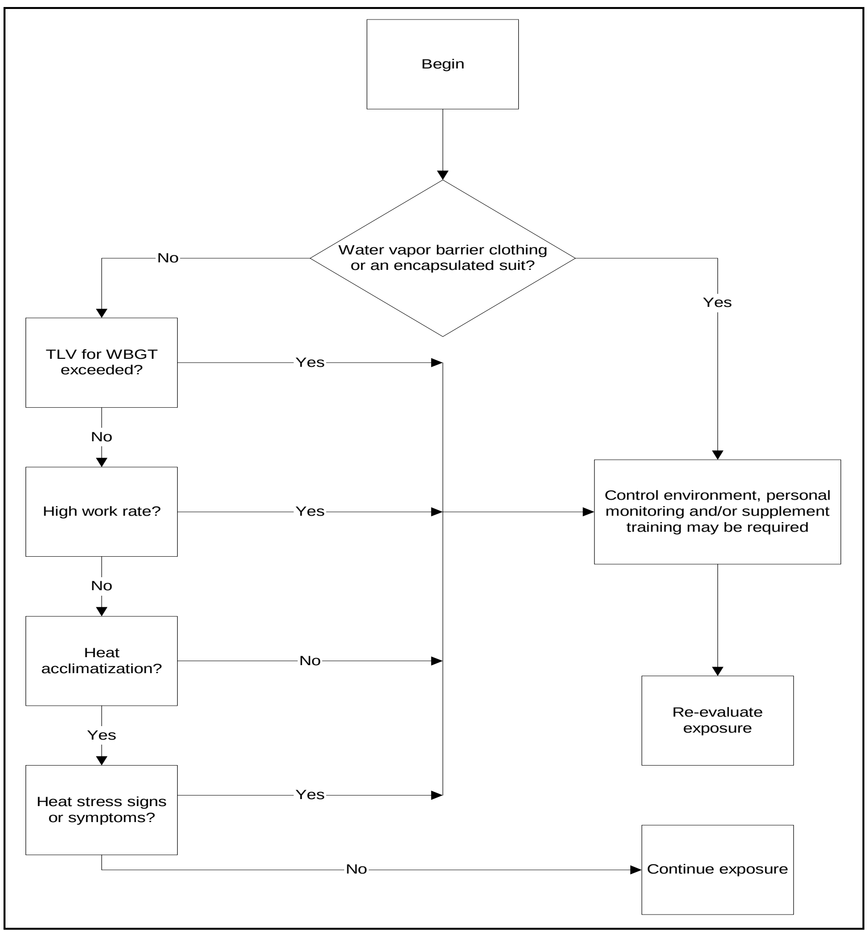
15.1 HEAT STRESS MONITORING AND WORK CYCLE MANAGEMENT

15.1.1 Both heat stress and heat strain must be assessed in evaluating worker safety and health, using the decision tree diagram shown at Figure D-3.

15.1.2 Heat stress is the net load on the body with contributions from both metabolic heat production and external environmental factors including temperature, relative humidity, radiant heat transfer, and air movement, as they are affected by clothing.

15.1.3 Heat strain is the net physiological load resulting from heat stress.

FIGURE D-3 EVALUATING HEAT STRESS AND STRAIN



15.1.4 TLVs specified in Table D-11 refer to heat stress conditions under which it is believed that nearly all heat acclimatized, adequately hydrated, unmediated, healthy workers wearing light-weight summer clothing may be repeatedly exposed without adverse health effects. The work areas are assumed to have at least some air movement. When the WBGT values in Table D-11 must be exceeded, the guidelines in Table D-12 must then be followed.

TABLE D-11 TLVs for Heat Exposure Working in Level D PPE

Hourly Activity	Work Rates		
	Light	Moderate	Heavy
Continuous Work	30.0°C/80°F	27°C/80.0°F	25.0°C/77.0°F
75% Work – 25% Rest	30.6°C/87.0°F	28.0°C/82.0°F	25.9°C/78.0°F
50% Work – 50% Rest	34°C/89.0°F	29.4°C/85.0°F	27.9°C/80.0°F
25% Work – 75% Rest	32.2°C/90.0°F	31°C/88.0°F	30.0°C/82°F

1. Temperature values in WBGT.
2. Refer to Table D-13 for work rates.
3. Work and rest environments are assumed to be the same. If different, hourly time-weighted average WBGTs must be calculated.

TABLE D-12 GUIDELINES FOR HEAT EXPOSURE LIMITS

Always monitor signs and symptoms of heat-stressed workers (refer to Table D-15). When WBGT-TLV criteria (Table D-11) are exceeded or water vapor impermeable clothing is worn, discontinue any environmentally induced or activity-induced heat stress for a person when any one of the following indicators is exhibited.
• Sustained heart rate is greater than 160 beats per minute for those under 35 years of age. • Sustained heart rate is greater than 140 beats per minute for those 35 years of age or older. • Complaints of sudden and severe fatigue, nausea, dizziness, lightheadedness, or fainting. • Periods of inexplicable irritability, malaise, or flu-like symptoms. • Sweating stops and the skin becomes hot and dry.
Good physical fitness and adequate hydration are the first lines of defense against heat stress

15.1.5 Physical Barriers to Heat Loss

Evaporation of sweat from a person's skin can be an important means of dissipating heat from the body. Also, the free movement of cool, dry air over the skin's surface optimizes heat loss. Water vapor impermeable or thermally insulating clothing, encapsulating suits, and similar convective and evaporative barriers can severely restrict heat loss and produce life-threatening heat strain, even when the ambient air temperature, radiant heat, and humidity are low. Whenever workers wear such restrictive clothing, it is essential that extra caution be exercised.

15.1.6 Wet-Bulb Globe Temperature (WBGT)

15.1.6.1 Since measurement of deep body temperature is impractical for monitoring the workers' heat load, the measurement of environmental factors is required to correlate with deep body temperature and other physiological responses to heat. The Wet Bulb Globe Temperature (WBGT) Index is the simplest and most suitable technique to measure the environmental factors.

15.1.6.2 Measurement of WBGT offers a useful, first-order index of heat stress by assessing the net effects of dry air temperature, radiant heat transfer, and ambient humidity. It may not, however, sufficiently reflect the effects of air movement on convective heat transfer or evaporative heat loss (typically major avenues of heat loss) and it does not by itself account for heat produced by physical work, often a major source of heat strain.

15.1.6.3 WBGT values are calculated using the following equation:

WBGT = 0.7 NWB + 0.2 GT + 0.1 DB

WBGT = wet bulb globe temperature index

NWB = natural wet-bulb temperature

GT = globe temperature

DB = dry-bulb temperature

15.1.6.4 The WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry-bulb thermometer.

- The wick of the natural wet-bulb thermometer should be kept wet with distilled water for at least ½ hour before the temperature reading is made. The wick should extend over the bulb of the thermometer, covering the stem about one additional bulb length.
- The dry-bulb thermometer must be shielded from the sun and the other radiant surfaces of the environmental without restricting the airflow around the bulb.
- The globe thermometer should be exposed at least 25 minutes before it is read.
- A stand should be used to suspend the three thermometers so that they do not restrict free airflow around the bulbs, and the wet-bulb and globe thermometers are not shaded.

15.2 WORK RATE

15.2.1 Introduction

As shown in Table D-13, physical activity can impose high rates of heat production. It is commonly the major source of heat strain, even when there is little or no environmental heat stress. The metabolic heat resulting from such activity can be an especially serious threat for someone wearing water-vapor-barrier or heat-insulating clothing, or an encapsulated suit. Even in cool and dry ambient conditions, high work rates or wearing such clothing require that the guidelines in Table D-16 be followed.

TABLE D-13 EXAMPLES OF METABOLIC HEAT PRODUCTION

Work Rates	Activity	Watts
Resting	Sitting quietly	130
	Sitting with moderate arm movements	150
Light	Sitting with moderate arm and leg movements	175
	Using table saw	215
	Standing with light work at machine or bench and some walking about	220
	Standing with light work at machine or bench while using mostly arms	250
	Replacing tires	255
	Standing with moderate work at machine or bench and some walking about	260
Moderate	Walking about with moderate lifting or pushing	360
	Carpenter sawing by hand	475
	Shoveling dry sand	480
	Heavy assembly work on a noncontinuous basis	500
Heavy	Intermittent heavy lifting with pushing or pulling (pick and shovel work)	520
	Shoveling wet sand	535

15.2.2 Heat Acclimatization

Periodic physical activity performed under heat stress conditions normally induces physiological changes, including those in Table D-15, that allow a worker to withstand heat stresses with reduced heat strain. Heat acclimatization is acquired gradually over weeks of continued physical activity under heat stress conditions. Its loss begins when the activity under heat stress conditions is discontinued. Table D-14 are some benefits to becoming acclimatized to heat stress conditions.

TABLE D-14 HEAT ACCLIMATIZATION BENEFITS

Someone with heat acclimatization exposed to environmentally or activity-induced heat-stress has:
• Improved productivity and safety • More stable and better regulated blood pressure which promotes lower pulse rates, less fatigue, improved alertness, and focus of attention • More finely tuned sweating reflexes with increased sweat production rate at lower electrolyte concentrations, when needed • Fewer and less severe signs and symptoms of heat strain for the same level of heat stress

15.2.3 Heat Stress

Heat Stress manifests itself in four disorders – Heat Stroke, Heat Exhaustion, Heat Cramps, and Sunburn. The symptoms, treatments, warnings, and prevention of each of these disorders and a work/rest schedule are noted in Table D-15.

TABLE D-15 HEAT STRESS

HEAT STRESS **(In descending order of severity)**
HEAT STROKE (Sun Stroke) results from the disruption of the body's heat regulating system, producing excessively high body temperature. Can be caused by continuous exposure to high temperatures for as little as three hours. **RAPID COOLING IS URGENT TO PREVENT DEATH.**
SYMPTOMS: Extremely high body temperature, often 106^{o} Fahrenheit (F) or above • Skin is red, hot, and dry; sweating is absent • Pulse is rapid and strong • Convulsion or collapse is possible • Delirium, disorientation, or unconsciousness is possible
EMERGENCY TREATMENT: • Immediately call for emergency help • Place person in an air-conditioned room, vehicle, or in a shaded area (at a minimum) • **COOL THE PERSON RAPIDLY --** remove the person's clothing, bathe the body in cool water, and massage continuously (submerge in cool water, or at least administer a sponge bath). Fans or air currents (such as hand fanning) also assist in the cooling process. • When the back of the hand held against the victim's cheek indicates normal skin temperature, or when internal body temperature reaches 102^{o}F or less, discontinue the cooling process and wrap the person in a blanket to prevent shock. • Victim may sip liquids
WARNINGS: • **Do not administer alcoholic beverages or stimulants (coffee, tea)** • **If the body temperature begins to rise again, repeat the cooling process**
PREVENTION: • Protect the body from radiant heat • Break the workday into short work/rest periods • Drink enough fluids to replace those lost by sweating
HEAT EXHAUSTION (Heat Prostration or Heat Collapse) results when the circulatory system fails to sufficiently compensate for increased blood flow demands imposed by the need to cool the body and dehydration caused by profuse sweating. Failure to provide quick treatment can lead to heat stroke.
SYMPTOMS: • Body temperature is normal or slightly elevated • SKIN IS CLAMMY AND PALE, AND THERE IS A MOIST, PROFUSE SWEATING

HEAT STRESS
(In descending order of severity)

- Pulse may be weak with low blood pressure
- Victim is tired and weak
- Victim may complain of dizziness or giddiness, and fainting is possible
- POSSIBLE MUSCLE CRAMPS
- Possible nausea or vomiting
- Mental state is generally rational

EMERGENCY TREATMENT:

- Place person in an air conditioned room, vehicle, or in a shaded area (at a minimum)
- Have person lie down; elevate feet 8 - 12 inches
- Loosen tight fitting clothing
- If conscious, have victim sip a glass of electrolyte replacement solution (Gatorade, ERG, or Squincher). Repeat ever 15 minutes to 1 hour; stop fluids if vomiting occurs.
- If symptoms persist or return, immediately summon medical assistance

PREVENTION:

- Schedule frequent rest periods
- Drink electrolyte liquids every 15 minutes to 1 hour to replace body fluids

HEAT CRAMPS are muscle pains and spasms caused by loss of electrolytes (due to sweating over an extended period of time). Not life threatening, but heat cramps may hinder work or cause a potential hazardous situation.

SYMPTOMS:

- Painful muscle cramps and spasms
- Heavy sweating, vomiting, and/or convulsions
- Normal, or near normal, pulse and blood pressure
- Irrational behavior

EMERGENCY/MEDICAL TREATMENT:

- Quiet rest in a cool, shaded area
- Gently massage affected area
- If person is not vomiting, give electrolyte fluids every 15 minutes to 1 hour
- If symptoms persist, victim should be transported to the nearest medical facility.

PREVENTION:

- Salt food more heavily than normal
- Drink electrolyte solutions
- Eat salty foods during heavy sweat-producing activities

WARNING: If on a low sodium diet or taking diuretics, consult your physician regarding the replacement of salts prior to field activities. Be sure to explain any problems to the LCPM.

SUNBURN is the most common of the heat disorders. It is usually a first-degree burn of the epidermis (first layer of skin), and the effects may not be noticed or felt until several hours after exposure.

SYMPTOMS:

- Skin redness
- Swelling
- Pain
- Blisters, nausea, vomiting, chills (in severe cases)

HEAT STRESS (In descending order of severity)	
	EMERGENCY/MEDICAL TREATMENT: • Put cold water on the burned area as quickly as possible • Submerge severe burns in cold water or soak with wet cloths • Elevate burned limbs • Do not break a blister (this increases the chance of infection)
	PREVENTION: • Cover exposed parts of the body • Gradually expose the skin to the sun for 20 minute intervals per day; extending the time as the skin builds its own natural protection in the form of a tan (not recommended) • Use sun lotion, sun block, and sun shields (reapply every hour, even on cloudy days)
HEAT STRESS MONITORING AND WORK/REST CYCLE	
	The following will be implemented during field activities when the temperature exceeds 87°F. The UXO QCS/SO will determine the appropriate work/rest schedule and ensure all personnel take the appropriate breaks; additional breaks will be approved, as necessary. <u>Measure Heart Rate:</u> To be conducted for 30 seconds as early as possible during the rest cycle. The rate should not exceed 110 beats per minute for most people. If the heart rate is higher during the next rest period, the following cycle should be shortened by 33 percent. The reduction of the work cycle will continue until the pulse rate reaches 110 beats per minutes. <u>Measure Body Temperature</u> orally with a clinical thermometer as early as possible in the resting period. If oral temperature (OT) at the beginning of the rest period exceeds 99.40°F, the worker will be prohibited from continuing work until the OT is maintained below 99.4°F (37.4°C). The next work cycle will be reduced by 33% if the oral temperature exceeds 99.68 °F (37.6°C). <u>Establish Work/Rest Schedule</u>: The UXO QCS/SO will monitor personnel every two hours at temperatures above 87°F, and every hour at temperatures above 90°F. Cool drinks will be available for consumption during rest periods.

15.2.4 Optimizing Safety and Health

People who are least endangered while workings in heat stress conditions are young and appropriately clothed, in good general health and physical condition, not obese, and adequately hydrated with electrolyte concentrations in normal ranges. To help assure that safe and healthy conditions are maintained, the guidelines in Table D-16 should be followed.

TABLE D-16 GUIDELINES FOR OPTIMIZING SAFETY AND HEALTH

For people working in hot conditions:
• Encourage drinking small volumes (approximately 1 cup) of cool or tepid water about every 20 minutes • Provide work settings with good ventilation and shielding from radiant heat sources • Assure co-worker observation to detect signs and symptoms of heat strain

• Pay extra attention to those who take medications that compromise normal cardiovascular, blood pressure, body temperature regulation, renal, or sweat gland functions
Never ignore anyone's signs or symptoms of heat strain

15.2.5 Cold Stress Monitoring

15.2.5.1 Cold Stress disorders includes Hypothermia, Frostbite, and Chilblain. The symptoms, treatment, and prevention of these disorders, plus work/rest cycles are detailed in Table D-17.

15.2.5.2 The ACGIH cold stress standard shall be the minimum protocols for cold stress, Table D-18. The cooling power of wind on exposed flesh is depicted in Table D-19.

15.2.5.3 As a preventative measure, insure team members have available and make use of an adequate drinking water supply.

TABLE D-17 COLD STRESS MONITORING

COLD STRESS **(In descending order of severity)**	
HYPOTHERMIA is characterized by a significant loss of body heat. Moderate cases may exhibit the first 7 symptoms below. Severe cases are indicated with extremely cold skin; loss of consciousness; faint pulse; and shallow, infrequent, or apparently absent respiration – death may result.	
	SYMPTOMS: 1. Severe shivering 6. Repeated falling 2. Abnormal behavior 7. Inability to walk 3. Slowing of movements 8. Collapse 4. Stumbling 9. Stupor 5. Weakness 10. Unconsciousness
	EMERGENCY/MEDICAL TREATMENT: • A severely shivering worker shall immediately terminate work and exposure to cold • Seek qualified medical help immediately • Remove the victim from the hypothermia-producing environment • Keep handling to a minimum; DO NOT rub or massage the victim • Cover the victim lightly with blankets; plastic may be used for further insulation. DO NOT cover face. • If victim is conscious, administer hot drinks, encourage activity (walking while wrapped in a blanket), and DO NOT administer any form of sedative, tranquilizer, or analgesic (pain reliever), as they may facilitate further heat loss.
	PREVENTION: Wear insulated garments in a layered fashion.
FROSTBITE includes localized injury resulting from exposure to cold temperatures, and includes several degrees of severity.	
	SYMPTOMS: • frostnip or incipient frostbite is a sudden blanching or whitening of the skin

COLD STRESS (In descending order of severity)	
	• superficial frostbite has a waxy or white appearance and is firm to the touch, but the tissue beneath is resilient • deep frostbite is an extremely serious condition in which tissues are cold, pale, and solid.
	EMERGENCY/MEDICAL TREATMENT: • **DO NOT** rub effected part with snow. • Slow rewarming in water at 103^o - 105^{o}F. • Give warm nutritious drinks (no alcohol). • Victim should not smoke.
	PREVENTION: Wear insulated garments in a layered fashion.
CHILBLAIN is an inflammation caused by exposure to cold moisture.	
	SYMPTOMS: • Localized itching • Swelling • Inflammation of fingers, toes, or ears • Severe spasms • Pain
	EMERGENCY/MEDICAL TREATMENT: • Warm gradually by placing parts in lukewarm water or with warm hands. Do not rub. • Place victim in warm but not hot room. • Give warm nutritious drinks (no alcohol).
	PREVENTION: Wear insulated garments in a layered fashion.
COLD STRESS PREVENTION AND WORK/REST CYCLE	
	• A work/rest regime and a heated shelter shall be provided, as needed. A change of clothing for each worker shall be on hand. Warm, non-alcoholic drinks (avoid caffeine) and soup will be available, if required. • Use the heated shelter at regular intervals when temperatures below 20^{o}F or equivalent wind chill are present. Frequency of breaks is dependent on environmental conditions and each worker's needs. • When entering shelter, remove outer layer of clothing and loosen remaining clothing to permit sweat evaporation. Do not return to work with wet work clothing. • Heavy shivering, frostnip, excessive fatigue, drowsiness, irritability, or euphoria indicates an immediate return to the heated shelter. • If conditions are below 10^{o}F or an equivalent wind chill, the following shall apply. o Work under constant supervision and the buddy system o Reduce work rate to avoid heavy sweating o Instruct workers in warming procedures, first aid, clothing, eating/drinking, and recognition of signs and symptoms of impending frostbite, hypothermia, or excessive cooling without shivering.

TABLE D-18 COLD TLVS

Air Temp. Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
C (approx.)	F (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26 to -28	-15 to -19	Norm.	1	Norm	1	75 min	2	55 min	3	40 min	4
-29 to -31	-20 to -24	Norm.	1	75 min	2	55 min	3	40 min	4	30 min	5
-32 to -34	-25 to -29	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
-35 to -37	-30 to -34	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
-38 to -39	-35 to -39	40 min	4	30 min	5	Non-emergency work should cease					
-40 to -42	-40 to -44	30 min	5	Non-emergency work should cease							
-43 & belov	-45 & belov	Non-emergency work should cease									

Notes:

- Schedule applies to any 4-hour work period with moderate to heavy work activity, with warm-up periods of ten (10) minutes in a warm location and with an extended break (e.g., lunch) at the end of the 4-hour work period in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule on step lower. For example, at –35C (-30F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).
- The following is suggested as a guide for estimating wind velocity if accurate information is not available:
  - **5 MPH: LIGHT FLAG MOVES**
  - 10 mph: light flag fully extended
  - 15 mph: raises newspaper sheet
  - 20 mph: blowing and drifting snow
- If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 W/m2: 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m2. In general, the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges because windy conditions rarely prevail at extremely low temperatures.
- TLVs apply only for workers in dry clothing.

TABLE D-19 COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS EQUIVALENT TEMP

Estimated Windspeed (in mph)	**Actual Temperature Reading (^{o} F)**											
	50	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**	**-50**	**-60**
	Equivalent Chill Temperature (^{o} F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
Windspeeds greater than 40 mph have little additional effect.	**Little Danger** In < 1 hr with dry skin. Maximum danger of false sense of security.				**Increasing Danger** Danger from freezing of exposed flesh within one minute.				**Great Danger** Flesh may freeze within 30 seconds.			
	Trench foot and immersion foot may occur at any point on this chart.											

16.0 STANDARD OPERATING PROCEDURES, ENGINEERING CONTROLS, AND WORK PRACTICES

16.1 STANDARD OPERATING PROCEDURES, ENGINEERING CONTROLS, & WORK PRACTICES

At a minimum, the following standard operating procedures (SOP), engineering controls, and work practices shall be adhered to.

16.2 GENERAL SAFETY PRECAUTIONS

- Do not carry fire or spark-producing devices on-site.
- Do not apply cosmetics, eat, drink, chew gum or tobacco, or smoke in work areas.
- Do not have fires for heating or cooking, except in authorized areas.
- Do not conduct operations without approved operating procedures and proper supervision.
- Do not become careless by reason of familiarity with ammunition.
- Do not conduct UXO operations during electrical, sand, dust, or snow storms.
- Avoid contact with suspect chemical hazards.
- Be aware of monitoring equipment, wind direction, nearest water source, evacuation routes, emergency communication, and notification procedures.
- Keep a first aid kit and fire extinguisher readily available while in the work area.
- Hard hats shall be worn in areas where there is the possibility of head injury from impact, falling objects, or flying objects. During field activities on ordnance projects, hard hats need not be worn unless a head injury threat is present.
- All personnel should be aware of the potential for slips, trips, and falls; always be aware of the placement of your feet.
- When working off of the ground on large pieces of equipment, maintain at least three points of contact with the equipment.
- All personnel will stay at least two feet away from the excavation unless a safety harness is employed with a retaining device.
- The UXO QCS/SO must be present when excavation operations are being performed.
- Alert team personnel of a suspected or potentially dangerous situation. If an alarm sounds, a strong nauseating odor is detected, or you see fire or smoke, all personnel are to evacuate the site and notify the UXO QCS/SO.
- Operational activities will only be conducted during daylight hours.

16.3 EXCAVATION SAFETY

16.3.1 Every effort shall be made to identify the presence of subsurface excavation hazards (i.e., sewer, telephone, water, fuel, electric, and pipe services). The UXO QCS/SO will contact utility locators before any excavations are conducted. Personnel will keep materials or equipment that might fall or roll into an excavation at least two feet from the edge of excavations, unless a retaining device is provided.

16.4 UXO DISPOSITION SAFETY

If ZAPATAENGINEERING UXO qualified personnel identify UXO or CWM items, ZAPATAENGINEERING will dispose of UXO in accordance with the approved work plan, and

ZAPATAENGINEERING will contact the CEHNC Safety Specialist, who will request EOD and/or Technical Escort Unit (TEU) support, when suspected CWM items are encountered. ZAPATAENGINEERING personnel will not handle suspected CWM items.

16.5 UXO SAFETY

- Only those personnel absolutely necessary to the operation and the CEHNC On-Site Safety Specialist (if present) will be allowed in the Exclusion Zone during UXO activities.
- Only personnel who have graduated from the U.S. Naval EOD School, Indian Head, Maryland, the U.S. Army Bomb Disposal School, Aberdeen Proving Grounds, Maryland, the EOD Assistant's Course at Redstone Arsenal, Alabama, or Eglin Air Force Base, Florida, are authorized to excavate anomalies.

16.6 GEOPHYSICAL SAFETY

16.6.1 The Geonics EM-61 Time Domain Electromagnetic (TDEM) All Metals Metal Detector will be used to detect any Unexploded Ordnance (UXO) and OE at OOU 3. Use of a TDEM detector will alert investigators of the presence of metal debris and provide an indication of the buried depth.

16.6.2 Time Domain Electromagnetic (TDEM) Instruments must be kept a minimum of 0.42 meters above the ground. Frequency Domain Electro Magnetic (FDEM) Instruments must be kept a minimum of 0.3 meters above the ground.

16.6.3 Electronic packages, data loggers and battery packs will not be stored on the ground in work areas.

16.6.4 Electronic packages, data loggers and battery packs will be kept a minimum of 1 meter from the ground during operations for Flux Gate Gradiometers, Cesium Vapor Magnetometers, Total Field Magnetometers.

16.6.5 Ground Penetrating Radar (GPR) will not be used for UXO activities.

16.7 BUDDY SYSTEM

The buddy system requires work crews consisting of teams of at least two, and is required during all operations within the Exclusion and Contamination Reduction Zones. Team members will maintain visual contact with each other and be alert for signs of a medical emergency, such as:

- Changes in complexion or skin color
- Changes in coordination or demeanor
- Excessive salivation and pupillary response
- Changes in speech pattern
- Mention of headaches, dizziness, blurred vision
- Nausea, cramps
- Irritation of eyes, skin, or respiratory tract

16.8 SMOKING RESTRICTIONS

Smoking is prohibited in the work areas. Upon mobilization, the UXO QCS/SO will designate a smoking area.

16.9 MATERIAL HANDLING

Contaminated soil will be stored in suitable containers, clean soil will be stockpiled on plastic and used for backfilling the excavation, and waste PPE will be stored in DOT approved 55-gallon drums. Water from dewatering and decontamination processes will be stored in 350-gallon totes until it is classified. Each container will be labeled to identify the type of waste, date, and the CEHNC project manager name and phone number. Contaminated soil and water will be disposed of properly off-site. Non-contaminated water will be pumped into an adjacent storm drain.

16.10 ILLUMINATION

All work areas will be performed during daylight hours.

16.11 SANITATION

16.11.1Potable Water

16.11.1.1 ZAPATAENGINEERING will provide workers and visitors with an adequate supply of potable water approved by federal, state, or local authorities.

16.11.1.2 Disposable cups will be provided for all sources of drinking water; no common drinking cups will be used.

16.11.1.3 A waste receptacle for soiled cups will be supplied.

16.11.1.3 Potable drinking water containers will be labeled as such and not used for any other purpose. Potable drinking water containers will be cleaned and sanitized daily, contain only ice and water, and be fitted with a tight-fitting lid and tap.

16.11.2Non-Potable Water

16.11.2.1 Non-potable water may be used for washing equipment and general housekeeping/cleaning, provided the water does not contain substances that may pose a threat to the employees' health.

16.11.2.2 There will not be any cross-connection, open or potential, between systems furnishing potable and non-potable water.

16.11.2.3 All outlets for non-potable water will be conspicuously posted **"CAUTION - Water unfit for drinking, washing, or cooking."**

16.11.3Toilet Facilities

Portable toilet facilities will be placed in the support zone.

16.11.4Food Handling

ZAPATAENGINEERING personnel will not perform food-handling services at this site.

16.11.5Temporary Sleeping Quarters

ZAPATAENGINEERING will provide per diem eligible employees (per Joint Travel Regulations) with temporary sleeping quarters at a local hotel, motel, or other suitable habitable quarters.

16.11.6Washing Facilities

Washing facilities, including water, soap, necessary decontamination products, materials and individual means of drying will be located in the Support Zone.

16.11.7Showers and Change Rooms

During this delivery order, there is no need for showers or change rooms for personal hygiene.

16.11.8Housekeeping

Every job site must be left clean and orderly at the end of the day. ZAPATAENGINEERING personnel are responsible for providing all general housekeeping of temporary office areas and work areas during the project. The floors of the temporary office area will be swept clean daily and kept as dry as practical (with consideration to weather conditions). Office trash will be removed on a daily basis and disposed in either government or municipal systems.

16.11.9Personal Hygiene

16.11.9.1 An adequate water and soap supply will be provided to allow personnel to wash hands and face prior to leaving the project site.

16.11.9.2 Personnel will be reminded to wash prior to eating or drinking after prior to leaving the work area.

16.12 SAFETY MEETINGS

Daily Safety Meetings are required prior to operations; all personnel are required to attend. Weekly Supervisors Meetings are required; all supervisors must attend.

16.13 EQUIPMENT SAFETY

Equipment safety will be in accordance with the most current revision of the USACE Safety and Health Requirements Manual (EM 385-1-1).

16.14 MOTOR VEHICLES AND TRAILERS

16.14.1 Motor vehicle operators will possess a valid driver's license.

16.14.2 Vehicles will be inspected prior to use and daily thereafter to assure parts, equipment, and accessories are in safe operating condition and free from apparent damage. Vehicles not meeting the safety standards will be removed from service until the defect is corrected.

16.14.3 All towing devices will be properly mounted and adequate for the weight drawn.

16.14.4 No vehicle will be driven on a downgrade with gears in neutral or clutch (if appropriate) disengaged.

16.14.5 No vehicle will be left unattended until after the motor has been turned off, parking brake set, and the gears engaged in low, reverse, or park.

16.14.6 Park vehicle with the front towards the emergency egress route. Turn wheels so that if the vehicle rolls, it will roll towards the area of most resistance, thus stopping the vehicle in the shortest distance.

16.14.7 A signal person will be used for backing or maneuvering when the operation site is not in full view, vehicles are backed more than 100 feet, terrain is hazardous, or two or more vehicles are backing in the same direction.

16.14.8 No person will be permitted to ride with arms and legs outside the vehicle body or while standing on the vehicle body, running boards, or off of the rear of the vehicle.

16.14.9 Each team vehicle will be equipped with a first aid kid, fire extinguisher, and eye wash (if used, the project manager's sedan will not require an eye wash.

16.15 POWER EQUIPMENT

Section 16 (Machinery and Mechanized Equipment) of the USACE Safety and Health Requirements Manual (EM 385-1-1) shall be followed when using power tools. These guidelines include but are not limited to:

- Power tools will be procured from a manufacturer listed by a nationally recognized testing laboratory; the tools will be designed for the specific application for which they are to be used.
- Power tools will be used, inspected, and maintained in accordance with the manufacturer's specifications.
- Equipment will be inspected, tested, in good repair, and equipped with all safety devices to assure it is in safe operating condition prior to use.
- PPE (including hearing protection, if needed) will be made available and used by the operator while operating power equipment. Loose and frayed clothing, loose long hair, or dangling jewelry will not be worn while operating power tools.
- Chain saw operators will not raise the chain saw above shoulder height.
- Only containers manufactured (and meeting the requirements of EM 385-1-1, section 9) for that purpose will be used to store or transport fuel. Fueling of equipment will be done in strict compliance with manufacturers instructions and safety guidelines.
- Fuel on the work site will be stored a minimum of 50 feet from established break areas. Fuel cans will be placed on drop cloths and absorbing material (when needed). Two 2-A: 10-B-C fire extinguishers (5 pound) will be readily available.

16.16 HAND TOOLS

Section 13 (Hand and Power Tools) of the USACE Safety and Health Requirements Manual (EM 385-1-1) shall be adhered to in selecting and using hand tools:

- Hand tools will be used, inspected, and maintained in accordance with the manufacturer's specifications.

- Tools will be inspected, tested, in good repair, and equipped with all safety devices to assure they are in safe operating condition prior to use.
- Protective clothing recommended for use while using the equipment will be made available and used by the operator.
- Throwing tools from one person to another is not permitted.

16.17 BLOODBORNE PATHOGENS

16.17.1 Bloodborne Pathogens are pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV). Personnel administering care must successfully complete bloodborne pathogens and must implement exposure control measures.

16.17.2 Personal Protective Equipment is the first line of defense against bloodborne pathogens. The following protective equipment will be available on-site for personnel administering first aid.

- Surgical Gloves - must be worn when hand contact with blood or other body fluids is possible or the care provider has non-intact skin areas on their hands.
- Masks/Eye Protection/Face Shields - will be worn when slashes, sprays, or droplets of blood or body fluids are likely to occur and contaminate the eyes, nose, or mouth of the care provider.
- Coveralls/Jacket - will be donned if the possibility exists for contamination of the body of the care giver.

16.17.3 To insure that equipment is used effectively, employees will adhere to the following practices when using personal protective equipment:

- Any garments penetrated by blood or other suspect infectious materials are to be removed immediately, or as soon as feasible.
- All personal protective clothing/equipment shall be removed prior to leaving the site and placed in a suitable container for decontamination and/or disposal.
- Disposable gloves are to be replaced as soon as practical after contamination or if they are torn, punctured, or otherwise lose their ability to function as an "exposure barrier."
- Potential exposure to the body of the caregiver will require donning a coat or coveralls to provide protection.

17.0 ACCIDENT PREVENTION

This Accident Prevention Plan outlines occupational safety and health policy, responsibilities, and program requirements.

17.1 ACCIDENT INVESTIGATION, REPORTING, AND RECORD KEEPING

17.1.1 All on-site and off-site accidents, regardless of severity, will be reported by ZAPATAENGINEERING's UXO QCS/SO, investigated, and analyzed. The ZAPATAENGINEERING Vice President of OE Programs and Senior ZAPATAENGINEERING staff members (selected by ZAPATAENGINEERING's President) will investigate the accident, analyze the cause, and identify the corrective action to be implemented to prevent similar occurrences.

17.1.2 Employees are responsible for immediately reporting all injuries, occupational illnesses, abnormal conditions, or disorders caused by exposure to environmental factors associated with the work site to the ZAPATAENGINEERING UXO QCS/SO. The immediate supervisor will notify the ZAPATAENGINEERING UXOSO, document the report; and provide medical treatment regarding the nature and cause of the illness. Within 24-hours, the ZAPATAENGINEERING UXO QCS/SO will notify ZAPATAENGINEERING Headquarters and the on-site CEHNC Safety Specialist of the report.

17.1.3 The ENG Form 3394 (the U. S. Army Corps of Engineers Accident Investigation Report) and ZAPATAENGINEERING's Employee Injury/Property Damage Report Form (ZAPATAENGINEERING Form 0034) will be completed and forwarded to the Corps of Engineers and ZAPATAENGINEERING Headquarters within two working days of the injury.

17.1.4 The following reporting criteria will be used:

- Death (regardless of the length of time between the injury and death).
- One or more lost workdays.
- Restriction of work or motion.
- Loss of consciousness.
- Transfer to another job site.
- Medical treatment required (other than first aid).

17.1.5 The UXO QCS/SO will maintain records on all health and safety issues and assure reportable accident and incident reports are submitted in a timely manner. Injury and illness records (OSHA Reporting Logs) will be maintained at ZAPATAENGINEERING's Charlotte, North Carolina.

17.2 INSPECTIONS

A key element in preventing accidents is an aggressive inspection program. Upon mobilization, the UXO QCS/SO will establish an inspection schedule that will efficiently cover the inspection requirements for UXO operations, as outlined in Table D-20.

TABLE D-20 UXO QCS/SO INSPECTIONS

Description	Amount	Type	Frequency
Site Preparation	1	Visual Observation	During Operations
Brush Clearing	1	Visual Observation	During Operations
Geophysical Activities	1	Visual Observation	During Operations
Intrusive Operations	1	Visual Observation	During Operations
White Phosphorus Residual Disposal	1	Visual Observation	Daily
Personal Protection	1	Visual Observation	Daily
Work Practices	1	Visual Observation	Daily
Site Control	1	Visual Observation	Daily
Emergency Response/First Aid Equipment	1	Visual Observation	Weekly

17.3 DRUG-FREE WORKPLACE

17.3.1 ZAPATAENGINEERING is committed to providing a safe work environment and to fostering the well being and health of its employees. That commitment is jeopardized when any ZAPATAENGINEERING employee illegally uses drugs or alcohol on the job, comes to work with these substances present in his/her body, or possesses, distributes, or sells drugs in the workplace. Therefore, ZAPATAENGINEERING has established the following policy:

17.3.2 It is a violation of company policy for any employee to possess, sell, trade, or offer for sale illegal drugs or otherwise engage in the illegal use of drugs, intoxicants, or alcohol on the job. It is a violation of company policy for anyone to report to work under the influence of illegal drugs or alcohol-that is, with illegal drugs, intoxicants, or alcohol in his/her body. It is a violation of the company policy for anyone to use prescription drugs illegally. However, nothing in this policy precludes the appropriate use of legally prescribed medications. Violations of this policy are subject to disciplinary action up to and including termination of employment.

18.0 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

The following items shall be immediately available for onsite use:

18.0.1. First Aid Equipment and Supplies (ANSI Z308.1) -- will be located in each vehicle and in the office, which comply with the USACE Safety and Health Requirements Manual (EM 385-1-1) and 29 CFR 1910.151. There will be one first aid kit for every 25 persons on-site. The UXO QCS/SO will maintain one kit at all times. Kits will be inspected on a weekly basis, and missing components immediately replaced.

18.0.2 Eye Wash Stations (ANSI Z-358.1) – Eye wash stations are applicable to this delivery order and will be available for immediate use at the excavation and decontamination activities.

18.0.3 Emergency Showers (per ANSI Z-358.1) – Emergency shower requirements are not applicable to this delivery order.

18.0.4 Emergency Use Respirators – Respiratory protection devices are will be available during site activities for emergency escape and rescue purposes. Since no hazardous chemical wastes or CWM has been identified at the work sites (except white phosphorus), their use is not anticipated.

18.0.5 Spill Control Materials – Spill control measures are covered in Section 14 of this appendix.

18.0.6 Fire Extinguishers – Classification 2-A: 10-B: C fire extinguishers (5 pound) will be maintained in the personnel transport vehicles at each work location.

18.0.7 Eye and Face Protection (ANSI Z87.1) – When mandated by PPE requirements, personnel must wear appropriate eye and face protection; personnel requiring corrective lenses will wear eyeglasses with approved corrective lenses, goggles over normal eyeglasses, or goggles fitted with corrective lenses.

18.0.8 Hearing Protection -- Required for personnel conducting site preparation with chain saws and weed whackers, or personnel in the vicinity of heavy equipment operations.

18.0.9 Head Protection (ANSI Z89.1) -- Personnel working in or visiting a hard hat area will be issued and required to wear protective headgear. Hard hats will not be required during ordnance operations unless head injury is possible. Hard hats will be inspected daily for signs of cracks, dents, or other defects that may reduce effectiveness.

19.0 LOGS, REPORTS, AND RECORDKEEPING

Table D-21 lists the safety-related logs, reports, and records that will be maintained during on-site operations, the criteria, and the personnel responsible for maintaining the information.

TABLE D-21 SAFETY-RELATED RECORD KEEPING REQUIREMENTS

Reporting Requirement	Criteria	Responsible Personnel
Site-Specific Training	• Specialized Training Form • Work Plan Acknowledgment Form	UXO QCS/SO
Daily Safety Inspections	• Written weekly report to ZAPATAENGINEERING PM to identify: o Daily weather conditions o Task/area inspected o Type of inspection o Safety topics at Morning Safety Meetings o Findings o Corrective actions o Follow-up inspection dates and results o Safety Inspection Log	UXO QCS/SO
Employee/ Visitor	• Site Visitor's Log • Part of final contract file	UXO QCS/SO
Medical Surveillance	• Certificates and Records	UXO QCS/SO
Personal Exposure	• IAW applicable OSHA standards, 29 CFR 1904, 1910, and 1926	UXO QCS/SO
QC Reports	• Daily QC Reports	UXO QCS/SO
Accidents	• Accident Investigation Report (ENG Form 3394 and ZAPATAENGINEERING Form) • Submit within 2 working days (IAW AR 385-40 and USACE • Supplement 1	UXO QCS/SO
Morning Safety	• Conducted Daily • Safety Meeting Attendance Log	UXO QCS/SO
Visitor Safety Briefing	• Safety Meeting Attendance Log	UXO QCS/SO
Equipment Maintenance	• Heavy Equipment Inspection Log • Daily Calibration and Quality Control Log • Vehicle Condition Inspection Log • Daily Truck Inspection Log	UXO QCS/SO
Daily Activities	• Official record of operational activities, will contain, as a minimum, the following information: o Date and start and stop times	UXO QCS/SO

Reporting Requirement	Criteria	Responsible Personnel
	o Daily weather conditions o Personnel on-site, company, and title or classification o Record of Site Safety Meeting o Proposed and actual work activities o Equipment use (type and length of time) o Injuries, incidents, or any other health and safety-related issues or situations, including as many facts concerning the accident/incident as possible o Official communications, written and verbal	

ATTACHMENT A ACTIVITY HAZARD ANALYSIS FORMS

HAZARD ANALYSIS

Hazard analysis analyzes the significance of potential hazards and identifies safety requirements (or alternatives) needed to eliminate or control the hazards to reduce the associated risk to an acceptable level. The hazard analysis also evaluates the adequacy of the operational and support procedures that will be implemented to eliminate, control, or abate identified hazards or risks. In many cases, there will be no potential hazards associated with an operation. In such a case, include the hazard analysis for in the SOP package, but note on the hazard analysis form that "There are no potential hazards associated with this operation; therefore, a hazard analysis is not required."

Personnel conducting the hazard analysis will be knowledgeable in UXO and explosive safety standards and requirements, have and understanding of the operation, and will be knowledgeable in the method used to conduct the hazard analysis.

The hazards analysis will specifically identify the following:

- Operations and activities that involve hazardous materials or potential exposure to hazardous conditions, and the actions required minimizing the risk during these activities.
- Requirements for personal protective equipment
- Requirements for life support devices and equipment
- Special emergency procedures (e.g. egress, rescue, evacuation) to produce the expected safe result
- Requirements for handling, storing, transportation, and disposal of hazardous materials
- Requirements for safety training and certification

OPERATION. Insert name of operation.

PREPARER. Insert name of person preparing Hazard Analysis.

REVIEWER. Insert name of person reviewing Hazard Analysis.

ITEM #. This is a consecutive numbering of the potential hazards associated with this operation.

DESCRIPTION OF HAZARD. Briefly describe the potential hazards associated with this operation.

EFFECT ON OPERATION. Briefly describe how the potential hazards will effect the operation.

RECOMMENDED CONTROL. All hazards require changes in the procedures or operation to reduce the risk. Insert the recommended controls.

MOBILIZATION ACTIVITY HAZARD ANALYSIS

Activity: Mobilization
Analyzed by/Date: Bradley J. Kuntz, September 29, 2003 Reviewed By/Date: John A. Soyak, CIH, October 15, 2003

Principal Steps	Potential Hazards	Recommended Controls
Reconfirm the location of the excavation coordinates. Utility locating. Identification and establishment of a specified and marked location for vehicle parking within the support zone. Establish logistical area with support zone. Set up potable water supply. Placement of Port-A-John (s), hand washing facilities, non-hazardous waste receptacles, and potable water containers within support zone.	Back strain/Sprain Slips, trips and falls Foot injuries Heat/Cold stress Electrical shock Cuts and lacerations with use of hand tools and equipment Flying projectiles Biological (ticks, poisonous snakes and poisonous plants)	Proper lifting techniques move heavy objects with wheelbarrow/carts. Unload on level ground and good housekeeping. Wear of ANSI-approved safety shoes or boots with steel toe. Rest/work cycles, fluids, heat/cold stress monitoring. Utilities will be located and digging permits acquired. Work gloves and hard hats. Safety glasses with side shields (impact resistant) during eye hazardous operations. Education, avoidance, proper use of PPE and use of insect repellants provided by UXO QCS/SO. Level of PPE – D

Equipment To Be Used	Inspection Requirements	Training Requirements
Hand tools GPS Marking Tape and Pin Flags Support vehicles	UXO QCS/SO inspect all hand tools prior to use. Repair or replace damaged tools. Daily heavy equipment inspection by operator and UXO QCS/SO. Daily site inspections by UXO QCS/SO. Inspect Fire Extinguishers, Eye Wash Station and First Aid Kits.	Basic First Aid and CPR Initial SSHP briefing Daily Safety Meetings Emergency Response Plan Accident Prevention Plan Heat/Cold Stress Awareness

GEOPHYSICAL INVESTIGATIONS ACTIVITY HAZARD ANALYSIS

Activity: Geophysical Investigations
Analyzed by/Date: Bradley J. Kuntz, September 29, 2003 Reviewed By/Date: John A. Soyak, CIH, October 15, 2003

Principal Steps	Potential Hazards	Recommended Controls
Conduct of geophysical equipment tests and evaluations Placement of inert OE items Anomaly surveys	Back Strain/Sprain Slips, trips and falls Hand cuts, lacerations, eye and foot injuries Heat/Cold Stress Biological OE and UXO Vehicle Operations	Proper lifting techniques Unload on level ground and good housekeeping. Personal Protective Equipment – Level D. Rest/work cycles, fluids, heat/cold stress monitoring. Avoidance and UXOSO will have a supply of insect repellent for issue to field personnel Visual inspections by UXO escort for OE and UXO items. Operate vehicle at safe speeds for conditions. Be knowledgeable of vehicle operations. Only properly licensed/certified operators will operate vehicles/other mobile equipment.

Equipment To Be Used	Inspection Requirements	Training Requirements
Shovels Powered hand equipment Hand tools Geophysical survey instrumentation Vehicles and trucks	Inspect all hand tools prior to use and repair or replace damaged tools. Daily communication check and verification of cellular telephones. Daily inspection of Fire Extinguishers and First Aid Kits. Daily activity inspections by UXOSO Magnetometer daily inspections and calibration prior to use. Perform required preventive maintenance, inspect vehicle for proper operation and safety equipment prior to use.	EOD Training Basic First Aid and CPR Daily Safety Meeting Emergency Response Plan Accident Prevention Plan Heat/Cold Stress Awareness Vehicle Operators – valid license

BRUSH CLEARING ACTIVITY HAZARD ANALYSIS

Activity: Brush Clearing
Analyzed by/Date: Bradley J. Kuntz, September 29, 2003 Reviewed By/Date: John A. Soyak, CIH, October 15, 2003

Principal Steps	Potential Hazards	Recommended Controls
Prepare Equipment Clear vegetation	Back Strain/Sprain Slips, trips and falls Hand cuts, lacerations, eye and foot injuries Heat/Cold Stress Biological OE and UXO Vehicle Operations	Proper lifting techniques Unload on level ground and good housekeeping. Personal Protective Equipment – Level D. Rest/work cycles, fluids, heat/cold stress monitoring. Avoidance and UXOSO will have a supply of insect repellent for issue to field personnel Visual inspections by UXO escort for OE and UXO items. Operate vehicle at safe speeds for conditions. Be knowledgeable of vehicle operations. Only properly licensed/certified operators will operate vehicles/other mobile equipment.

Equipment To Be Used	Inspection Requirements	Training Requirements
Shovels Powered hand equipment Hand tools Vehicles and trucks	Inspect all hand tools prior to use and repair or replace damaged tools. Daily communication check and verification of cellular telephones. Daily inspection of Fire Extinguishers and First Aid Kits. Daily activity inspections by UXOSO Magnetometer daily inspections and calibration prior to use. Perform required preventive maintenance, inspect vehicle for proper operation and safety equipment prior to use.	EOD Training Basic First Aid and CPR Daily Safety Meeting Emergency Response Plan Accident Prevention Plan Heat/Cold Stress Awareness Vehicle Operators – valid license

EXCAVATION ACTIVITY HAZARD ANALYSIS

Activity: Pits Excavation
Analyzed by/Date: Bradley J. Kuntz, September 29, 2003 Reviewed By/Date: John A. Soyak, CIH, October 15, 2003

Principal Steps	Potential Hazards	Recommended Controls
Erect silt fences to both delineate work area and provide erosion control. Identification and establishment of EZ, CRZ, and SZ. Placement of 55-gallon drums, 350-gallon totes, and roll-off boxes in CRZ. Set up clean soil stockpile area. Mobilize excavator to site. Excavate pits Inspect suspected soil to segregate any remnants of white phosphorus grenades or metallic scrap from the soil. Place suspected contaminated soil in containers. Inspection of scrap metal for explosive/white phosphorus residue. Decontaminate excavator bucket. and Debris	Back strain/Sprain Slips, trips and falls Lower leg lacerations Hazardous Noise Excavation cave-in or side wall collapse Foot injuries Heat/Cold stress Cuts and lacerations with use of hand tools and equipment Flying projectiles Biological (ticks, poisonous snakes and poisonous plants) White phosphorus exposure Injuries from high water pressure	Proper lifting techniques, move heavy objects with wheelbarrow/carts. Unload on level ground and good housekeeping. Use of leg chaps during using hand tools. Earplugs and/or muffs. Initial and daily inspection by competent person. Wear of ANSI-approved safety shoes or boots with steel toe. Rest/work cycles, fluids, heat/cold stress monitoring Gloves and hard hats. Safety glasses with side shields (impact resistant) Education, avoidance, proper use of PPE and repellant to be provided by UXO QCS/SO. Evacuate if see smoking and/or burning soil; dust monitor during excavation operations. Level of PPE –Level D

Equipment To Be Used	Inspection Requirements	Training Requirements
Excavator Hand Tools Sump pump Drums/Roll off containers Totes PPE –Level D Decontamination Materials High pressure water cleaner Airborne monitoring instruments Support Vehicles	Daily heavy equipment inspection by operator and UXO QCS/SO. Inspect all hand tools prior to use. Repair or replace damaged tools. Daily site inspections by UXO QCS/SO. Daily inspection of PPE and instruments by UXO QCS/SO Airborne monitoring of EZ activities by UXO QCS/SO. Daily inspection of excavation by UXO QCS/SO (OHSA designated competent person. Daily inspection of Fire Extinguishers, Eye Wash Station and First Aid Kits by UXO QCS/SO.	EOD Training Basic First Aid and CPR Daily Safety Meeting Emergency Response Plan Accident Prevention Plan **HEAT/COLD STRESS AWARENESS**

ANOMALY EXCAVATIONS ACTIVITY HAZARD ANALYSIS

Activity: Anomaly Excavations
Analyzed by/Date: Bradley J. Kuntz, September 29, 2003 Reviewed By/Date: John A. Soyak, CIH, October 15, 2003

Principal Steps	Potential Hazards	Recommended Controls
Location and establishment of anomaly excavation sites.	Back Strain/Sprain Slips, trips and falls	Proper lifting and digging techniques Unload on level ground and good housekeeping.
Identification of anomalies.	Hand cuts, lacerations, eye and foot injuries	Personal Protective Equipment – Level D.
Excavation of anomalies.	Biological	Avoidance and UXOSO will have a supply of insect repellent for issue to field personnel
	OE and UXO	Visual inspections and identification of OE and UXO items by UXOSO and Project Team personnel.
	Explosion, fragments, projectiles	Establishment of safe distance zones.
	Heat/Cold Stress	Rest/work cycles, fluids, heat/cold stress monitoring.
	Unauthorized personnel	Establish exclusion zone and stop all unauthorized personnel.
	Vehicle Operations	Operate vehicle at safe speeds for conditions. Be knowledgeable of vehicle operations. Only properly licensed/certified operators will operate vehicles/other mobile equipment.

Equipment To Be Used	Inspection Requirements	Training Requirements
Shovels Powered hand equipment Hand tools Magnetometer(s) Geophysical survey instruments Vehicles and trucks	Inspect all hand tools prior to use and repair or replace damaged tools. Daily communication check and verification of cellular telephones. Daily inspection of Fire Extinguishers and First Aid Kits. Daily activity inspections by UXOSO. Magnetometer daily inspections and calibration prior to use. Perform required preventive maintenance, inspect vehicle for proper operation and safety equipment prior to use.	EOD Training Basic First Aid and CPR Daily Safety Meeting Emergency Response Plan Accident Prevention Plan Heat/Cold Stress Awareness Vehicle Operators – valid license

TRANSPORTATION OF EXPLOSIVES ACTIVITY HAZARD ANALYSIS

Activity: Transportation of Explosives
Analyzed by/Date: Bradley J. Kuntz, September 29, 2003 Reviewed By/Date: John A. Soyak, CIH, October 15, 2003

Principal Steps	Potential Hazards	Recommended Controls
Movement of explosives from the explosives delivery drop-off area to the detonation area by vehicle.	Unplanned detonation of explosives.	Do not expose explosives to heat, shock, or friction. Maintain explosive compatibility. Utilize vehicles with a non-plastic liner or plywood liner and cover with a topper or tarp. Individually secure each container to the vehicle floor and side rails. Brace in accordance with DOT regulations. Do not exceed vehicles weight capacity. Hand load containers of explosives into vehicle bed. Store no other material in vehicle bed. Have water, first aid, and fire extinguishers on site. Transportation and handling on-site by EOD-qualified personnel under supervision of SUXOS. Use least populated and safest transportation routes to minimize public exposure to explosives.
	Lifting heavy objects.	Use proper lifting techniques.
	Hand cuts, lacerations, eye and foot injuries	Personal Protective Equipment – Level D.
	Heat/Cold Stress	Rest/work cycles, fluids, heat/cold stress monitoring
	Thunderstorms or lightning.	UXOSO will monitor weather conditions and identification of shelter locations.
	Vehicle Operations	Operate vehicle at safe speeds for conditions. Be knowledgeable of vehicle operations. Only properly licensed/certified operators will operate vehicles/other mobile equipment

Equipment To Be Used	Inspection Requirements	Training Requirements
Vehicles and trucks Hand carts and dollies Cellular phones	Daily communication check and verification of cellular phones. Daily inspection of Fire Extinguishers and First Aid Kits. Daily activity inspections by UXOSO Daily vehicle inspection by UXOSO. Placard vehicle.	EOD Training Basic First Aid and CPR Daily Safety Meeting Emergency Response Plan Heat/Cold Stress Awareness Vehicle Operators – valid license

OE DISPOSAL ACTIVITY HAZARD ANALYSIS

Activity: OE Disposal
Analyzed by/Date: Bradley J. Kuntz, September 29, 2003 Reviewed By/Date: John A. Soyak, CIH, October 15, 2003

Principal Steps	Potential Hazards	Recommended Controls
Demolition of OE	Back Strain/Sprain	Proper lifting techniques
	Slips, trips and falls	Unload on level ground and good housekeeping.
	Heat/Cold Stress	Rest/work cycles, fluids, heat/cold stress monitoring.
	Hand cuts, lacerations, eye and foot injuries	Personal Protective Equipment – Level D.
	Biological	Avoidance and UXOSO will have a supply of insect repellent for issue to field personnel
	Explosion, fragments, projectiles	Establishment, marking and enforcement of safe blast distances. Use tamping materials. Demolition activities under supervision of SUXOS/UXOSO and conducted by PROJECT TEAM personnel.
	Noise	Ear plugs/muffs.
	Thunderstorms or lightning.	UXOSO will monitor weather conditions and identification of shelter locations.
	Vehicle Operations	Operate vehicle at safe speeds for conditions. Be knowledgeable of vehicle operations. Only properly licensed/certified operators will operate vehicles/other mobile equipment

Equipment To Be Used	Inspection Requirements	Training Requirements
Shovels Hand tools Explosives and detonators Vehicles and trucks	Inspect all hand tools prior to use and repair or replace damaged tools. Daily communication check and verification of cellular telephones. Daily inspection of Fire Extinguishers and First Aid Kits. SUXOS/UXOSO to inspect and oversee all demolition activities SUXOS/UXOSO to coordinate demolition activities, approvals and schedules with CEHNC Safety. Daily vehicle inspection. Daily site activity inspections by UXOSO.	EOD Trained Personnel Basic First Aid and CPR Daily Safety Meeting Emergency Response Plan Accident Prevention Plan Heat/Cold Stress Awareness Vehicle Operators – valid license

ENVIRONMENTAL SAMPLING ACTIVITY HAZARD ANALYSIS

Activity: Environmental Sampling
Analyzed by/Date: Bradley J. Kuntz, September 29, 2003 Reviewed By/Date: John A. Soyak, CIH, October 15, 2003

Principal Steps	Potential Hazards	Recommended Controls
Collect confirmatory soil samples from sides and bottom of excavation. Collect composite soil samples from contaminated soil in containers. Collect composite water sample from 350-gallon tote. Level of PPE –Level D	Back strain/Sprain Slips, trips and falls Foot injuries Heat/Cold stress Cuts and lacerations with use of hand tools and equipment Flying projectiles Biological (ticks, poisonous snakes and poisonous plants) Noise from heavy equipment Excavation cave-in or side wall collapse White phosphorus exposure	Proper lifting techniques, move heavy objects with wheelbarrow/carts. Unload on level ground and good housekeeping. Wear of ANSI-approved safety shoes or boots with steel toe. Rest/work cycles, fluids, heat/cold stress monitoring Work gloves and hard hats Safety glasses with side shields (impact resistant) Education, avoidance, proper use of PPE and repellant to be provided by UXO QCS/SO. Earplugs and/or muffs. Initial and daily inspections by competent person prior to entry. Evacuate if see smoking and/or burning soil.
Equipment To Be Used	**Inspection Requirements**	**Training Requirements**
Hand Tools Drums/Roll off containers 350-gallon tote PPE –Level D Decontamination Materials Sampling Equipment and Containers Support Vehicles	Inspect all hand tools prior to use. Repair or replace damaged tools. Daily site inspections by UXO QCS/SO. Daily inspection of PPE and instruments by UXO QCS/SO Daily inspection of excavation by UXO QCS/SO Daily inspection of Fire Extinguishers, Eye Wash Station and First Aid Kits by UXO QCS/SO.	Basic First Aid and CPR Daily Safety Meeting Emergency Response Plan Accident Prevention Plan Heat/Cold Stress Awareness

BACKFILLING OPERATIONS ACTIVITY HAZARD ANALYSIS

Activity: Backfilling Operations
Analyzed by/Date: Bradley J. Kuntz, September 29, 2003 Reviewed By/Date: John A. Soyak, CIH, October 15, 2003

Principal Steps	Potential Hazards	Recommended Controls
Backfill remainder of excavation with clean soil from soil stockpile. Compact soil every 6 inches. Level of PPE –Level D	Back strain/Sprain Slips, trips and falls Foot injuries Heat/Cold stress Cuts and lacerations with use of hand tools and equipment Flying projectiles Biological (ticks, poisonous snakes and poisonous plants) Noise from heavy equipment Excavation cave-in or side wall collapse White phosphorus exposure	Proper lifting techniques, move heavy objects with wheelbarrow/carts. Unload on level ground and good housekeeping. Wear of ANSI-approved safety shoes or boots with steel toe. Rest/work cycles, fluids, heat/cold stress monitoring Work gloves and hard hats Safety glasses with side shields (impact resistant) Education, avoidance, proper use of PPE and repellant to be provided by UXO QCS/SO. Earplugs and/or muffs. Initial and daily inspections by competent person prior to entry. Evacuate if see smoking and/or burning soil.
Equipment To Be Used	**Inspection Requirements**	**Training Requirements**
Vibratory compactor Hand Tools PPE –Level D Support Vehicles	Inspect all hand tools prior to use. Repair or replace damaged tools. Daily site inspections by UXO QCS/SO. Daily inspection of excavation by UXO QCS/SO Daily inspection of Fire Extinguishers, Eye Wash Station and First Aid Kits by UXO QCS/SO.	Basic First Aid and CPR Daily Safety Meeting Emergency Response Plan Accident Prevention Plan Heat/Cold Stress Awareness

DISPOSITION OF SCRAP METAL, CONTAMINATED SOIL, AND WATER ACTIVITY HAZARD ANALYSIS

Activity: Disposition of Scrap Metal Contaminated Soil, and Water
Analyzed by/Date: Bradley J. Kuntz, September 29, 2003 Reviewed By/Date: John A. Soyak, CIH, October 15, 2003

Principal Steps	Potential Hazards	Recommended Controls
Collect, document, and properly dispose of all metallic scrap. Remove and properly dispose of all contaminated soil and water. Discharge all non-contaminated water into storm drain Level of PPE –Level D	Back strain/Sprain Slips, trips and falls Foot injuries Heat/Cold stress Cuts and lacerations with use of hand tools and equipment Flying projectiles Biological (ticks, poisonous snakes and poisonous plants) Noise from heavy equipment White phosphorus exposure	Proper lifting techniques, move heavy objects with wheelbarrow/carts. Unload on level ground and good housekeeping. Wear of ANSI-approved safety shoes or boots with steel toe. Rest/work cycles, fluids, heat/cold stress monitoring Work gloves and hard hats Safety glasses with side shields (impact resistant) Education, avoidance, proper use of PPE and repellant to be provided by UXO QCS/SO. Earplugs and/or muffs. Evacuate if see smoking and/or burning soil
Equipment To Be Used	**Inspection Requirements**	**Training Requirements**
Hand Tools Drums/Roll off containers PPE –Level D Support Vehicles	Inspect all hand tools prior to use. Repair or replace damaged tools. Daily site inspections by UXO QCS/SO. Daily inspection of PPE and instruments by UXO QCS/SO Daily inspection of Fire Extinguishers, Eye Wash Station and First Aid Kits by UXO QCS/SO	Basic First Aid and CPR Daily Safety Meeting Emergency Response Plan Accident Prevention Plan Heat/Cold Stress Awareness

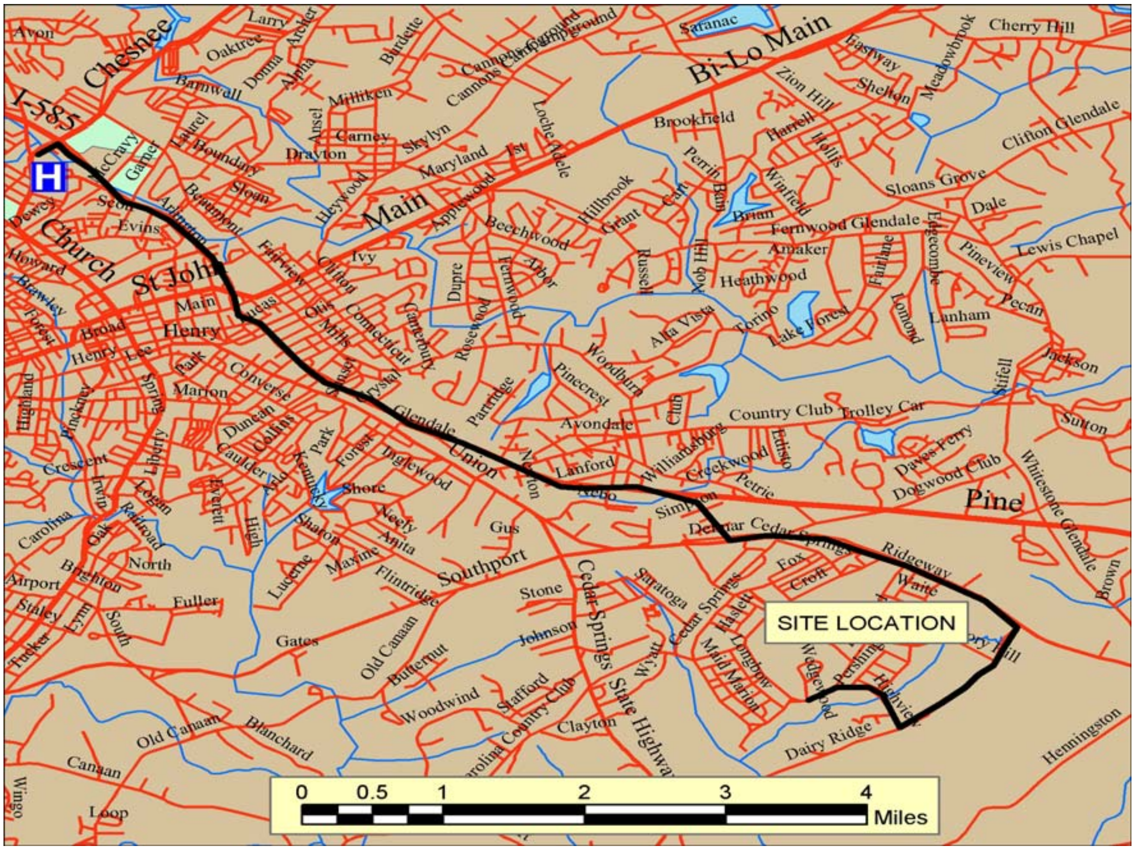
DEMOBILIZATION ACTIVITY HAZARD ANALYSIS

Activity: Demobilization
Analyzed by/Date: Bradley J. Kuntz, September 29, 2003 Reviewed By/Date: John A. Soyak, CIH, October 15, 2003

Principal Steps	Potential Hazards	Recommended Controls
Final grading of excavation surface. Seed excavation surface. Demobilize excavator. Clean up and remove heavy equipment from logistical area. Remove potable water supply from site. Remove Port-A-John(s), hand washing facilities, non-hazardous waste receptacles, and potable water containers from site.	Back strain/Sprain Slips, trips and falls Foot injuries Heat/Cold stress Cuts and lacerations with use of hand tools and equipment Flying projectiles Biological (ticks, poisonous snakes and poisonous plants) Noise from heavy equipment	Proper lifting techniques, move heavy objects with wheelbarrow/carts. Unload on level ground and good housekeeping. Wear of ANSI-approved safety shoes or boots with steel toe. Rest/work cycles, fluids, heat/cold stress monitoring. Work gloves and hard hats. Safety glasses with side shields (impact resistant) Education, avoidance, proper use of PPE and repellant to be provided by UXO QCS/SO. Earplugs and/or muffs. Evacuation if see smoking and/or burning soil Level of PPE – Level D
Equipment To Be Used	**Inspection Requirements**	**Training Requirements**
Hand tools PPE – Level D Support vehicles	Inspect all hand tools prior to use. Repair or replace damaged tools. Use tools for their intended purpose. Daily site inspections by UXO QCS/SO. Daily inspection of Fire Extinguishers and First Aid Kits by UXO QCS/SO	Basic First Aid and CPR Daily Safety Briefing Emergency Response Plan Accident Prevention Plan Heat/Cold Stress Awareness

ATTACHMENT B ROUTE MAP TO HOSPITAL

Directions to Spartanburg Medical Center
864-560-6000



Name	Spartanburg Regional Medical Center
Location	Spartanburg, South Carolina
Telephone Number	864-560-6000
Directions	From OOU-3 • Proceed south on Wedgewood Drive approximately .25 miles and turn left on East Croft Circle. • Continue on East Croft Circle approximately 5.0 miles to Hwy 34 (Southport Road) and turn left. • Proceed on Hwy 34 approximately 3.5 miles and turn right on Hwy 5 • Proceed on Hwy 56 approximately 5 miles until it joins with Hwy 22 Turn right on Hwy 22 • Proceed 2.5 miles on Hwy 221 until it splits into Hwy 56 and Hwy 9. Take the right fork (Hwy 9). • Proceed on Hwy 9 for approximately 1 mile. Medical center will be on the right hand side.

APPENDIX E
ENVIRONMENTAL SAMPLING AND ANALYSIS PLAN

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TABLES

FIGURES

ATTACHMENTS

1.0 PROJECT BACKGROUND

1.0.1 ZAPATAENGINEERING, under contract DACA87-00-D-0034, Task Order 0014 with US Army Engineering and Support Center, Huntsville (CEHNC), has been tasked to perform an ordnance and explosives (OE) removal action at three ordnance operable units (OOU) on property that was part of the Former Camp Croft, Spartanburg, South Carolina. The work required falls under the Defense Environmental Restoration Program (DERP) – Formerly Used Defense Sites (FUDS) program.

1.0.2 The OOUs 3, 11C, and 11D encompass a total of approximately 48 acres and are comprised of the Wedgewood Subdivision, a private residential area and nearby land. OOU 3 areas of concern include approximately 24 acres. OOU 11C contains approximately 9.48 acres. OOU 11D contains approximately 11.2 acres. An overall site map of Camp Croft and the projects sites can be seen in Figure B-1 in Appendix B.

1.0.3 ZAPATAENGINEERING may submit field samples to the designated Government Laboratory (GL) in Vicksburg, Mississippi. ERDC - Vicksburg will perform analysis of the samples to detect and quantify possible concentrations of WP associated with the suspected burial pit(s). The Scope of Work (SOW) is provided in Appendix A of this Work Plan.

1.0.4 The purpose of the Environmental Sampling and Analysis Plan (ESAP) is to ensure that the quality of data collected or generated during this site investigation meets or exceeds that required by the data quality objectives (DQOs). The ESAP defines a quality assurance (QA) program for oversight of field and laboratory activities and for the review of chemical data. The program is designed to show that test results and field procedures are reproducible and will corroborate the accuracy of the analytical methodologies employed as required by EM 200-1-3, ER 1110-1-263, and DID OE-005-10.01.

1.1 SITE HISTORY AND CONTAMINANTS

1.1.1 On November 4, 1940, the War Department announced that a new training center would be located in Spartanburg County, South Carolina. Camp Croft Infantry Replacement Training Center (IRTC) was officially activated on January 10, 1941, with housing for 20,000 trainees and support personnel. Camp Croft IRTC consisted of two general areas: a series of firing ranges and a troop housing area with attached administrative headquarters. Camp Croft IRTC served as one of the Army's principal IRTCs; approximately 250,000 soldiers were trained. Camp Croft was also a prisoner of war camp during World War II. The installation was declared surplus to the Army's needs in November 1946 and exceeded to the War Assets Administration in 1947.

1.1.2 The Former Camp Croft was used for a variety of different purposes. It had at least eleven live ammunition-training ranges used for small arms ammunition, anti-tank rockets, anti-aircraft artillery, 60-millimeter (mm) infantry mortars, and 81 mm infantry mortars. The training range impact areas comprised a total of 16,929 acres. The camp also had a grenade court (approximately 175 acres), although no historical evidence was located to document or confirm present day ordnance at the grenade court.

1.1.3 OOU 3 is located in the former cantonment area, north of the current Camp Croft State Park (Figure B-2 in Appendix B). Practice grenades, ordnance related scrap, and 2.36-inch rocket fragments that may have been overshot from another local firing range were found in OOU 3 during the Phase I Engineering Evaluation/Cost Analysis (EE/CA) investigation conducted in 1997. During a removal action conducted in March 1997, seven Mark (MK) II fragmentation grenades were recovered, as well as numerous practice hand grenades and grenade parts, suggesting that this area may have been a former hand grenade practice area. The previous work areas and specific work completed by UXB are identified in the Final Removal Report dated April 2001, stated that three (3) small pits in Grid 17 and one (1) small pit in Grid 40 remain to be cleared (overall grids were previously mapped using digital geophysical methods and intrusively excavated). Twelve (12) M15 white phosphorous (WP) grenades were excavated from one (1) of the pits in Grid 17 and 150 pounds of non-expended smoke canisters were excavated from the pit in Grid 40; however, additional excavation activities were halted to reevaluate safety measures and develop proper procedures to be implemented prior to continuing with the excavations. The M15 grenades reportedly contain 15 ounces of white phosphorus. Approximately 2.5 pounds of hexachloroethane is contained inside the non-expended smoke canisters.

1.1.4 OOU 11C is located west of Cedar Springs Drive, due northwest of OOU3 (Figure B-3 in Appendix B). OOU 11C is privately owned and is an undeveloped, moderately wooded property. M9 rifle grenade fragments have been found at depths of 13 inches below ground surface. OOU 11C is in a residential area adjacent to Kelsey Creek where other ordnance items, including MK II hand grenades, have been found.

1.1.5 OOU 11D is located between Keltner Avenue and East Croft Circle, north of OOU3 (Figure B-4 in Appendix B). The area is privately owned and developed for use as a golf course. The area is a suspected former grenade range. Some of the area within OOU 11D is wooded and may require some brush clearing. Practice grenades at depths of three inches have been recovered in OOU 11D.

1.1.6 The current land usage is 7,088 acres for Camp Croft State Park, 4,936 acres for farming, 256 acres for private industry, and 6,764 acres for residential.

1.2 SUMMARY OF EXISTING SITE DATA

Environmental sampling will be conducted on a limited basis to support the M15 WP grenade removal within the pits previously identified in Grid 17 of OOU3. No previous samples have been collected from the suspected white phosphorus contaminated soil or materials to date.

1.3 SITE-SPECIFIC DEFINITION OF PROBLEMS

1.3.1 The primary purpose and objective of this project is to implement and perform a removal action at the Former Camp Croft in Spartanburg, S.C. Work required under this task includes safely locating, identifying, and disposing of all explosive hazards to depth from previously identified pits within OOU3. After these tasks are completed, they will be documented in a

Removal Report. The primary contaminant of concern is white phosphorus from discarded M15 white phosphorous grenades and smoke canisters.

1.3.2 Soil generated during intrusive investigation will be screened by ZAPATAENGINEERING for large pieces of smoking white phosphorus. Sampling will be conducted in the pit only if smoking soil is observed while excavating. If necessary, the pits will be over excavated to ensure all white phosphorus impacted soil is removed and confirmatory soil samples will be collected beneath the areas where smoking soil occurred. ZAPATAENGINEERING will collect a maximum of ten soil samples, including field quality control and background samples. Samples will be submitted to the Government Laboratory in Vicksburg, Mississippi using their standard TAT.

1.3.3 If smoking soil is encountered, it will be allowed to burn off and segregated from non-smoking soils. The material will be placed in 55-gallon drums and staged near the project field office. At the end of the excavation activities, one composite sample will be collected from these drums for waste characterization and forwarded to ERDC - Vicksburg to screen for the presence of white phosphorus. Based on the analytical results, the soil will be disposed of in accordance with federal, state and local regulations. Non-contaminated spoils will be returned to the pit at the conclusion of the removal action. Recovered M15 Grenades will be transported to the Vulcan Quarry, as has been done in the past, and disposed of in accordance with the Work Plan. The excavation will be backfilled with a mix of the soil that was removed for the pit and sand. The sand mix will establish the boundaries of the pits that were excavated. Once each section is excavated, the barricades will be repositioned prior to excavation of the next section of the pit. This process will position the excavator on or in areas free of UXO/OE items (outside of the pit area or in areas that have been previously cleared) thereby affording an additional level of safety. Additionally, in order to afford a level of protection to the equipment operator operating the excavator, the exposed areas of the excavator will be covered using “Lexan” (3.78”) or the equivalent thickness of Plexiglas (approx 2.5”).

1.3.4 OE are a safety hazard and constitute an imminent and substantial endangerment to site personnel and the public. During this removal action, it is the Government’s intent that ZAPATAENGINEERING destroy, by detonation on-site, all OE encountered. This action will be performed in a manner consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 104 and the National Contingency Plan (NCP), Section 300.400. No Federal, State, or local permits are required for any action taken on this site. OE found during execution of the SOW fall under the applicable provisions of 29 Code of Federal Regulations (CFR) 1910.120, Hazardous Waste Operations and Emergency Response.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section identifies those individuals and organizations participating in the project, and defines their specific roles and responsibilities as they relate to the data quality management function. All project personnel are responsible for identifying, reporting, and documenting any activity, which could adversely affect the quality requirements set forth in the Statement of Work. Specific responsibilities of essential personnel and subcontractors related to this ESAP are defined in the paragraphs that follow. Refer to Figure 2-1, Organizational Chart in the Technical Management Plan for a graphical presentation of the entire project organization.

2.1 PROJECT MANAGER (PM)

The ZAPATAENGINEERING Project Manager, Mr. Michael J. Winningham, carries the primary responsibility for implementing the contractor-required activities in the SOW. The PM will oversee the performance of all project team members, coordinate subcontractor activities, and ensure that technical and contractual issues are resolved. The PM will manage the intrusive investigation and sample collection activities, as well as supervise field personnel and subcontractors to ensure that procedures described in the Work Plan are implemented in accordance with the Site Safety and Health Plan (SSHP). The PM is also responsible for maintaining daily records of work performed, personnel on-site, any work stoppages, and communications with other agencies pertaining to the project.

2.2 ENVIRONMENTAL TECHNICIAN

The ZAPATAENGINEERING Environmental Technician will report to the PM and will provide direction and support for all project sampling activities, including sample collection, handling, storage, preservation, and shipment. Other responsibilities include, but are not limited to:

- supporting the preparation of the site-specific work plans with respect to analytical requirements and methodologies;
- interfacing with government laboratory personnel on matters concerning chemical sampling and analysis, laboratory readiness, sampling schedules, sample containers, laboratory reports, and the resolution of non-conforming activities or data;
- reviewing analytical data to ensure conformance with quality assurance testing and standards and approving analytical data; and
- identifying, reporting, and recommending solutions for non-conforming sampling or analytical activities or data.

2.3 QA MANAGER

The QA Manager is independent of the project team and is responsible for reviewing all QA/QC procedures to be used in the project, reviewing subcontractor system audits and Quality Control (QC) procedures to ensure compliance with the project QC guidelines in the work plan, performing a quality review to ensure the quality of deliverables from the project team to CEHNC, and interaction and communication with subcontractor and CEHNC QA personnel.

2.4 QC OFFICER

To ensure that quality is maintained throughout all phases of this sampling effort, a three-phase control process is maintained. Quality control phases (QC phases) of preparatory, initial, and follow-up are performed onsite by an assigned ZAPATAENGINEERING QC officer whether or not a Government representative is present. The QC officer will summarize the activities of each QC phase in the daily QC report. Because of the relative small amount of sampling required for this project, the ZAPATAENGINEERING assigned QC Officer for this project will be Mr. Tim Hendrix, who is also the Unexploded Ordnance Quality Control/Safety Officer (UXO QC/SO).

2.5 SUBCONTRACTORS

2.5.1 ERDC - Vicksburg

2.5.1.1 The government laboratory, ERDC – Vicksburg, will perform analytical confirmatory testing for white phosphorus. Adherence to ERDC – Vicksburg's Quality Assurance and Quality Control Program is accomplished by the assignment of an experienced employee. This person is responsible for all phases of ERDC – Vicksburg's involvement in the project, including pre-project planning, sample bottle preparation, computer entry, analytical and QC data approval, final review of the analytical report, and discussions of results with CEHNC and ZAPATAENGINEERING. The Point of Contact (POC) for ERDC – Vicksburg is Mr. Richard Karn, who can be reached at (601) 634-3863. All samples should be sent to the below address and chain of contact person.

USACE ERDC - Vicksburg
Attn: Linda Stevenson, EP-C
3903 Halls Ferry Road
Vicksburg, MS 39180-6199

2.5.2 ERDC – CRREL

The government Quality Assurance (QA) laboratory, ERDC – CRREL, will perform analytical QA split samples for this project. Adherence to ERDC – CRREL's Quality Assurance and Quality Control Program is accomplished by the assignment of an experienced employee. This person is responsible for all phases of ERDC – CRREL's involvement in the project, including pre-project planning, sample bottle preparation, computer entry, analytical and QC data approval, final review of the analytical report, and discussions of results with CEHNC. The Point of Contact (POC) for ERDC – CRREL is Ms. Marianne E. Walsh, who can be reached at (603) 646-4666.

CRREL
ATTN: Marianne E. Walsh
72 Lyme Road
Hanover, NH 03755-1290
(603) 646-4666

2.5.3 Science Applications International Corporation (SAIC)

Although ERDC - Vicksburg will conduct a comprehensive QC review of data prior to issuing reports, Science Applications International Corporation (SAIC) will also review the QC data and perform its own validation process. The data-evaluation process includes verification, validation, and review. SAIC's Senior Analytical Chemist, Mr. Nile Luedtke, will produce a Quality Control Summary Report of the validation process and results. The process is described in Attachment B of this Appendix. The validation will be documented in the draft and final Removal Reports.

3.0 PROJECT SCOPE AND OBJECTIVES

3.1 TASK DESCRIPTION

3.1.1 Upon the completion of the site preparation, surface clearance operations will be conducted in support of brush clearing and geophysical operations. The surface clearance team will carefully identify and mark anomalies identified during the surface clearance using standard sweep line techniques. The sweep line will sweep the grid in alternating north and south oriented lanes, identifying potential OE items and recovering OE-related scrap. All surface clearance operations will be performed under the general supervision of the on-site SUXOS. The UXO Technician II, working under the direct supervision of the UXO Technician III, will identify and mark the target anomalies with crossed pin flags or stakes with flagging tape.

3.1.2 The UXO Technician III will record identification data, including nomenclature, offset, and weight on a field copy of the grid sheet. As a final check to ensure that the anomaly has been removed or destroyed, the UXO Technician III will visually check the anomaly locations at the end of the day to confirm the anomaly removal. The UXO Team will detonate in place any UXO or OE items containing explosives that are encountered during the surface clearance operations. All disposal operations will be performed under the direct supervision of the on-site SUXOS and the UXO Safety Officer.

3.1.3 The acquisition of anomalies will be accomplished by the Geophysical Teams operation using the same geophysical equipment utilized during geophysical mapping. Target anomalies identified on dig sheets will be flagged for excavation. In areas, which cannot be geophysically mapped, the search for anomalies will be accomplished by using magnetometers in a "Mag & Flag" type of operation. The decision whether to use a Mag & Flag or Mag & Dig operation will be made by the SUXOS on site depending on the condition of the grids. In the event of heavily contaminated areas or grids, the individual grids may need to be swept more than once. If the grid is to be swept more than once, operators may vary the instrument sensitivity settings to remove the larger anomalies first, increasing sensitivity in successive sweeps until the SOW objective for the grid is met.

3.1.4 For Mag & Flag operations, instrument operators line up along one side of the grid, one operator per lane, and advance to the opposite side of the grid. The instrument will be used to check the lane for anomalies and a pin flag placed next to the highest reading from the instrument at each anomaly. Operators are usually staggered slightly so that the instruments do not interfere with each other. After the grid has been completely swept by the team, UXO technicians go back and excavate each of the anomalies marked by the pin flags.

3.1.5 For Mag & Dig operations, instrument operators line up as in mag & flag operations. Usually there are teams consisting of one instrument operator and one or two excavators. As the operator proceeds along the lane, he uses the instrument to check for anomalies. As each anomaly is discovered, it is excavated and identified. This continues until the lane is completed and repeated in the next lane until the grid has been cleared.

3.1.6 Prior to excavation of targets, a two-person team will mark anomaly locations in the field. Utilizing the identical surveying system as was used for the collection of data, the team will reestablish the coordinate location of each anomaly as listed on the dig sheet and mark them using pin flags labeled with the appropriate target identifier. The location of each anomaly will then be refined using the same geophysical instrument as was used for the original survey. The team will collect and carefully monitor continuous geophysical readings and slowly maneuver the instrument over the anomaly until the peak response is located. Pin flags will then be adjusted to the location of peak response. The locations of all target peak locations will also be marked with spray paint in case any pin flags are disturbed prior to the start of excavation. The reacquisition team will document the coordinates of all adjusted anomaly locations and their peak response values as well as any targets that cannot be reacquired.

3.1.7 Prior to any intrusive operation, the exclusion zone must be clear of all non-UXO qualified personnel. ZAPATAENGINEERING will coordinate the Removal Action activities and excavations with homeowner's and golf course management. Non-UXO qualified personnel will not be allowed back into the exclusion zone until all intrusive activities within that zone are complete. Every effort will be made to minimize the disruption to residents of the community consistent with safety concerns. Once established, the exclusion zone will remain in effect until all intrusive and disposal activities within the zone boundaries have been completed. Once activities within the zone have been concluded, the SUXOS will direct closure of the zone, opening the area to normal activities.

3.1.8 ZAPATAENGINEERING will conduct a clearance to depth in three small pits in Grid 17 and one pit in Grid 40. We assume a clearance effort of one week per pit for UXO operations. In the event that clearance depths of the pits exceed four feet, ZAPATAENGINEERING will develop safety measures in compliance with OSHA, USAESCH EM 385-1-1, and other pertinent regulations.

3.1.9 The Most Probable Munition (MPM) fragmentation distance for M15 White Phosphorus grenade is 517 feet, which will require the local residents to be evacuated as well as use of engineering controls. Engineering controls will consist of a portable canopy with adjustable legs, which will be positioned over the pit(s). For additional safety, the canopy will be covered with a fire resistant tarp (top and both sides, with the ends being open). The Croft Fire Department will stand ready to assist just outside of the fragmentation distance during intrusive operations (at no cost). As necessary, homes nearest the pits will be wetted down with a controlled spray by the local fire department. Residents within the fragmentation arc will be evacuated.

3.1.10 Based on aerial photographs, it appears that two residential homes are within the immediate vicinity of Grid 17. The USAESCH Guide for Selection and Siting of Barricades for Selected Unexploded Ordnance (HNC-ED-CS-S-96-8 R1 dtd Sep 97) used to determine the best methodology and calculations for providing a level of property protection to the nearby and surrounding residences. A barricade made of sufficient thickness (e.g., 0.09" of steel or 0.22" of aluminum), sized and sited in accordance with HNC-ED-CS-S-96-8 was determined to be the best method of defeating the fragmentation of the M15 WP grenade. Either a plate barricade design or a shed structure design will be used to mitigate the fragmentation hazard associated with Grid 17. Costs and practicability will be the determining factor on which design is used.

3.1.11 The pit will be excavated using a backhoe. If the backhoe cannot gain access to the backyard, the pits will be excavated by hand. The backhoe will be located outside of the engineering controls and the operator will extend the boom of the backhoe and excavate the pit in 12-inch lifts. Excavation will commence at the point furthest from both houses and work towards them in a forward and to the right direction. Excavation will continue until there is no further evidence of UXO/OE or OE related scrap items. Spoils will be placed onto geotextile and visually searched by hand by the UXO Technicians for OE items. This process will be repeated until entire contents of the pit(s) have been excavated. Grid 17 will be geophysically mapped as a Quality Control check per Task 7 of the SOW, and the anomalies will be reacquired.

3.1.12 Environmental sampling will be conducted on a limited basis to support the M15 grenade removal within the pits previously identified in Grid 17. If smoking soil is observed while excavating, the pits will be over excavated (if required) to ensure white phosphorus impacted soil is removed. Confirmatory soil samples will then be collected from beneath the areas where smoking soil was observed. Up to ten environmental samples will be collected, which includes field quality control samples. Sampling will not be conducted within the excavation area until all smoking soil has been removed.

3.1.13 If smoking soil is encountered, it will be allowed to burn off and segregated from non-smoking soils. The soils will only be containerized and sampled for disposal if they were smoking. A composite soil sample of the suspected contaminated material will be forwarded to ERDC - Vicksburg for white phosphorus. Spoils determined to contain white phosphorus will be disposed of as Investigated Derived Waste (IDW), per Task 14 of the SOW. Non-contaminated spoils will be returned to the pit at the conclusion of the removal action. Recovered M15 Grenades will be transported to the Vulcan Quarry, as has been done in the past, and disposed of in accordance with the Work Plan. The excavation will be backfilled with a mix of the soil that was removed for the pit and sand. The sand mix will establish the boundaries of the pits that were excavated. Once each section is excavated, the barricades will be repositioned prior to excavation of the next section of the pit. This process will position the excavator on or in areas free of UXO/OE items (outside of the pit area or in areas that have been previously cleared) thereby affording an additional level of safety. Additionally, in order to afford a level of protection to the equipment operator operating the excavator, the exposed areas of the excavator will be covered using "Lexan" (3.78") or the equivalent thickness of Plexiglas (approx 2.5").

3.2 APPLICABLE REGULATIONS AND STANDARDS

3.2.1 Applicable regulations and standards are listed in Section 2.1 of the Technical Management Plan.

3.2.2 ZAPATAENGINEERING contacted Mr. Scott Wilson, CERCLA Section of South Carolina Department of Health and Environmental Control (SCDHEC), concerning applicable soil standards for white phosphorus to be evaluated consistent with CERCLA requirements. Mr. Wilson stated that South Carolina uses the EPA Region IX PRGs for white phosphorus and suggested we follow the residential standard. Thus, evaluation of sample results will include comparison of detected concentrations to Region IX residential PRGs for white phosphorus of 1.6 mg/kg. If any concentrations exceed the Region IX residential PRGs for white phosphorus, it will be reported in the Removal Report. This will define the quality control/quality assurance criteria.

3.3 PROJECT SCHEDULE

A project schedule is provided in Section 8, Work, Data, and Cost Management Plan.

4.0 NONMEASUREMENT DATA ACQUISITION

4.0.1 Nonmeasurement data acquisition describes those data needed from nonmeasurement sources. This may include information obtained from databases, literature, handbooks, local planning authorities, and other specific organizations. Information of this type may be needed to support risk assessment (local relevant or significant habitats, endangered species, future land uses, and well surveys); geological data (site bedrock formations, soil series); hydrogeological data (local or regional aquifers); meteorological data; data supporting modeling activities, etc.

4.0.2 Nonmeasurement data relevant to this project is included in Section 11, Environmental Protection Plan, of the Work Plan.

5.0 FIELD ACTIVITIES BY AREA OF CONCERN

5.1 SUBSURFACE SOIL

5.1.1 The primary chemical of concern at this site is white phosphorus, which originated as a component of MP15 WP grenades that were reportedly dumped at Grid 17. Soil generated during intrusive investigation will be sifted by ZAPATAENGINEERING for remnants of grenades and other metallic scrap. If smoking soil is observed, the pits will be over excavated to ensure white phosphorus impacted soil is removed and up to ten confirmatory samples for white phosphorus will be collected. QA/QC samples will be collected simultaneously with soil samples. If confirmation sampling is required, it is estimated that one Quality Control (QC) duplicate and one Quality Assurance (QA) duplicate sample will be collected and analyzed for the parameters listed in Table E-1. The government laboratory will analyze the samples under their standard TAT. Evaluation of sample results will be compared to the Region IX residential Preliminary Remediation Goals (PRGs) for white phosphorus of 1.6 mg/kg and reported in the Removal Report.

5.1.2 After completing the excavation and confirmatory sampling (if required), ZAPATAENGINEERING will begin backfilling as discussed in the Technical Management Plan. No confirmatory samples will be collected if smoking soil is not encountered and the excavation will be backfilled without any additional actions. See Section 5.3.1 of this plan for more details.

5.2 WASTE CHARACTERIZATION SAMPLES

ZAPATAENGINEERING may temporarily store both soil and water IDW during this task order. For waste classification purposes, composite samples will be collected from this media as indicated in the following two subsections. Labels for individual samples will include the sample number, the ZAPATAENGINEERING telephone number, the USACE point of contact and the phone number, content description and suspected contaminant(s). A separate red and black label will be placed on the container of origin indicating "ON HOLD PENDING ANALYSIS…DO NOT TAMPER WITH CONTAINER…AUTHORIZED PERSONNEL ONLY".

5.2.1 Soil

If smoking soil is encountered, it will be allowed to burn off and segregated from non-smoking soils. The material will be placed in 55-gallon drums and staged near the project field office. At the end of the excavation activities, one composite sample will be collected from these drums for waste characterization using stainless steel pre-cleaned utensils. Labels for samples will read "S = IDW soil". ERDC - Vicksburg will analyze the sample under their standard TAT for white phosphorus as specifically required for waste acceptance by the disposal facility. Table E-1 is a summary of the analytical sampling requirements for soil waste characterization samples. Based on the analytical results, the soil will be disposed of in accordance with federal, state and local regulations.

5.2.2 Water

Site personnel will drum water generated during decontamination activities, and sequentially number each, including date, site, and origin and suspected contaminant(s). A composite water sample will only be collected from the drums if smoking soils are encountered during the execution of this task order. Labels for samples will read "W = IDW water". As indicated on Table E-1, if required, this composite wastewater characterization sample will be analyzed for white phosphorus using standard TAT. In water, white phosphorus has a Region IX tap water PRG of 0.73 ug/L, a Drinking Water Equivalent Level (DWEL) of 0.5 ug/L and a Lifetime Health Advisory of 1 ug/L. If analytical laboratory results indicate the IDW is contaminated or hazardous, it will be shipped to the permitted Clean Harbors facility. If laboratory results indicate that the water stored in the drums doesn't require treatment or no composite sample is required, the water will be discharged at a nearby stormwater drainage system.

5.3 FIELD PROCEDURES

5.3.1 Soil Sampling

5.3.1.1 While excavating the pit at Grid 17, up to ten confirmatory soil samples will be collected if smoking soil is encountered. In addition, the pit will be over excavated to increase the probability white phosphorus impacted soil is removed. Sample quantities are estimates, which are subject to change once fieldwork starts. Grab samples will be collected using stainless steel pre-cleaned utensils, from soil directly below suspected white phosphorus impacted areas.

5.3.1.2 All samples will be packed in an amber, 4-ounce wide mouth glass jar with Teflon cap. Samples will be collected as quickly as possible and packed tightly to minimize contact with air. One-field quality control duplicate and one-quality assurance split sample will also be collected. The government laboratory ERDC - Vicksburg, will perform laboratory analysis for white phosphorous.

5.3.1.3 For soil waste disposal requirements, composite samples will be collected from the drums containing suspected white phosphorus contaminated soil removed from the pit. As above, these samples will be collected using stainless steel pre-cleaned utensils. Samples will be packed in containers as indicted in Table E-1. Samples will be sent to the government laboratory ERDC – Vicksburg for white phosphorus for standard TAT.

TABLE E-1 FIELD SAMPLING AND ANALYSIS

ENVIRONMENTAL SAMPLING AND ANALYSIS PLAN

Matrix	No. Field Smpls	QC Dup/ Splts	Total Smpls	QA Dup/ Splts	Total QA Smpls	Analysis/ Extraction	Analytical Procedures	DQO Level	Holding Time to Extract	Holding Time to Prep Extract	Holding Time After Prep Extract to Analysis	Preservation Requirements	Sample Containers	Total Cntnrs
Soil	9	1	10	1	1	White Phosphorous	SW7580	Level III	14 days	7 Days	14 Days	Ice to 4º C, No Headspace	Two 125m Amber Glass Jars w/ PFTE-lined Septum	11
Waste Characterization (Waste Water)	1	0	1	0	0	White Phosphorous	SW7580	Level III	5 days		8hours	Ice to 4º C	One Amber Liter Glass Jar	1
Waste Characterization (Soil)	1	0	1	0	0	White Phosphorous	SW7580	Level III	14 days	7 Days	14 Days	Ice to 4º C, No Headspace	Two 125m Amber Glass Jars w/ PFTE-lined Septum	1

Note: The number of samples for both soil and waste characterization may change, depending if smoking soil is encountered during excavation activities.

5.3.1.5 After collection, soil samples will be transferred immediately into pre-cleaned glass containers with Teflon-sealed screw caps. Glass containers will be labeled and wrapped so as to prevent glass breakage. Samples will be placed in a cooler with bagged ice to keep the temperature of the samples at approximately 4 degrees C. Required sampling equipment for collection of soil samples includes:

- Nitrile Gloves
- Coolers;
- Ice;
- Zip-lock bags;
- Pre-cleaned glass jars and lids;
- Chain-of-Custody Forms;
- Stainless-steel hand auger;
- Stainless-steel bowls and utensils;
- Field notebook;
- Sample labels; and
- Water-proof pen for labeling.

5.3.2 IDW Water Sampling

A composite water sample will only be collected from the containerized decontamination water if smoking soils are encountered during the execution. Prior to sampling, the drum will be mixed using a pump. As with the soil, samples will be sent to the government laboratory ERDC – Vicksburg for white phosphorus for standard TAT. Required sampling equipment for collection of IDW water includes:

- Nitrile Gloves
- Coolers;
- Ice;
- Zip-lock bags;
- Pre-cleaned glass jars and lids;
- Chain-of-Custody Forms;
- Teflon bailer;
- Bailing Nylon String;
- Field notebook;
- Sample labels; and
- Water-proof pen for labeling.

5.3.3 Field Quality Control and Quality Assurance Sampling Procedures

Quality Assurance (QA) and Quality Control (QC) samples are analyzed to assess the quality of the sampling effort and the analytical data. These samples may include split samples, replicates of field samples (field duplicates), rinsate blanks, and trip blanks. QA and QC samples will not be collected for waste characterization samples.

5.3.3.1 Split Samples (Duplicates)

Split samples (or duplicate samples) are collected as a single sample, homogenized (with the exception of VOC samples), divided into two or more equal parts, and placed in separate containers. The number of duplicate samples is generally 10% of the field samples. The samples will be split in the field prior to delivery to a laboratory. Ordinarily, two different laboratories analyze duplicate samples. Quality Assurance duplicate samples scheduled for this project will be sent to a Government Quality Assurance (GQA) laboratory (ERDC – CRREL), while Quality Control duplicate samples will be sent to another government laboratory (ERDC – Vicksburg) with a different identification number.

5.3.3.2 QA Samples

5.3.3.2.1 Quality Assurance (QA) samples will be sent by overnight delivery to the GQA laboratory (ERDC – CRREL) to evaluate the performance of the Government Laboratory in Vicksburg, Mississippi. These samples will be generated from splits of the required field control samples. Each field control sample collected will be homogenized thoroughly, and then divided equally, one portion sent to the GQA laboratory and the remainder sent to ERDC - Vicksburg. The GQA samples will include all sample matrices and analytical parameters except samples analyzed for waste characterization. See Table E-1 for the number and sampling requirements for QA samples.

5.3.3.2.2 The GQA laboratory will be notified of the impending shipment of samples not less than two weeks notice before shipment. ZAPATAENGINEERING will provide sample containers, shipping, etc. for the GQA laboratory. All GQA sample handling and custody requirements will be administered by ZAPATAENGINEERING similar to the environmental samples. ZAPATAENGINEERING will notify CEHNC at least two weeks before field activities begin to prepare the GQA laboratory for sample receiving.

5.3.3.2.3 ERDC - Vicksburg laboratory data (including parent sample, field control samples and associated laboratory QC) will be provided to ERDC – CRREL and CEHNC per the submittal schedule for QA evaluation.

5.3.3.3 Quality Control Samples

The sampling team will collect Quality Control (QC) samples for analysis by the Government Laboratory in Vicksburg, Mississippi. QC samples will be generated from field duplicates collected from the standard samples. The identity of QC samples will not be provided to the analysts or laboratory personnel. ZAPATAENGINEERING will keep a log identifying each Quality Control sample to its duplicate soil or groundwater sample. This procedure ensures that the laboratory will not know which Quality Control sample matches the field sample. A table will be provided in the report that designates the QC sample to the duplicate field sample. The purpose of the QC samples is to provide site-specific, field-originated checks of the quality of the data generated by the laboratory. See Table E-1 for the number and sampling requirements for QC samples.

5.3.4 Calibration Procedures and Frequency

5.3.4.1 This discussion describes procedures for maintaining the accuracy of all instruments and measuring equipment, which are used for conducting field tests.

5.3.4.2 Field instruments and equipment used to gather generate, or measure environmental data will be calibrated on a daily basis so that accuracy and reproducibility of results are consistent with the manufacturer's specifications. In the event that an internally calibrated field instrument fails to meet calibration/checkout procedures, it will be returned to the manufacturer for service. The calibration procedures and frequencies for laboratory instruments will be as specified in SW-846.

5.3.4.3 Equipment to be used during the removal activities will be examined to certify that it is in proper operating condition. This examination includes referring to the manufacturer's operating manual and the instructions for each instrument to ensure that all maintenance requirements are being met.

5.3.4.4 Because of the physical nature of white phosphorus, ZAPATAENGINEERING does not propose the use of field instruments to screen for the presence of white phosphorus. However, dust levels will be conducted during excavation and sifting activities, as determined by the Safety Officer, using a Particulate Dust Monitor (PDM). Details of this device and its maintenance and calibration are provided in Appendix D, SSHP.

5.3.5 Decontamination

5.3.5.1 All sampling equipment that comes into contact with potentially contaminated media will be decontaminated in the hotline area. This procedure is based on Table E-1 of EM 200-1-3, dated February 1, 2001.

1) Non-phosphate detergent and tap-water (bottled water) wash, using a brush if necessary
2) Tap-water rinse
3) Isopropyl alcohol rinse
4) De-ionized/distilled water rinse 2x
5) Air dry. (Decontaminated sampling equipment will be wrapped in aluminum foil after decontamination and drying, if they are not to be immediately used.)

5.3.5.2 Decontamination will occur prior to and after each use of a piece of equipment. Disposable equipment intended for one-time use will not be decontaminated after use, but will be packaged for appropriate disposal.

5.3.6 Location and Survey Information

Drawings will show the location, identification, coordinates and elevations of sampling locations with a map scale large enough to show their location with reference to landmarks at the site. A tabulated list of the sampling locations (minimum 1' accuracy) and monuments, including their coordinates and elevations, all field books, and all computation sheets will be prepared and submitted to the CEHNC in the Final Report.

5.3.7 Field DQOs and Parameters

5.3.7.1 Field data quality objectives can be divided into two major segments, those pertaining to field observations and field instruments, and those related to sample selection, collection, and shipping. Calibration of the field equipment, adherence to operational procedures, and documentation of all observations and readings will assure the accuracy, completeness, and representativeness of the data.

5.3.7.2 The media to be sampled during the field activities may include soil and investigative derived waste consisting of soil and water. The collected samples and the data generated from these samples, as well as other site-generated data, are intended to provide the information necessary to assess disposal options. Specifically for soils, representative samples will be collected from suspected areas of contamination associated with WP-related anomalies or notably stained/smoking soils. For IDW, samples will be collected to assess the presence of specific contaminants for use in disposal determinations. The analytical data of all samples must be sufficient in both precision and accuracy to identify the compounds present and the respective concentrations. Field duplicates will be collected and submitted to the analytical laboratory for assessing the quality of these data. These samples will be identified as such and reported as any other field sample. Duplicate samples will be collected and analyzed to check for sample reproducibility.

5.3.7.3 Sampling for white phosphorus and waste characterization will be as indicated in Table E-1. If site conditions or data indicates there should be any deviation from this table, the ZAPATAENGINEERING Project Manager will immediately notify the CEHNC for further discussion. Any deviations from sampling procedures will be described in the field logbook.

6.0 FIELD OPERATIONS DOCUMENTATION

Verifiable sample collection and custody is an integral part of all field operations. Several steps will be taken in the field to document and ensure that samples collected in the field have been properly acquired, preserved, and identified. This information will be included in additional reports drafted after field activities are complete.

6.1 QUALITY CONTROL AND STATUS REPORTS

A variety of reporting mechanisms will be employed throughout the project to facilitate communication between the CEHNC and ZAPATAENGINEERING. These mechanisms include Weekly Project Status Reports, Monthly Status Reports, and QC Summary Reports. Each report is instrumental in maintaining adequate continuing communication between the various entities involved in the project. On the days environmental samples are collected, a Daily Quality Control Report for Environmental Sampling will be prepared by ZAPATAENGINEERING and submitted to CEHNC via e-mail.

6.1.1 Weekly Project Status Report

ZAPATAENGINEERING will prepare and submit a project status report on a weekly basis following the “Notice to Proceed” until approval of the Final Removal Report. Elements of the report will include project expenditures and progress, field information, summary of vehicles and equipment, personnel on site, and exposure data as required by DID OE-085.01.

6.1.2 Monthly Status Reports

Each month, ZAPATAENGINEERING will submit a progress report to the CEHNC identifying accomplishments, noting deficiencies, and describing corrective actions associated with the project. Information from the DQCRS is summarized in the Monthly Status Reports. Progress Reports will be submitted to the CEHNC Project Manager along with the request for payment. The percentage of the contract amount consumed by each task will be identified.

6.1.3 Quality Control Summary Report

The Quality Control Summary Report (QCSR) will document all data validation. SAIC will compile the QCSR report for this project. The report will include a discussion of any data points that may have been influenced or compromised, their impact on Data Quality Objectives or remedial decisions, problems encountered, and any corrective actions implemented. The QCSR will be issued as an appendix within the Removal Report. An example of the elements required for this level of effort includes, but are not limited to, the following:

- Laboratory QC Activities - Elements are a summary of planned laboratory control activities, a summary of any deviations from planned activities, and a summary of evaluation of the data quality of each analysis and matrix.
- Field QC Activities - Elements are a summary of planned field quality control activities, a summary of any deviation from planned activities, and a summary of the evaluation of the quality of the sampling.
- Data Presentation and Evaluation - Elements are an assessment of sampling and analysis techniques, an evaluation of the data quality of each matrix and parameter, and an evaluation of the usability of the data.

6.2 FIELD LOG BOOK AND/OR SAMPLE FIELD SHEETS

6.2.1 Sample collection, storage, packing, and shipment will be properly documented to ensure chemical data integrity. Chemical QA information will be recorded in the field logbook using indelible ink. Corrections to be made will be identified by drawing a single line through the error, then initialing and dating the line. Each page will be dated, initialed, and sequentially numbered. The inside cover will include the address and telephone number of the ZAPATAENGINEERING office. The cover of each field logbook will bear the following:

- project name;
- project number; and
- opening and closing dates for data contained in the book.

6.2.2 At the beginning of each daily entry, the date, start time, weather, and planned activities will be recorded. The names of visitors and the purpose of their visits will be noted. Any deviations from the ESAP will be recorded along with the reason for the deviation.

6.2.3 In addition to the field logbook, data acquisition information will be recorded on the Chain-of-Custody (Figure E-1).

6.2.4 Sampling personnel will record the preparation activities that may be pertinent to the sampling event at each sampling location in the field logbook. For soil sampling, this documentation may include information on the presence of surface staining, water logging or ponding, proximity to roads or waste piles, apparent upgradient physiographic or hydrogeologic features of significance, the depth from which the samples were collected, and sampling techniques.

6.2.5 A unique identification number will be assigned to each sample. The sample identification number will contain an alphanumeric sequence referencing the sample by matrix and location, depth, and/or relative position in the sampling sequence. Upon sample collection, the ZAPATAENGINEERING field technician will label sample containers with this identification number that uniquely identifies the sample. The sample identification number will be logged in the field logbook, and on the Chain-of-Custody Record (Figure E-1). ZAPATAENGINEERING will reference all information pertaining to a particular sample by its unique identification number recorded on the sample bottle, in the field logbook, and on the sample chain-of-custody form. All QA split samples will be identified using the same identification number as there equivalent primary split sample, with "(QA)" added to the end of the identification. All Quality Control duplicate samples will be identified as QCx, with the x representing the ascending QC sample order. ZAPATAENGINEERING will keep a log relating each Quality Control sample to its duplicate soil sample. This procedure will ensure that the laboratory will not know which Quality Control sample matches the standard sample.

6.2.6 To assure that the samples are representative of the area from which they are collected, chain-of-custody records will be used as control documents to ensure that samples are handled properly, and sample custody is maintained. The chain-of-custody record will be initiated by the field sampling personnel upon collection of the sample, and will accompany each sample cooler. Each individual who has possession of the samples will sign the chain-of-custody.

6.2.7 To control common problems such as labeling errors, chain-of-custody errors, and transcription errors, detailed procedures for properly recording sample information and analytical requests on chain-of-custody forms, and for sample packaging and shipment are described in herein. Field personnel are required to become familiar with the appropriate sections of this Work Plan, prior to initiating fieldwork.

6.2.8 The sample technician will generate a sample register in the field. The function of the sample register is to provide a comprehensive record of collected samples to be used for shipment tracking, tracking receipt of analytical data, and to provide a foundation for information management. All information will be recorded daily in indelible ink. Daily entries will include information on the date and time sampled, sample location, headspace readings, sample identification number, sample type, matrix type, laboratory destination, date shipped, shipment tracking number, and associated QA/QC samples.

6.3 DATA ASSESSMENT AND PRESENTATION

Data will be arranged and presented in a clear and logical format in accordance with scientifically accepted standards. There should be, at a minimum, two types of data tables. The first shall include all analytical results for all samples collected. The second shall include all analytical results greater than Method Detection Limit (MDL) for all samples collected. Tables should be sorted by method and include appropriate data flags resulting from laboratory review and from Contractor's data validation. Figures, charts, tables, and other visual displays (e.g., maps and sections) will be used for organizing, evaluating, and presenting data and for highlighting relationships of data to maximum contaminant levels or other standards. Data displays are necessary for documenting results and aiding the decision-making process during an investigation.

6.3.1 Tabular Data Displays

6.3.1.1 Raw analytical data and field data (unsummarized values) will be presented in tables as part of the project report. Raw analytical data tables will be organized by sample/measurement location and type, and will include the following:

- Sample/measurement identification code;
- Sample/measurement location, type, and matrix;
- Sampling date;
- Analytical methods;
- Analytical results; and
- Reporting units.

6.3.1.2 Field data tables will be specific to the type of data to be reported (e.g., soil or water-quality parameters). Measurement values and qualifiers (as assigned during data validation) will be listed in the tables, including those for rejected data. Rejected data will be marked as such in the raw data table, and the reasons for rejection will be presented in a footnote. The reporting units will be those specified by the associated approved analytical or field method. In general, concentrations of specific contaminants will be reported as: milligrams per liter (mg/L), micrograms per liter (ug/L), or milligrams per kilogram (mg/kg).

6.3.1.3 Sorted summary tables will be used to display trends or patterns in analytical data generated from field samples. These tables typically will be composed of subsets of data from the raw data tables and usually will be sorted by sample location, medium, and constituents. Data will be screened for analyte concentrations in excess of their respective detection limits, and those in excess of Region IX Preliminary Remediation Goals (PRGs), residential criterion (1.6 mg/kg). The number and type of sorted summary tables used in the project report will be determined following receipt, reduction, and validation of analytical data.

6.3.2 Graphical Data Displays

A graphical method of data presentation may be used when appropriate to illustrate data trends and patterns as a supplement to information presented in data tables. ZAPATAENGINEERING will supply the following types of graphical data presentations:

- Maps, plan views, and vertical profiles - delineate sample area boundaries, topographic features, runoff patterns, and contamination, and show contaminant concentrations at discrete points;
- Contour maps - estimate concentrations of contaminants between sampling locations, depict groundwater flow patterns;
- Additional maps and logs may be provided as necessary to present data and information collected during field efforts.

7.0 SAMPLE PACKAGING AND SHIPPING REQUIREMENTS

7.1 CHAIN-OF-CUSTODY

The primary objective of sample custody is to provide accurate, verifiable, and traceable records of sample possession and handling from the preparation and shipment of bottle ware through laboratory receipt, sample analyses, and data validation. A sample is considered in custody if it is:

- in actual possession of the sampler or transferee;
- in view of the sampler or transferee after establishment of physical possession;
- sealed for sample integrity by the sampler; and/or
- in a secured area, with access restricted to authorized personnel.

7.2 CONTAINER PREPARATION/MANAGEMENT

ERDC - Vicksburg will furnish sampling containers. Containers will be provided with the I-Chem batch number and the lot number for any preservatives provided to permit traceability. All standard custody procedures are maintained for pre-cleaned sample containers. If the containers must be stored between receipt by ZAPATAENGINEERING and sample collection, they will be stored at the ZAPATAENGINEERING office or in a designated secure area on the site.

7.3 CHAIN-OF-CUSTODY DOCUMENTATION, TRACEABILITY, AND SAMPLE INTEGRITY (FIELD)

7.3.1 After sample collection, all sample containers will be labeled with an identification number that uniquely identifies the sample. The sample identification number will be logged in the field logbook and on the Chain-of-Custody Record (Figure E-1) along with the following information:

- sampling personnel;
- date and time of collection;
- field sample location and depth (if appropriate);
- observations of ambient (weather) conditions;
- type of sampling (composite or grab);
- method of sampling;
- sampling matrix or source;
- intended analyses and type of container;
- preservation method; and
- observations of physical characteristics of the sample.
- carrier tracking number

7.3.2 For samples transported from the field to the laboratory by common carrier, chain-of-custody is maintained. Completed custody forms must accompany each sealed cooler and are placed in a plastic bag taped to the inside lid of the cooler. The sampling team in the field seals coolers with a custody seal to ensure that tampering will be immediately evident. Individual sample containers are also sealed with a custody seal. A sample identification number is recorded with waterproof ink on the container label. A uniquely numbered sample tag is affixed to the container using a rubber band. The tag's number can then be cross-referenced with the sample identification number. A copy of each package slip form associated with a shipment of samples is maintained in the project file.

7.4 SAMPLE PACKING

7.4.1 Samples will be packed for shipping in waterproof ice chests and coolers. Unless prohibited by size, sample containers will be individually sealed in Ziploc or other plastic bags, prior to packing in the cooler. Bubble wrap or Styrofoam packing will be used to prevent breakage during shipment. Wet ice sealed in Ziploc or other plastic bags (to inhibit cross-contamination of samples due to melting water) will be placed in the cooler with the samples to maintain the samples at a temperature of approximately 4° Celsius during temporary on-site storage and shipping. Immediately prior to shipment, melted ice will be drained from the bags and fresh ice added.

7.4.2 The chain-of-custody form will be signed as "relinquished" by the principal sampler or responsible party. The form will be sealed in a waterproof plastic bag and placed inside the cooler by (typically) taping the bag to the inside lid of the cooler.

7.4.3 Following packing, the cooler lid will be sealed with strapping or duct tape. Two custody seals will be signed, dated and affixed on/around two corners of the cooler, across the seal of the lid, and covered with clear tape. The tape will be placed on either end of the custody seal, thereby requiring the seal be broken during any attempt to open the cooler. The cooler will also be labeled with "This End Up" and "Fragile" warning markers.

7.5 SAMPLE SHIPPING

The sample coolers typically will be shipped on the day samples are collected, via overnight express carrier, to the laboratory. Because of holding time considerations, ZAPATAENGINEERING will discourage the shipment of samples on Fridays unless it is absolutely necessary, and only if the laboratory can ensure that personnel will be present on Saturdays to receive and process the samples within the requisite holding times. A copy of the bill of lading will be retained by ZAPATAENGINEERING and will become part of the sample custody documentation. Prior to sample shipment, the laboratory will be notified by phone to ensure personnel will be available to receive the coolers. Samples will be shipped for delivery during normal operating hours. If samples must be shipped for delivery at other times, ZAPATAENGINEERING will make arrangements with ERDC - Vicksburg to have personnel available to receive off-hours delivery.

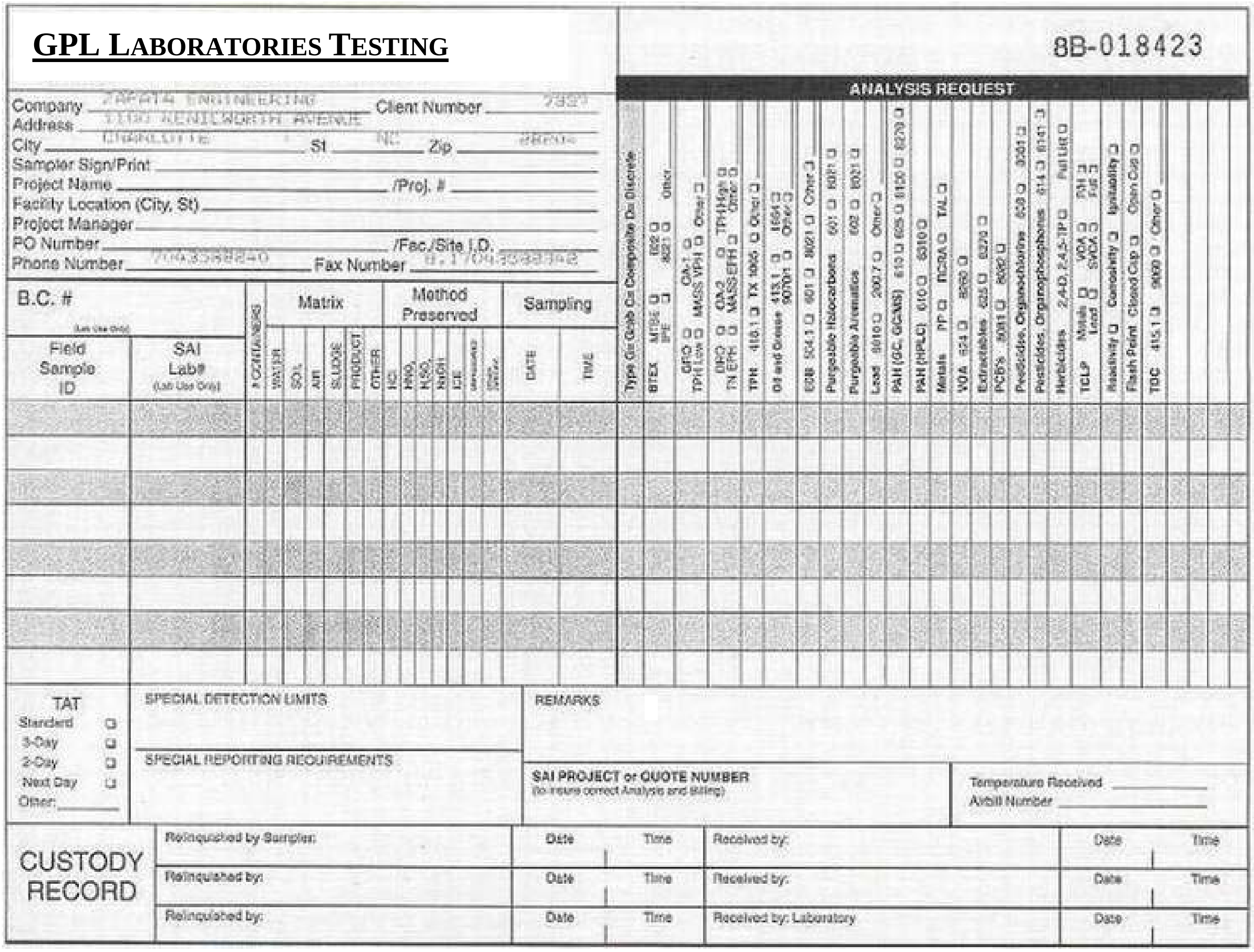
7.6 SAMPLE RECEIPT

7.6.1 Upon receipt at the laboratory, the Laboratory Project Manager or other approved personnel will complete the “Cooler Receipt Form”, which documents the condition in which the samples were received at the facility. The Cooler Receipt Form will be completed and attached along with the laboratory report and chain of custody record and will become part of the final analytical package. A sample copy of the cooler receipt form is included as Figure E-2.

7.6.2 Upon arrival at the laboratory, the cooler temperature will be checked and documented using the temperature vial included with each of the sample coolers. Any corrective action for temperature excursions (should be 4 +/-2^{o} C) will be made and documented. If required, sample containers will be checked for pH adjustment by the appropriate preparation or analytical department as soon after receipt as possible. The pH of each sample is checked and documented. To avoid compromising sample integrity, volatile samples are checked for proper pH adjustment only at the time of analysis. The pH of volatile samples will not be adjusted.

7.6.3 The samples are unpacked and, after inspection of the shipment, the chain-of-custody form is signed by the person receiving the samples. A log-in worksheet is completed, where integrity information and special instructions are recorded. If discrepancies are observed, the samples are stored, and appropriate laboratory personnel (i.e., Project Manager, Supervisors, QA Manager, Laboratory Director) are notified. The laboratory then notifies the client as to the discrepancies and awaits the client's instructions. Further action is entirely at the discretion of the client and will be noted on the final data report.

FIGURE E-1 SAMPLE CHAIN-OF-CUSTODY



GPL LABORATORIES TESTING

8B-018423

Company ZAPATA ENGINEERING Client Number
Address 1100 KENILWORTH AVENUE
City CHARLOTTE St NC Zip
Sampler Sign/Print
Project Name /Proj. #
Facility Location (City, St)
Project Manager
PO Number /Fac./Site I.D.
Phone Number Fax Number

B.C. # (Lab Use Only)

Field Sample ID	SAI Lab# (Lab Use Only)	# CONTAINERS	Matrix: WATER	SOIL	AIR	SLUDGE	PRODUCT	OTHER	Method Preserved						Sampling: DATE	TIME

ANALYSIS REQUEST

Type: Grab / Composite / Discrete; BTEX; MTBE; TPH; Oil and Grease; EDB; Purgeable Halocarbons; Purgeable Aromatics; Lead; PAH (GC, GC/MS); PAH (HPLC); Metals PP / RCRA / TAL; VOA; Extractables; PCB's; Pesticides, Organochlorine; Pesticides, Organophosphorus; Herbicides; TCLP; Reactivity / Corrosivity / Ignitability; Flash Point Closed Cup / Open Cup; TOC

TAT
Standard ☐
3-Day ☐
2-Day ☐
Next Day ☐
Other:

SPECIAL DETECTION LIMITS

SPECIAL REPORTING REQUIREMENTS

REMARKS

SAI PROJECT or QUOTE NUMBER
(to insure correct Analysis and Billing)

Temperature Received
Airbill Number

CUSTODY RECORD					
Relinquished by Sampler:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by: Laboratory	Date	Time

FIGURE E-2 SAMPLE COOLER RECEIPT FORM

COOLER RECEIPT FORM **BC#**

Client:____

Cooler Received On: _________And Opened On: _________

By:_______________ ___________________________________
(Signature)

1.	Temperature of Cooler when opened ________Degrees Celsius__________			
2.	Were custody seals on outside of cooler? If yes, how many, what kind and where: ______________________________	YES	NO	NA
3.	Were custody seals on containers and intact?	NO	YES	NA
4.	Were the seals intact, signed, and dated correctly?	YES	NO	NA
5.	Were custody papers inside cooler?	YES	NO	NA
6.	Were custody papers properly filled out (ink, signed, etc)?	YES	NO	NA
7.	Did you sign the custody papers in the appropriate place?	YES	NO	NA
8.	What kind of packing material used? Bubblewrap Peanuts Vermiculite Other None			
9.	Was sufficient ice used (if appropriate)?	YES	NO	NA
10.	Did all bottles arrive in good condition(unbroken)?	YES	NO	NA
11.	Were all bottle labels complete (#,date,signed,pres,etc)?	YES	NO	NA
12.	Did all bottle labels and tags agree with custody papers?	YES	NO	NA
13.	Were correct bottles used for the analysis requested?	YES	NO	NA
14.	a. Were VOA vials received?	YES	NO	NA
	b. Was there any observable head space present in any VOA vial?	NO	YES	NA
15.	Was sufficient amount of sample sent in each bottle?	YES	NO	NA
16.	Were correct preservatives used? If not, record standard ID of preservative used here__________________________	YES	NO	NA
17.	Was residual chlorine present?	NO	YES	NA
18.	See attached for resolution of non-conformance: UPS Velocity Airborne Route Off-street FedEx Misc.			

8.0 INVESTIGATIVE-DERIVED WASTE (IDW)

8.0.1 Investigative derived waste (IDW) includes recovered smoke canisters, soils, disposable personal protection equipment (PPE), and decontamination fluids. All decontamination water will initially be collected in 55-gallon drums and labeled with appropriate identification. If smoking soil is observed, it will be allowed to burn out and collected in separate 55-gallon drums and labeled as "Soil - Solid". Tyvek suits, personal protective equipment (PPE), and other plastics will also be collected in separate 55-gallon drums and labeled as "plastics". Smoke canisters will also be collected in separate 55-gallon drums and labeled as "Smoke Canisters -Solid". Analytical results from earlier investigations determined that the smoke canisters should be disposed of as hazardous waste. This generator knowledge will be used for waste classification and profiling. A copy of the previous waste profile is included in Attachment C. The drums will be stored on pallets near the field office. The storage area for the drums will be flagged with brightly colored barrier tape and stakes or safety cones. Labeling will include the date, ZAPATAENGINEERING'S phone number, the U.S. Army Corps of Engineers point-of-contact and phone number, and content description (i.e., decon water, etc.).

8.0.2 Sample results from soil and water testing (if required) will be used to assist in the classification of IDW. All IDW will be handled in a manner consistent with EPA Region IV guidance provided in EPA Region IV Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual, February 1991, Section 4.5, and Management of Investigative-Derived Wastes During Site Inspections, EPA/540/G-91/009, May 1991.

8.0.3 Operations at the former Camp Croft will potentially generate four types of IDW streams, identified below.

Waste Stream	*Product*
Hexachloroethane-Zinc Oxide Smoke Canisters (Used)	Solid
Decontamination Water	Liquid
Soil with White Phosphorus Contamination	Solid
Used PPE	Solid

8.1 IDW WASTE STREAMS

8.1.1 Hexachloroethane-Zinc Oxide Smoke Canisters

There are known HC smoke canisters (partials and fully intact canisters) on site. Analytical results from earlier investigations determined that the smoke canisters should be disposed of as hazardous waste. This generator knowledge will be used for waste classification and profiling, thus no sampling of the canisters will be required. A copy of the previous waste profile is included in Attachment C. Recovered smoke canisters will be collected in 55-gallon drums and labeled as "Smoke Canisters -Solid". These drums will be transported and disposed of by Clean Harbors, Inc., utilizing incineration.

8.1.2 Decontamination Water

Site personnel will drum water generated during decontamination activities, and sequentially number each, including date, site, and origin and suspected contaminant(s). A composite water sample will only be collected from the drums if smoking soils are encountered during the execution of this task order. Labels for samples will read "W = IDW water". As indicated on Table E-1, if required, this composite wastewater characterization sample will be analyzed for white phosphorus using standard TAT. In water, white phosphorus has a Region IX tap water PRG of 0.73 ug/L, a Drinking Water Equivalent Level (DWEL) of 0.5 ug/L and a Lifetime Health Advisory of 1 ug/L. If analytical laboratory results indicate the IDW is contaminated or hazardous, it will be shipped to the permitted Clean Harbors facility. If laboratory results indicate that the water stored in the drums doesn't require treatment or no composite sample is required, the water will be discharged at a nearby stormwater drainage system.

8.1.3 Used PPE

Expendable PPE will be disposed of as non-hazardous solid waste in a Subtitle D landfill.

8.1.4 Soil

Suspected contaminated soil will be sifted to segregate scrap from the soil. Soils will then be stockpiled inside the engineering control structure. If smoking soil is encountered, it will be allowed to burn off and segregated from non-smoking soils. The soils will only be containerized and sampled for disposal if they were smoking. The material will be placed in 55-gallon drums and staged near the project field office. At the end of the excavation activities, one composite sample will be collected from these drums for waste characterization using stainless steel pre-cleaned utensils. Labels for samples will read "S = IDW soil". ERDC - Vicksburg will analyze the sample under their standard TAT for white phosphorus as specifically required for waste acceptance by the disposal facility. Table E-1 is a summary of the analytical sampling requirements for soil waste characterization samples. Based on the analytical results, the soil will be disposed of in accordance with federal, state and local regulations.

9.0 FIELD ASSESSMENT/THREE-PHASE INSPECTION PROCEDURES

9.0.1 To ensure that quality is maintained throughout all phases of this sampling effort, a three-phase control process (Engineer Regulation (ER) 1180-1-6 and Corps of Engineers Guide Specifications (CEGS) 01450 and 01451) is maintained. Quality control phases (QC phases) of preparatory, initial, and follow-up are performed onsite by an assigned ZAPATAENGINEERING QC officer whether or not a Government representative is present. The QC officer will summarize the activities of each QC phase in the daily QC report. Because of the relative small amount of sampling required for this project, the ZAPATAENGINEERING assigned QC Officer for this project will be Mr. Tim Hendrix, who is also the Unexploded Ordnance Quality Control/Safety Officer (UXO QC/SO).

9.0.2 The QC phases are performed for each definable feature of work. A definable feature is a task that is separate and distinct from other tasks and has separate control requirements. For example, the definable features of the sample collection task include, at a minimum, each matrix (air, water, soil, containerized waste, etc.).

9.0.3 The definable features of the sample collection task for this project are as follows:

- White phosphorus confirmatory soil sampling of the excavation pit.
- Soil waste characterization samples of the suspected white phosphorus contaminated soil removed from the excavation.
- Decontamination waste water characterization samples collected after all decontamination efforts are complete.

9.0.4 Table E-1 indicates the primary and QA samples to be collected for each of the above definable features of the sample collection task. Section 5.3, Field Procedures, describes the activities and lists required field equipment and supplies during these phases.

9.1 PREPARATORY PHASE

9.1.1 The ZAPATAENGINEERING QC Officer in conjunction with the sampling team will conduct the preparatory phase inspection prior to the beginning of any definable feature of work. This includes a review of all work requirements, a physical examination of all required material and equipment, an examination of work areas to make certain completion of all preliminary work, and a demonstration of all field activities. If new sampling or technical personnel arrive onsite during the work effort, the QC Officer will repeat the preparatory phase with these personnel prior to beginning work. All personnel will review in detail this ESAP, prior to this inspection, and will participate in a discussion of all pertinent sections of this plan during the preparatory meeting.

9.1.2 The following represents a checklist of required onsite materials, which will be verified during the preparatory phase inspection:

- Project plans (Work Plan, Site Safety and Health Plan, ESAP, Standard Operating Procedures (SOPs).
- Area maps.
- Field logbooks/indelible ink pens.
- Drum logs/labels.
- Analytical requirements summary table (Table E-1).
- Field instrument calibration tables.
- Daily Quality Control Report Forms.
- Shipping container checklist.
- Chain-of-custody forms (Figure E-1).
- Hazardous waste manifest forms.
- Sample shipping documents (e.g. air bills).
- Communication and phone logs.
- Technical reference books for the identification of chemical hazards.
- Material safety data sheets (MSDS).
- Field instrument manuals.
- Reference materials and regulation for proper completion of manifests.
- Sampling equipment (listed in Section 5.3).
- Personal protection equipment.

- Sample containers and labels.
- Sample preservatives.
- Sample coolers and sample packing materials.
- Decontamination reagents (Alconox, rinse waters, brushes, decon tubs, aluminum foil, etc.).
- IDW storage containers (e.g. drums, 350-gallon tote, etc.).

9.1.3 Any instruments will be calibrated during the preparatory inspection meeting using certified calibration standards, gases, etc. The sample team will also demonstrate how each type of sample will be collected using the intended sample containers, sampling equipment, decontamination, and sample handling procedures. In addition, the decontamination area will be chosen and established. The sample numbering system, sample labeling, laboratory turnaround times, laboratory tracking system, and sample shipment documentation requirements will also be discussed

9.2 INITIAL PHASE

The initial phase inspection will be performed when sampling is first initiated for each definable feature of work. The ZAPATAENGINEERING QC Officer will oversee sampling activities and review the work for compliance with contract requirements. As a minimum, this will include the following:

- Initial instrument calibration and ongoing calibrations will be observed, verified, and documented.
- Inspection of field notes to assure that all pertinent data are recorded according to project requirements.
- Individual sample labels and chain-of-custody forms are inspected for accuracy, completeness, and consistency.
- Inspection of the packaging and shipping of the samples.
- Ensure that primary and QA samples are correctly matched and recorded in the field logbook and daily quality control reports.

9.3 FOLLOW-UP PHASE

Follow-up phase inspections will be performed on an as-needed basis by the QC Officer to ensure continued compliance with project requirements until completion of that particular feature of work. General procedures and documentation will be periodically checked to ensure they are complete, accurate, and consistently executed throughout the duration of the project. Inspections will also include a review of any field data and the daily calibration log of all instruments being used. Confirmation sampling will be closely monitored to make sure that they are properly collected, stored, packaged, shipped, and analyzed.

10.0 NON-CONFORMANCE/CORRECTIVE ACTIONS (FIELD)

10.0.1 Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or performance that may affect data quality. All proposed and implemented corrective action will be documented in the Field Log Books to the Project Manager. Corrective action will be implemented only after approval of the

Project Manager or the CEHNC Project Manager. If immediate corrective action is required, approvals secured by telephone from CEHNC and the Project Manager will be documented in an additional memorandum.

10.0.2 During any field activity, the field staff will be responsible for documenting and reporting all suspected technical and QA non-conformances and suspected deficiencies. Typical field protocol to correct problems associated with field instruments or sampling equipment include the following:

- Repeating the measurements to check for error.
- Making sure the meters or instruments are adjusted properly for ambient conditions, such as temperature.
- Checking or replacing batteries.
- Recalibrating the instruments.
- Replacing the meters or instruments used to measure field parameters.
- Stopping work (if necessary) until the problem is corrected.

10.0.3 If a non-conformance or problem requires a major adjustment to the field sampling procedures outlined in the Work Plan (e.g. changing sampling methodology or sampling schedule), the Project Manager, in conjunction with CEHNC, will be responsible for:

1) initiating corrective action,
2) evaluating the reported non-conformance,
3) determining the appropriate corrective actions,
4) approving all changes in writing or verbally prior to field implementation, if feasible,
5) ensuring that explanations of non-conformances and associated corrective actions are included in an appendix to the report scheduled for this investigation,
6) ensuring that no additional work dependent on the non-conforming activity is performed until the appropriate corrective actions are completed, and
7) reporting all changes to all affected parties, including EPA Region IV and SCDEHC.

11.0 QUALITY ASSURANCE PROJECT PLAN

This site-specific Quality Assurance Project Plan (QAPP) for the OE removal action at the Former Camp Croft in Spartanburg, South Carolina describes, quality assurance and quality control methods, equipment maintenance, and laboratory procedures. The purpose of the QAPP is to ensure that the quality of data collected or generated during this site investigation meets or exceeds that which is required by the data quality objectives. The QAPP defines a quality assurance (QA) program for oversight of field and laboratory activities and for the review of chemical data. The program is designed to ensure that test results and field procedures are reproducible and corroborate the accuracy of the analytical methodologies employed. It is the responsibility of all project personnel, either performing or overseeing sampling and analysis procedures, to adhere to the requirements of this QAPP and any supporting project-specific documents.

11.1 PROJECT LABORATORY ORGANIZATION AND RESPONSIBILITIES

ERDC Vicksburg will perform analytical testing for confirmatory soil testing and investigative wastes for white phosphorus. Adherence to ERDC's Quality Assurance and Quality Control

Program is accomplished by the assignment of an experienced project manager to each project. The project manager is responsible for all phases of ERDC's involvement in the project, including pre-project planning, sample bottle preparation, computer entry, analytical and QC data approval, final review of the analytical report, and discussions of results with the client. QA Managers and staff at the laboratory assist the project manager. Duties of the key personnel are as follows:

11.1.1 Laboratory Director

- responsible for day-to-day operation of lab;
- provides project manager guidance;
- establishes production priorities; and
- approves hiring decisions.

11.1.2 Project Manager

- contacts client concerning individual job tasks;
- reviews all work plans, works with lab to schedule analyses and manpower allocations;
- coordinates financial and contractual aspects of the projects;
- provides formatting and technical review of all reports;
- provides day-to-day communication with the client;
- approves all reports and invoices for the project; and
- responds to post-project inquiries.

11.1.3 QA Manager

- coordinates with the project manager and Laboratory Manager to assure that project QA is maintained;
- is available to discuss QA activities and results with client;
- prepares QA reports to management;
- performs periodic system audits;
- reviews compliance reports and approves corrective actions;
- coordinates the preparation and approval of all QA plans, method SOPs and QA audit responses; and
- coordinates and is present during all external QA audits.

11.1.4 Laboratory Operations Manager

- coordinates all production activities;
- works with project managers to ensure analytical objectives are met;
- provides guidance to department managers; and
- interviews and hires laboratory technical personnel.

11.1.5 Sample Manager

- schedules bottle orders and supervises bottle prep staff;
- supervises custody staff;

- coordinates with project manager and field/sampling manager on scheduling field sampling efforts;
- identifies and documents custody discrepancies and communicates with client on custody problems; and
- supervises sample management staff, including computer log-in.

11.2 DATA ASSESSMENT ORGANIZATION AND RESPONSIBILITIES

11.2.1 Although ERDC Vicksburg will conduct a comprehensive QC review of data prior to issuing reports, SAIC will also review the QC data and perform its own validation process. The validation will be documented in the draft and final Removal Reports. Persons performing the data validation will have a minimum of 10 years experience plus directly relatable laboratory experience coupled with two years of data review and two year of data validation experience.

11.2.2 Validation will address all method requirements (including calibrations) and will be in general accordance with current EPA Functional Guidelines. Additional validation items include documentation of sample temperature upon receipt, the date samples were preserved in the lab and preservation methods. SAIC will also review the results of method blanks and matrix spike/matrix spike duplicates. Analytical dates will be compared to sampling dates ensuring that holding times were not violated. SAIC'S validation will also include assigning flags, reporting the flags and their reasons, and listing and describing any other discrepancies in the Data Validation/Quality Control Summary Report. If anomalous results are detected, the laboratory will be queried for an explanation. Validation will follow guidance set forth in the EM 200-1-3, Appendix I, February 1, 2001.

11.3 DATA QUALITY OBJECTIVES

11.3.1 To generate data that will meet the project objectives, it is necessary to define the types of decisions that will be made, identify the intended use of the data, and design a data collection program. Data quality objectives (DQOs) are statements that define the type of data, the manner in which such data may be combined, and the acceptable uncertainty in the data, which establish requirements for data quality and quantity based on the intended use of the data. The DQO process will assist in determining the appropriate quantifier, detection limits, reporting limits (quantitation limit), analytical methods, and sampling procedures.

11.3.2 Data needs specific to this site investigation have been identified by evaluating existing data and through ZAPATAENGINEERING's discussions of project requirements with CEHNC. The primary purpose and objective of this project is to implement and perform a Removal Action at the Former Camp Croft in Spartanburg, S.C. Work required under this task includes safely locating, identifying, and disposing of all explosive hazards to depth from previously identified pits within OOU3. After these tasks are completed, they will be documented in a Removal Report. The primary contaminant of concern is white phosphorus from discarded M15 white phosphorous grenades. The following paragraphs discuss the data collection tasks and subsequent chemical analyses, which will provide the information necessary to accomplish the project objectives.

11.3.1 Analytical Data Quality Levels

Different data uses require different levels of data quality. EPA guidelines divide data into two separate categories. Screening Data with Definitive Confirmation is the first category and replaces EPA's former data categories of Levels I and II. Former categories of Levels III through V have been replaced by the Definitive Data category, also known as Level IV. The objective of the sampling and analysis efforts is the generation of Definitive Data.

11.3.2 Measurement Quality Objectives for Chemical Data Measurement

11.3.2.1 Analytical data will be reported using the standard reporting limit (SRL) with positive values qualified between the SRL and the method detection limit (MDL). A "J" qualifier will be used to flag data above the MDL but below the SRL. Such values will be indicated in text, tables and figures as "<RL" (see Attachment A of this Appendix).

11.3.2.2 Chemical data collected during this program will be validated to ensure the procedures defined in the ESAP have been followed and that the quantity of data adequately supports the intended use of the data as described in EPA's *Data Quality Objectives Process* (August 2000). The Quality Assurance/Quality Control (QA/QC) evaluation will determine whether the data meet the requirements of the ESAP and will include validation of the laboratory data.

11.3.2.3 The overall objective of the field effort is to provide an accurate, precise, and representative assessment of the soil to be removed from the excavation area. The collected samples and data generated from these samples, concurrent with other site-generated data, are intended to provide the information necessary to assess disposal options. The following section describes the DQOs in terms of precision, accuracy, representativeness, completeness, and comparability for both field and laboratory programs. These terms are described as follows:

11.3.2.4 Precision

Precision is the degree of mutual agreement among individual measurements of a given parameter under the same conditions.

11.3.2.5 Accuracy

Accuracy is the degree of agreement of a measurement or the average of several measurements with an accepted reference or "true" value; it is a measure of bias in the system.

11.3.2.6 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Careful choice and use of appropriate methods in the field will ensure that samples are representative. This is relatively easy with water or air samples, given that the components of these media are usually homogeneously dispersed. In contrast, soil and sediment contaminants are unlikely to be evenly distributed; hence, it is important for the sampler and analyst to exercise good judgment when collecting and analyzing a sample.

11.3.2.7 Completeness

11.3.2.7.1 Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that one is expecting to obtain under normal conditions. The data set must contain all analytical results and data specified for the project to be considered complete. In addition, all data are compared to project requirements to ensure that specifications have been met. Any deviations are reported in the report narrative.

11.3.2.7.2 Little data on the completeness achieved by individual methods exist. Screening data will be expected to have lower completeness levels. However, since they are on-site measurement techniques, providing results in real-time or after minimal delay, measurements can be repeated easily. Thus, a high degree of completeness can be achieved with these analytical levels.

11.3.2.7.3 Project completeness will primarily be based on the analytical samples collected for the target analyte (white phosphorus) and less on any field observations, screening, or toxicity characteristics (waste characterization samples). ZAPATAENGINEERING expects a completeness level of at least 90%. The validation process may reject the remaining data.

11.3.2.8 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sampling data should be comparable with data generated using similar methods, samples, and sample conditions. This goal is achieved through using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units.

11.4 SAMPLE RECEIPT, HANDLING, CUSTODY, AND HOLDING TIME REQUIREMENTS

Container and preservation specifications will meet all appropriate requirements as stated in ER 1110-263 and in EM 200-1-3, Table L-1, dated February 1, 2001. Refer to Table E-1 for a summary of the relevant sample containers, preservation requirements, and holding times.

11.4.1 Sample Containers

11.4.1.1 ZAPATAENGINEERING will use sample containers furnished by ERDC - Vicksburg. The laboratory will certify that it has and uses pre-cleaned containers. The source and lot numbers of sample containers used in the sampling event will be recorded in the sample technician’s field logbook for each sample collected. The lot number may be used to trace the bottleware preparation and certification of cleanliness. When bottleware is shipped directly from the supplier to the field, a formal chain-of-custody is not normally initiated. In this instance, the packing slip serves as the initiation of chain-of-custody.

11.4.1.2 All standard custody procedures are maintained for pre-cleaned sample containers. If the containers must be stored between receipt by ZAPATAENGINEERING and sample collection, they will be stored at the ZAPATAENGINEERING office.

11.4.2 Sample Documentation, Identification, and Log-in (ERDC - Vicksburg)

11.4.2.1 The sample receipt custodian is responsible for the inspection of shipping containers upon laboratory receipt for overall integrity upon arrival to the laboratory. This will ensure that the contents have not been altered or tampered with during transit. If tampering is apparent, the sample receipt custodian will immediately contact the assigned ERDC Project Manager. The sample custodian will document any deficiencies at the time of sample receipt at the laboratory on the Cooler Receipt Form (Figure E-2) and may file a Condition Upon Receipt Variance Report (CUR), if necessary. The Project Manager is responsible for client notification.

11.4.2.2 If sample integrity and/or custody procedures are violated, ZAPATAENGINEERING will initiate an investigation to determine the cause and the extent of the violation. Upon completion of the investigation, corrective action will be initiated to ensure that similar infractions do not occur. If sample integrity is indeed violated (i.e., a custody seal has been tampered with, the sample cannot be accurately identified, or holding times have been exceeded), the field team will resample the relevant sample location(s).

11.4.2.3 If shipping containers arrive intact, the sample receipt custodian in the receiving area will immediately open them. After measuring temperature, the chain-of-custody form and temperature container are removed for inspection. Container temperature is documented in the Laboratory Information Management System (LIMS) and Cooler Receipt Form. Sample coolers will not be above 4 ± 2^{o} Celsius upon arrival at the analytical laboratory.

11.4.2.4 Sample containers are checked for pH adjustment by the appropriate preparation or analytical department as soon after receipt as possible. The pH of each sample is checked and documented. To avoid compromising sample integrity, volatile samples are checked for proper pH adjustment only at the time of analysis.

11.4.2.5 A lot number is assigned to each group of samples received, recorded on both the chain-of-custody form and each sample container submitted with the project, and noted in LIMS. Proper and complete sample documentation must be provided on the chain-of-custody form in order to log samples into the LIMS. The LIMS includes all information necessary to maintain chain-of-custody, including laboratory ID, client ID, and initials of the sample receipt custodian. Ancillary information such as sample collection date and requested analyses is transferred directly from the chain-of-custody form into the LIMS and appears on the client acknowledgment letter for each project.

11.4.2.6 Once the chain-of-custody is verified, the project identified by this unique number is logged into the LIMS to disburse the desired work order request to the laboratory. The sample receipt custodian checks each sample against the chain-of-custody form for discrepancies between information on the sample label and information provided on the chain-of-custody form. The sample receipt custodian also inspects all samples for leakage or obvious seal tampering (if provided). All samples are unpacked in a well-ventilated sample receipt area. Samples received in plastic containers that appear to be accumulating or evolving gas, are treated cautiously because they may contain toxic fumes or be of an explosive nature.

11.4.2.7 Discrepancies noted from the custody staff are transmitted to the Project Manager and are resolved with the client prior to assigning laboratory work. The Project Manager attempts to resolve custody discrepancies expeditiously to avoid compromising holding time limits. After a decision concerning a sample has been made, the Project Manger makes an initialed note on phone logs stating person notified, time, date, and resolution, if applicable.

11.4.2.8 Only authorized personnel are permitted within the laboratory areas where sample access is possible. Sample storage areas are designed to segregate volatile and non-volatile samples. Standards and extracts are also departmentally controlled and stored in segregated facilities.

11.4.2.9 The set of analyses required for a group of samples is project-dependent. After log-in and verification, samples are placed in appropriate storage (refrigerated for all but metals) until ready for preparation and/or analysis. They are not relinquished until the group is ready for prep/analysis. Using LIMS-generated sample preparation worksheets for guidance, samples are extracted, digested, or distilled as appropriate.

11.4.2.10 All samples have documented in-house chain-of-custody. For all samples, department-specific, in-laboratory sample tracking forms are executed by department staff. When samples and sample preparations are removed from or returned to designated storage areas, the form is signed and dated by the analyst.

11.4.2.11 Sample holding times are tracked via the LIMS. Sample collection dates are routinely entered into the LIMS with all sample log-ins. This information allows holding times specific to each departmental analysis to be tracked by department managers, supervisors, chemists, and analysts through the use of daily status sheets, reference sheets, and preparation worksheets. Analyzed data is recorded via instrument outputs or analysis forms when applicable as an integral part of the raw data. Upon the analysis of each parameter, the date of analysis is entered into the LIMS and can be compared to the sample date to confirm that holding times have not been compromised.

11.4.3 Sample Distribution

11.4.3.1 After analysis, digests and extracts stay in the lab area. Original unused sample portions or empty bottles are returned to the sample receiving area for storage. Disposal of unused samples, digests or extracts, will be handled at the central storage occurs either as soon as holding times have expired or three weeks after analytical submission of results, unless the Project Manager is requested by the client to save them. Prior to receiving requested extended samples, digests, or extracts, the client must provide proof of existing extract storage, in writing, to ERDC's Project Manager.

11.4.3.2 Prior to report submission, the laboratory reviews all analytical results. Soil samples that are either unknown or suspected to be hazardous by characteristic are composited in 5-gallon containers. Grab samples are then collected from the individual containers and composited, then analyzed for disposal approval. Non-hazardous samples are shipped to a solid waste landfill. Water samples are stored in drums; non-aqueous phases are segregated into separate containers for disposal as appropriate. Again, tracking and disposal of all samples is documented by LIMS.

11.4.4 Interlaboratory Custody

11.4.4.1 The Laboratory Director at each location will monitor the sample load and turnaround time through LIMS-generated reports. If analysis demand appears to exceed capacity or instrument failure occurs, samples may be transferred (provided transfer is not prohibited by client contracts or arrangements, project QA plans, or certification limitations) to another government laboratory to ensure that holding times and turnaround commitments are met.

11.4.4.2 If samples are transferred to another laboratory, full custody is maintained. Special determination codes specific to each laboratory location are entered into the LIMS to enable the project manager and laboratory director to track sample progress and maintain chain-of-custody. Copies of the original chain-of-custody form (executed for interlaboratory sample submittal), computerized LIMS work order acknowledgments, and extract or digest preparation logs pertinent to the project order will accompany the samples or preparations. This material includes dates of sample preparation and requested analyses. Standard custody procedures will be followed at the other division laboratory upon receipt of the samples.

11.5 ANALYTICAL PROCEDURES

Samples collected from soil and water (if required) will be shipped to ERDC - Vicksburg for analysis of white phosphorus using Method SW 7580 as indicated on Table E-1.

11.5.1 Preventive Maintenance

ERDC - Vicksburg is equipped with state-of-the-art computerized instruments. In an effort to gain maximum performance and minimize downtime, regular inspection, maintenance, cleaning, and servicing of all laboratory and field equipment will be performed according to the manufacturers' recommendations. A maintenance log will be kept for each piece of laboratory and field instrumentation, detailing any malfunction and the steps taken to correct the problem.

11.5.2 Maintenance Schedule

11.5.2.1 Routine repairs and maintenance will be performed and documented by the analyst responsible for the particular instrument. Documentation of non-routine maintenance will be signed and dated by the analyst or repair technician. Maintenance contracts will be carried for most instruments and close contact maintained with service personnel to provide optimum instrument functioning. An undefined spare parts inventory will also be maintained for routine repairs at the facility.

11.5.2.2 Equipment such as refrigerators, ovens, and freezers will not be calibrated, but checked daily with calibrated thermometers. Sample storage refrigerators must be 4°C + 2°. All thermometers are calibrated annually against a NIST-certified thermometer.

11.5.3 Contingency Plan

In general, each facility has at least one backup unit for each critical unit. In the event of instrument failure, portions of the sample load may be diverted to duplicate instruments within each facility; the analytical technique may be switched to an alternate approved technique (such as manual calorimetric determination as opposed to automated calorimetric determination); or samples may be shipped to another properly certified or approved government location (where approved SOPS, QA procedures, and instruments are utilized), once ZAPATAENGINEERING has coordinated with CEHNC.

11.5.4 Laboratory Quality Control Procedures

The following discussion defines the Quality Assurance/Quality Control (QA/QC) and analytical procedures to be used in the laboratory.

11.5.4.1 Method Specific Data Quality Objectives

The data quality objectives for precision and accuracy are described in the analytical methods and are achieved through the analysis of laboratory-specific QC samples. Quality Control samples include, but are not limited to, laboratory control samples, laboratory duplicates, and blanks. Control limits used to evaluate the QC sample results include percent recovery and relative percent difference, and are functions of the analytical method and sample matrix. The effectiveness of a QA program is measured by the quality of data generated by the laboratory. Data quality is judged in terms of precision, accuracy, representativeness, completeness, and comparability. These terms may be described as follows:

11.5.4.1.1 Precision

The objective for precision is to meet the limits set by the methods and/or in-house limits. Relative percent difference (RPD) is used to express precision between two replicate values.

The RPD is calculated as:

$$RPD = \left\{ \frac{|V1 - V2|}{((Vl + V2)/2)} \right\} \times 100$$

Vl, V2 = Values obtained by analyzing the duplicate samples.

11.5.4.1.2 Accuracy

The objective for accuracy is to meet the limits set by the method and/or in-house limits. Percent recovery (%Rec) is used to express accuracy.

The %Rec is calculated as:

$$\%Rec = \frac{SPV - SAV}{SA} \times 100$$

SAV = The background value obtained by analyzing the sample
SA = Concentration of the spike added to the sample

SPV = Value obtained by analyzing the sample with the spike added

11.5.4.1.3 Representativeness

The objective for representativeness of field samples is to ensure that a set of data accurately depicts the distinguishing characteristic of a sample source. Results are considered reliable and representative if the sample distribution is within statistically defined bounds of the population mean and variance.

11.5.4.1.4 Completeness

10.5.4.1.4.1 Completeness is defined as the percentage of measurements made which are judged to be valid measurements. It is important that critical samples are identified and valid data obtained.

11.5.4.1.4.2 The percent completeness for each set of samples can be calculated as follows:

$$\text{Completeness} = \frac{\text{valid data obtained}}{\text{total data planned}} \times 100$$

11.5.4.1.4.3 ZAPATAENGINEERING expects a completeness level of at least 90 percent. The validation process may reject the remaining data.

11.5.4.1.4.4 The achievement of method detection limits depends on instrument sensitivity and matrix effects. Therefore, it is important to monitor the instrument sensitivity to ensure data quality through constant instrument performance. The instrument sensitivity will be monitored through the analysis of method blanks and calibration check samples.

11.5.4.1.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sampling data should be comparable with data generated using similar methods, samples, and sample conditions. This goal is achieved through using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units. The objective for comparability is to strive toward the comparability of sample parameters on similar matrices as they relate to precision and accuracy determinations. Strict adherence to QA/QC procedures promotes the comparability of one set of reference data to another or comparability of data among all facilities.

11.5.4.1.6 Quality Control Checks

ERDC - Vicksburg employs laboratory control sample (LCSs) to assess the validity of the analytical results. Determination of the validity of sample results is based on the acceptance criteria being met by the LCS. The acceptance criteria for each type of LCS are defined in the appropriate methods and SOPs. These acceptance criteria are determined from historical data and method requirements. The LCSs are analyzed in the same manner as the field samples. QC check samples are analyzed on an analytical batch frequency unless otherwise stated. An analytical batch is defined as a group of samples, which are processed as a unit. If particular laboratory method QC requirements are more stringent than the general procedures given below, the laboratory method QC requirements indicated in ERDC's Quality/Quality Control Manual are followed. The government laboratory ERDC Vicksburg normally analyzes a LCS and MS/MSD (matrix spike and spike duplicate) for each set of samples in a batch (20samples).

11.5.4.1.7 Laboratory Blanks

All analytes shall be reported for each laboratory blank. All non-blank sample results shall be designated as corresponding to a particular laboratory blank in terms of analytical batch processing.

11.5.4.1.8 Surrogates Spike Recoveries

Surrogate spike recoveries shall be reported with organic method reports where appropriate (i.e., when the method requires surrogate spikes). The report shall also specify the control limits for surrogate spike results. Any out-of-control recoveries (as defined in the specified method) shall be evaluated to determine if re-analysis is required (both sets of data are to be reported) at no additional cost to the government.

11.5.4.1.9 Matrix Spike Samples

Matrix spike recoveries shall be reported for all organic and inorganic analyses. The report shall also specify the control limits for matrix spike results for each method for each matrix.

11.5.4.1.10Laboratory Duplicates and/or Matrix Spike Duplicates

Relative percent difference shall be reported for all duplicate pairs as well as analyte/matrix-specific control limits.

11.5.5 Performance and System Audits

Performance and/or system audits will be implemented by the laboratory QA Officer to insure that data of known and defensible quality are produced during the project.

11.5.5.1 System Audits

System audits are qualitative evaluations of components of the laboratory quality control measures systems. They determine if the measurement systems are being used appropriately. The audits may be carried out before all systems are operational, during the laboratory program, or after the completion of the program. Such audits typically involve a comparison of the activities specified in the QA/QC Plan with activities actually scheduled or performed. The data management audit addresses only data collection and management activities.

11.5.5.2 Performance Audits

The performance audit is a quantitative evaluation of the measurement systems of a program. It requires testing the measurement systems with samples of known composition or behavior to evaluate precision and accuracy. The performance audit is carried out by or under the auspices of the QA Officer without knowledge of the analyst. Based on this evaluation, the laboratory QA Officer will implement corrective actions as necessary to ensure that reliable data is obtained.

11.5.5.3 USACE Audits

The USACE, Hazardous, Toxic and Radioactive Waster Center of Expertise, do not certify USACE government laboratories.

11.5.6 Non-Conformance/Corrective Action (Laboratory)

11.5.6.1 Corrective actions are measures taken to rectify conditions adverse to the quality of a product or system and, where possible, to preclude their recurrence. Corrective actions should be timely, determine the root cause, and evaluate any propagation of the error or problem. Corrective actions should be implemented with an understanding of the technology and work activities associated with the quality element, and should be monitored for progress and success. Corrective actions should be initiated using the following procedures:

- For chronic problems which could affect data quality or production and are due to equipment or facility disrepair or inadequacy, improper training, supply quality, reagent quality, standard quality, SOP inadequacy or error, or any other problems which could be corrected by management, corrective action reports should be prepared by the analyst and channeled through the Department Manager/Lab Manager to the Laboratory Director using the non-conformance memo (NCM).
- For uncorrectable non-conformance problems, which could affect the quality of report data, the analyst or Department Manager initiates corrective action. Before an NCM is prepared, the analyst/Department Manager shall review raw data calculations, procedures, methods, operating conditions of the instrument, and all data available. If this review does not resolve the problem, analysis of the batch (samples and QC samples) is repeated, provided sufficient samples are available. If data are submitted in cases where QC is not in compliance, the non-compliance is documented in a case narrative, which is part of the data report.
- When QA data exceed ERDC's established criteria, the analyst or Department Manager initiates an NCM.
- If warning limits are exceeded, the Department Managers Supervisor notifies the respective supervisors or chemists who in turn attempt to define and correct the problem.

11.5.6.2 A copy of the NCM is filed in the work order folder to which it pertains. The Department Manager and QA Manager may check follow-up to corrective actions. The final report is printed and signed by the Project Manager after all review has been completed. All Laboratory Information Management System (LIMS) reports shall be downloaded onto electronic media in a clear and concise format. A paginated data package is provided upon request.

11.6 LABORATORY REPORTING LIMITS

11.6.1 ERDC will provide data reporting elements for definitive data per Section I.13.4.2 of EM 200-1-3. The laboratory will report all analytical results greater than the MDL, which, in the analyst's professional judgment, are believed to be reliably detected. Concentrations reported between the MDL and the Practical Quantitation Limit (PQL) will be flagged as estimated. PQLs shall be at least 3 times MDLs for all analytes.

11.7 LABORATORY OPERATIONS DOCUMENTATION

The data shall be assembled in a package so that USEPA could validate the data in accordance with USEPA requirements. The data package shall be submitted as part of the Removal Report. These data will also be included in the draft and final Removal Reports in tabular format.

11.7.1 Electronic Data Records

11.7.1.1 ERDC - Vicksburg will maintain a high level of data security for the LIMS by carefully assigning user passwords and file access/lock codes. These security measures will ensure that only authorized ERDC personnel can access client files to view data and that data entry and editing is restricted to highly trained data management personnel.

11.7.1.2 Data will be provided electronically by ERDC's Electronic Data Deliverable (EDD) format. All electronic data submitted by the laboratory is required to be error-free, and in complete agreement with the hardcopy data. Data files are to be delivered both by e-mail and on high density CD accompanying the hardcopy data reports. The disk must be submitted with a transmittal letter from the laboratory that certifies that the file is in agreement with hardcopy data reports and has been found to be free of errors. The laboratory, at their cost, will correct any errors identified by CEHNC. ERDC will be responsible for archiving the electronic raw data and sufficient associated hardcopy data (e.g., sample login sheets and sample preparation log sheets) to completely reconstruct the analyses that were performed for a period of ten years after completion of this contract.

11.7.2 Verification of Hard Copy Records

11.7.2.1 Signed hard copies of results are the official reporting mechanism and will always be submitted, allowing verification of downloaded information. The LIMS manager maintains internal documentation for all LIMS programs. This documentation will include descriptions of any program additions, deletions or modifications, the date of revision, and the initials of the responsible programmer. A simulation account will be maintained in order to verify that the hardware and software are functioning properly. When hardware and/or software modifications are made, this account will use actual data to model an account to verify that the modifications are functioning as anticipated. Anti-virus software will serve as a protective measure.

11.7.2.2 Forms routinely printed for verification and signatures will include data worksheets, data approval forms, and final reports. Hard copies of final reports, field data, chain-of-custody forms, and any ancillary documentation pertinent to the project will be stored in a secure storage area and placed in files organized by lot number.

12.0 REFERENCES

USACE (United States Army Corps of Engineers), February 2001, *Requirements for the Preparation of Sampling and Analysis Plans, EM 200-1-3,* Washington, D.C.

USACE (United States Army Corps of Engineers), October, 1990, *Chemical Data Quality Management for Hazardous Waste Remedial Activities, ER 1110-1-263,* Washington, D.C.

US Army Corps of Engineers, Washington D.C., *Engineering and Design - Requirements for the Preparation of Sampling and Analysis Plans*, EM 200-1-3, 01 February 2001.

USEPA (United States Environmental Protection Agency), January 2000, *Data Quality Objectives Process for Hazardous Waste Sites (G-4HW),* Washington, D.C.

USEPA (United States Environmental Protection Agency), August 2000, *Data Quality Objectives Process (G-4),* Washington, D.C.

USEPA (United States Environmental Protection Agency), July 2002, *National Functional Guidelines for Inorganic Data Review,* EPA 540-R-01-008, Washington, D.C.

USEPA (United States Environmental Protection Agency), October 1999, *National Functional Guidelines for Organic Data Review,* EPA 540-R-99-008, Washington, D.C.

USEPA (United States Environmental Protection Agency), Region IV, 1991, *Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual,* Athens Georgia.

ATTACHMENT A

ERDC – VICKSBURG WHITE PHOSPHORUS (WP) SOP

METHOD 7580

WHITE PHOSPHORUS (P_4) BY SOLVENT EXTRACTION AND GAS CHROMATOGRAPHY

1.0 SCOPE AND APPLICATION

1.1 Method 7580 may be used to determine the concentration of white phosphorus (P_4) 4 (CAS Registry No. 7723-14-0) in soil, sediment, and water samples.

1.2 This method includes two different extraction procedures for water samples. The first procedure provides sensitivity on the order of 0.01 µg/L, and may be used to assess compliance with Federal water quality criteria. The second procedure provides a method detection limit of 0.03ng/mL. The method includes one procedure for the extraction of soil/sediment samples which provides a method detection limit of 0.06 ng/g.

1.3 White phosphorus is a toxic, synthetic substance that has been used in poisons,smoke-screens, matches, and fireworks, and has been used as a raw material in the production of phosphoric acid. It has been used in smoke-producing munitions since World War I. White phosphorus is thermodynamically unstable in the presence of atmospheric oxygen. As a result, until recently, the prospect of long-term environmental contamination from smoke munitions was considered unlikely. However, a catastrophic die-off of waterfowl at a US military facility has been traced to the presence of P_4 in salt marsh sediments, and lead to the realization that P_4 can persist in anoxic sedimentary environments.

1.4 This method is restricted to use by, or under the supervision of, analysts experienced in solvent extraction and gas chromatography. Each analyst must demonstrate the ability to generate acceptable results using this method.

1.5 Because P_4 will spontaneously combust in air, the procedures for the preparation of standards described in Section 5 require the use of a glove box or other suitable enclosed area purged with nitrogen.

2.0 SUMMARY OF METHOD

2.1 Water samples are extracted by one of two procedures, depending on the sensitivity required.

2.1.1 For the more sensitive procedure, a 500 mL water sample is extracted with 50 mL of diethyl ether. The extract is concentrated by back extraction with reagent water, yielding a final extract volume of approximately 2.0 mL. A 2.0 µL aliquot of this extract is injected into a gas chromatograph (GC) equipped with a nitrogen-phosphorus detector (NPD). This procedure provides sensitivity on the order of 0.01 µg/L, and may be used to assess compliance with Federal water quality criteria.

2.1.2 When a less sensitive method is required for water samples, a 30 mL water sample is extracted once with 3.0 mL of isooctane. A 2.0 µL aliquot of the extract is analyzed by GC/NPD. This procedure provides sensitivity on the order of 0.1 µg/L.

2.2 Wet soil or sediment samples are analyzed by extracting a 40 g wet-weight aliquot of the sample with a mixture of 10.0 mL of MilliQ reagent water and 10.0 mL of isooctane. The extraction is performed in a glass jar on a platform shaker for 18 hours. A 2.0 µL aliquot of the extract is analyzed by GC/NPD. This procedure provides sensitivity on the order of 1 µg/kg.

2.3 The concentration of P in the extract is calculated using peak area (or height) and an external standard calibration procedure. The sample concentration is determined from the extract concentration using the final volume of the sample extract, sample volume (water samples) or sample weight (soils/sediments). Results for soils and sediments are reported on a wet-weight basis.

2.4 Separate calibrations are required for water and soil/sediment samples because the sample extracts are prepared in different solvents (diethyl ether and isooctane).

3.0 INTERFERENCES
To date, no chromatographic interferences with this determination have been reported, in part due to the selectivity of the nitrogen-phosphorus detector. This procedure offers several advantages compared to other procedures described in the literature which determine P by converting it to phosphate, in that background concentrations of phosphate are quite common in many water and sediment samples.

4.0 APPARATUS AND MATERIALS
4.1 500-mL separatory funnels with PTFE stopcocks, for water sample extraction (larger separatory funnels may be employed).
4.2 125-mL separatory funnels with PTFE stopcocks, for back extraction of water samples.
4.3 40-mL clear glass vials (for less sensitive water method).
4.4 120-mL glass vials or jars with PTFE-lined screw caps.
4.5 500-mL graduated cylinder.
4.6 10-mL graduated cylinder.
4.7 1-L amber glass bottle with PTFE-lined screw cap (for preparation of the aqueous spiking solution).
4.8 250-mL and 50-mL glass volumetric flasks, with ground-glass stoppers.
4.9 Disposable pasteur pipets.
4.10 Vortex mixer.
4.11 Platform shaker, with table to hold 120-mL vials or jars used for soil extractions.
4.12 Glove box or other suitable system to handle P_4 under a nitrogen atmosphere, complete with purified nitrogen source, gas regulator, and tubing.
4.13 Analytical balance, capable of weighing 0.1 mg.
4.14 Forceps, for handling P_4.
4.15 Gas-tight syringe, 10 µL.
4.16 Razor blades or scalpels, for cutting P_4.
4.17 2mL chromatography vials with crimp top Teflon lined caps.
4.18 Gas chromatograph, capable of isothermal operation at 80°C, equipped with a nitrogen-phosphorus detector, data system, and all relevant accessories. Alternate detectors (i.e. FPD (Flame Photometric Detector) equipped with a phosphorus filter) may be used if performance is documented.
4.19 GC column - primary, 30 m wide-bore capillary column, 100% methyl silicone, 0.5 µm film thickness (DB-1, or equivalent).
4.20 GC column - confirmation, OV-17, 30m x 0.5um film thickness x 0.53 ID.
4.21 GC column – confirmation, DB 608, 30m x 0.5um film thickness x 0.53 ID.

5.0 REAGENTS
All reagents must be checked for purity and contaminants through the analysis of method blanks (see Sec. 8.2).
5.1 White phosphorus, (99% purity), Aldrich Chemical, or equivalent.
5.2 Isooctane (2,2,4-trimethylpentane), GC grade.

5.3 Diethyl ether, GC grade.
5.4 Toluene, GC grade.
5.5 MilliQ reagent water.
5.6 Nitrogen, prepurified, for glove box.
5.7 Helium, for GC carrier gas.
5.8 Hydrogen, zero grade, for NPD detector.

5.9 Preparation of calibration stock standard in toluene: The instrument calibration standards for soil/sediment samples and for water samples extracted with isooctane (Sec. 7.6) are prepared in iso-octane. A separate set of calibration standards is required for water samples extracted with diethyl ether (see Sec. 5.9).

5.9.1 Cut several pieces of P_4 to the appropriate size in a nitrogen atmosphere that is less than 0.5ppm oxygen. Care should be taken to ensure that each piece of freshly cut P_4 is lustrous on all surfaces.

5.9.2 Weigh a small freshly cut piece of P_4 (approx. 90 mg) into a aluminum weighing dish then transfer it to a 100mL volumetric flask containing toluene. Record the weight in the standards log book.

5.9.3 Bring the flask to volume with toluene and stir in a magnetic stirrer until the P dissolves. Protect the flask from light by wrapping the flask in aluminum foil.

5.9.4 Calculate the concentration of P in the volumetric flask.

5.9.5 Using the calibration stock standard, prepare 5 calibration standards in iso-octane over the linear range of the calibration curve. For a 40 g (wet weight) sediment sample and a 2 µL injection volume, the concentration of the lowest standard should be approximately 2 µg/L in isooctane. For the iso-octane water extraction, the concentration of the lowest standard should be approximately 2 µg/L in isooctane. The remaining standards are approximately 4, 8, 16, 32, 65, and 120 ug/L. An intermediate standard made in iso-octane may be necessary due to the high concentration of the stock.

5.9.6 Store any working stock solutions and calibration standards in the dark at 4°C.

5.10 Preparation of calibration stock standard in diethyl ether. Because of the volatility of diethyl ether, it is likely that calibration standards and stock standards for the water samples extracted by the diethyl ether procedure in Sec. 7.3 will have to be prepared more frequently than those standards in isooctane for the soil/sediment samples procedure.

5.10.1 Using the toluene calibration stock standard prepared in Sections 5.9.1 through 5.9.5, prepare 5 calibration standards in diethyl ether over the linear range of the calibration curve. Since the stock standard is diluted by a factor of approximately 5000, the small amount of toluene is insignificant. The lowest concentration standard should be set at or below a sample concentration of 0.01 µg/L. For a 500-mL water sample, a 1.0 mL final extract volume, and a 2 µL injection volume, the concentration of the standard will be approximately 5 µg/L in diethyl ether. The remaining standards should span the linear working range of the chromatographic system (see SW 846 Method 8000B for a discussion of five-point initial calibration standards).

5.10.2 Store any working stock solutions and calibration standards in the dark at
-20°C.

5.11 Preparation of the aqueous stock solution of P_4 - The solubility of P_4 in water is approximately 3 mg/L. The following instructions involve the preparation of a stock solution from an excess of P_4 (i.e., this should produce a saturated solution of P_4 in water).

5.11.1 Cut a piece of P_4 weighing at least 15 mg, in a nitrogen atmosphere with less than 0.5ppm of oxygen such as a glove box. Care should be taken to ensure that the piece of freshly cut P_4 is lustrous on all surfaces.

5.11.2 Maintaining the nitrogen atmosphere, place the freshly cut piece of P_4 into an 1L amber glass container with a PTFE-lined cap.

5.11.3 Fill the container with MilliQ reagent grade water, leaving no headspace.

5.11.4 Seal the container, remove it from the nitrogen atmosphere, and stir the mixture for several days with a magnetic stirrer.

5.11.5 As noted above, this procedure involves the use of an excess of P_4. After several days, the concentration of the P_4 in the aqueous stock solution must be determined by extraction with isooctane and analysis using the procedures in Sec. 7.6.

5.12 Preparation of the aqueous spiking solutions - Two different aqueous spiking solutions are required for preparation of matrix spike/matrix spike duplicate aliquots. One solution is used for spiking water samples. The other solution is used for spiking soil/sediment samples.

5.12.1 Based on the concentration of the stock solution determined in Sec. 7.6, prepare an aqueous spiking solution at a concentration of 24 µg/L by diluting the stock solution. A 1.0 mL volume of this spiking solution added to a 30 mL sample will produce a concentration of approximately 0.8 µg/L of P_4.

5.12.2 Based on the concentration of the stock solution determined in Sec. 7.6, prepare a soil spiking solution at a concentration of 80 µg/L by diluting the stock solution. A 1.0 mL volume of this spiking solution added to a 40 g wet soil sample will produce a concentration of approximately 2 µg/kg of P_4.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 White phosphorus is released into the environment from smoke munitions in the form of small, discrete particles. These particles persist in soils, sediments, and may occur as suspended or colloidal particles in anoxic waters. Therefore, some samples or sample aliquots from a given location may contain P particles while others do not. The nature and distribution of P_4 contamination from other, non-military, sources has not been studied, but sample collection procedures should address the likelihood that P_4 is present in discrete particles, and must be designed to ensure that multiple representative samples of the matrix of interest are collected. In addition, soil and sediment samples must be carefully homogenized and subsampled.

6.2 Because P_4 will oxidize on contact with oxygen, care must be taken to limit the contact of the sample with the atmosphere and to minimize any introduction of air into the samples. In addition, work by Walsh and Nadeau (Ref. 1) and others indicate that P_4 may be subject to losses as a result of volatilization from the sample.

6.2.1 Aqueous samples should be poured gently into the sample container to minimize agitation which might drive off the volatile P_4. If bubbling does occur while transferring the sample to the container, the sample should be discarded and another sample collected. Each container should be filled with sample until it overflows. Each container should be tightly sealed with a PTFE-lined cap. The container should then be inverted to check for air bubbles. If any air bubbles are present, a new sample must be collected.

6.2.2 Containers for soil samples should be filled as completely as possible, eliminating as much free air space as practical.

6.3 Samples are preserved by cooling to approximately 4°C. Do NOT adjust the pH of water samples or add chemical preservatives, as these may oxidize the P_4.

6.4 EPA has not established formal holding times for samples containing P_4. However, preliminary data suggest that water samples should be stored at approximately 4°C in the dark, and should be extracted within 5 days of collection. Soil/sediment samples should be stored at approximately 4°C, in the dark, and kept tightly sealed to prevent loss of moisture. When stored in this manner, preliminary data indicate that soil/sediment samples may be held indefinitely.

6.5 Due to the volatility of diethyl ether, water sample extracts prepared with diethyl ether (Sec. 7.3) should be analyzed within 8 hours of extraction, and extracts should be stored in tightly capped containers in a refrigerator until analysis.

6.6 Isooctane extracts of soil/sediment samples (Sec. 7.4) and of water samples (using the less sensitive alternative extraction procedure in Sec. 7.6) should be stored in tightly capped containers in a refrigerator and analyzed within 30 days of extraction.

7.0 PROCEDURE

7.1 Establish the instrument operation conditions, using the information below as guidance.
Column: DB-1, 30 m by 0.53 mm ID with 3.0 µm film thickness
Oven Temp: 50°, programmed.
Carrier Gas: Helium 10-15mL/min.
Air at 100-120mL/min.
Hydrogen at 3-4mL/min.
Using these conditions, P_4 will elute at approximately 2.9 minutes, and the entire chromatographic run will typically be less than 5 minutes. Optimize the performance to minimize interferences and maximize sensitivity. Document the operating conditions used.

7.2 Initial calibration
Because of the different solvents used for soil/sediment samples and water samples (by the more sensitive method), separate initial five-point calibrations are required for each solvent. In addition, the nitrogen-phosphorus detector may

present problems with long-term stability. Therefore, a 5-point initial calibration must be performed at the beginning of each 12-hour analytical shift during which samples are to be analyzed. The calibration procedures are the same for both solvents, and only the calibration associated with samples to be analyzed that day must be run on that day (i.e., if only water samples will be analyzed, only the calibration standards in diethyl ether need to be analyzed that day). As a practical matter, if both water and soil/sediment analyses are to be performed, the water sample extracts in diethyl ether should be analyzed first, to avoid evaporation of the solvent. If water samples are extracted using the less sensitive procedure involving isooctane, then both water and soil/sediment extracts may be analyzed using the same initial calibration in isooctane. Perform either of the initial calibrations each day, using the procedure outlined below. See Method SW846 Method 8000 for further details of external standard calibration procedures.

7.2.1 The instrument is calibrated by injecting 3.0 µL aliquots of each calibration standard. To avoid "memory effects," vary the order of the five standards, or analyze from lowest concentration to highest.

7.2.2 Calculate the calibration factor (CF) for the initial calibration curve as follows: Peak height may be used for calculating the calibration factor, but may not be as representative to small, broad, or oddly shaped peaks.

7.2.3 The linearity of the calibration is evaluated on the basis of the relative standard deviation of the five calibration factors, in accordance with SW846 Method 8000B. Calculate the mean CF, the standard deviation (SD) of the CFs, and the relative standard deviation (RSD), as follows. where n is the number of initial calibration standards analyzed. The calculation of a calibration factor is analogous to the calculation of the slope of a regression line forced through the origin (0,0). Data from the U. S. Army Corps of Engineers indicates that the NPD response is linear over a range of at least 20-fold, and passes through the origin. In order to be used for sample analyses, the RSD of the initial calibration must be less than or equal to 15%. As noted above, the initial calibration must be performed at the beginning of each analytical shift during which samples will be analyzed.

7.3 Water sample extraction - diethyl ether extraction procedure providing sensitivity of approximately 0.01 µg/L. See Sec. 7.6 for the less sensitive isooctane alternative extraction procedure.

7.3.1 Carefully transfer a 500-mL aliquot of the water sample to a 500-mL separatory funnel (a larger separatory funnel may be employed). Add 50 mL of diethyl ether, and shake the separatory funnel for 5 minutes with periodic venting. Allow the sample to stand for 15 minutes, or until phase separation occurs.

Optional Step: Add 16 g of sodium chloride to the mixture of liquids in the separatory funnel to increase and stabilize the ionic strength of the water sample and aid in the phase separation during the extraction. If the sample is seawater, addition of the sodium chloride is not necessary.

7.3.2 Diethyl ether is relatively soluble in water and the solubility is greatly affected by temperature. After phase separation, collect the diethyl ether (usually 3-10 mL) in a 10-mL graduated cylinder, and record the exact volume. Note: The volume of the ether layer will depend on the temperature and the ionic strength of the water sample.

7.3.3 For ease of application in a production laboratory environment, adjust the volume of the diethyl ether extract to a constant volume of 10.0 mL at this point. The extract is then concentrated by back extraction with reagent water in Sec. 7.3.4. The advantage of the use of a constant extract volume here is that it minimizes the need to recalculate the volume of reagent water required for each sample extract, although the latter approach may be employed. See Sec. 7.7 for details of the calculation of the volume of reagent water required.

7.3.4 The volume of the diethyl ether extract is reduced to approximately 1.0 mL by back-extraction with reagent water. Transfer the diethyl ether extract to a 125-mL separatory funnel and add 99.2 mL of reagent water. Shake for 1 minute.
7.3.5 After phase separation, collect the remaining diethyl ether phase in a 10-mL (or smaller) graduated cylinder and record the exact volume. Tightly cap the graduated cylinder until the extract is analyzed. See Sec. 6.4 for a discussion of holding times for these sample extracts.

7.3.6 If no diethyl ether phase separates, check the temperature of the solution. If the temperature is significantly below 25EC, then all of the diethyl ether may remain in solution. There are three practical solutions to this problem.

7.3.6.1 Warm the solution in the separatory funnel to 25°C, and allow the phases to separate.

7.3.6.2 Add small volumes (0.5 mL or less) of fresh diethyl ether to the solution, shake the separatory funnel, and allow the phases to separate. Continue adding fresh ether until the solubility of the ether in the reagent water is exceeded and the extract has been concentrated to approximately 1.0 mL.

7.3.6.3 If this problem persists, calculate the volume of reagent water required at the temperature of the solution (i.e., the ambient laboratory temperature), using Sec. 7.7 and the solubility and density of diethyl ether at the new temperature, and extract another aliquot of the sample and use the newly calculated volume of reagent water for back extraction.

7.3.7 Prepare the water matrix spike/matrix spike duplicate (MS/MSD) aliquots by adding 500 mL of the water sample selected for spiking to each of two 500-mL separatory funnels. Spike each MS/MSD aliquot in the funnel with 1.0 mL of the aqueous spiking solution in Sec. 5.11.1 and swirl gently to mix the contents. Extract and concentrate the MS/MSD aliquots in the same manner as samples, beginning at Sec. 7.3.1.

7.4 Soil/sediment sample extraction

7.4.1 Carefully homogenize the soil/sediment sample in its original container using a spatula. Weigh out 40 g of the homogenized wet sample into a tared 120-mL glass jar.

7.4.2 Weigh out a separate 5-10 g aliquot of each sample for use in determining the percent moisture. Air-dry each sample in a fume hood for at least a day, then dry this aliquot at 105°C for 24 hours and reweigh. As noted in Sec. 2.3, soil/sediment P concentrations are reported on a wet-weight basis using this method. However, the percent moisture is reported separately so that the data user can make comparisons between samples and perform dry weight calculations as necessary.

7.4.3 Add 10.0 mL of MilliQ reagent water and 10.0 mL of isooctane the sample in the glass jar from Sec. 7.4.1, and seal the jar with the PTFE-lined cap.

7.4.4 Prepare the MS/MSD aliquots by weighing out two additional 40-g aliquots of the soil/sediment sample chosen for spiking into clean 120-mL glass jars. Add 1.0 mL of the aqueous spiking solution (Sec. 5.11.2) to each jar. Seal each jar immediately, and swirl it until the contents are mixed (approximately five times). Add 10.0 mL of MilliQ water and 10mL of iso-octane to each jar.

7.4.5 Vortex the jars for 1 minute.

7.4.6 Place the jars on a platform shaker, and shake for 18 hours (or overnight).

7.4.7 After removing the samples from the platform shaker, let the samples stand for about 15 minutes to allow phase separation. If a clear iisooctane layer does not form centrifuge a portion of the sample for 5 min at 2500 rpm.

7.4.8 Using a disposable Pasteur pipet, transfer an aliquot of the isooctane layer to a suitable labeled storage vial with a PTFE-lined cap. See Sec. 6.4 for a discussion of holding times for these sample extracts.

7.5 Sample analysis

7.5.1 Allow the sample extract to warm to room temperature and inject 3.0 µL of the extract (water or soil/sediment) into the GC, using a 10 µL gas tight syringe. Record the retention time and peak area (peak height optional) of P_4 in the sample extract.

7.5.2 Confirm all positive hits for white phosphorus using either the OV 17 or DB 608 column using the conditions listed above (7.1). These columns will require a longer analysis time than the DB 1 column.

7.6 Alternative water sample extraction procedure providing detection limits of approximately 0.0.06 µg/L. This procedure must be used to determine the concentration of the aqueous stock solution in Sec. 5.10.

7.6.1 Add 30 mL of the water sample (or the aqueous stock solution) to a 40-mL vial with a PTFE-lined cap. Add 3.0 mL of isooctane to the vial and cap it tightly.

7.6.2 Shake the vial for 5 minutes, and let stand to allow the phases to separate.

7.6.3 Remove the isooctane layer with a disposable Pasteur pipet.

7.6.4 Analyze a 3.0 µL aliquot of the isooctane using the procedure in Sec. 7.5.1.

7.6.5 Calculate the concentration of P using 0.0030 L (3.0 mL) as the final extract volume and 0.030 L (30 mL) as the sample volume.

7.7 Calculation of the volume of reagent water needed to concentrate the diethyl ether extract to 1.0 mL. Diethyl ether is very soluble in water, and given the solubility and the density of diethyl ether, the volume of ether that will dissolve in a known volume of reagent grade water can be calculated. By reversing the calculation, the volume of reagent water that would be necessary to dissolve a specific portion of a diethyl ether extract can be determined. Since the P_4 will remain in the free ether phase, the diethyl ether extract can be safely and effectively be concentrated by back extraction with reagent water.

7.7.1 Both the solubility and density of diethyl ether vary with temperature. At 25EC, the solubility of ether in water is 6.05%, on a weight/weight basis. The density of diethyl ether is 0.7076 g/mL at 25ºC. The density of reagent water at 25EC is 0.997 g/mL. Reducing the volume of ether in Sec. 7.3.3, 10 mL, to 1.0 mL will require dissolving 9.0 mL of ether in reagent water.

7.7.2 The volume of "excess" ether is 9.0 mL.

7.7.3 The mass of this ether is (9.0 mL x 0.7076 g/mL) = 6.37 g.

7.7.4 The mass of an aqueous solution saturated with 6.37 g of ether is (6.37 g)/(0.0605) = 105.3 g.

7.7.5 The mass of water in that aqueous solution is (105.3 - 6.37), or 98.9 g.

7.7.6 The volume of water required to dissolve 9.0 mL of ether is (98.9 g)/(0.997 g/mL) = 99.2 mL. Therefore, 99.2 mL of reagent water are adde to the diethyl ether extract in Sec. 7.3.4.

7.7.7 Using these relationships, the volume of reagent water needed to concentrate other volumes of diethyl ether can also be calculated. Also, similar calculations can be made for temperatures other than 25ºC. For instance, at 20EC, the solubility of diethyl ether in reagent water is 6.89% (w/w), the density of diethyl ether is 0.7133 g/mL, and the density of water is 0.9982 g/mL. Substituting these values into the calculations shown above, the volume of reagent water required to concentrate 10.0 mL of diethyl ether to 1.0 mL at 20EC is 91.7 mL.

7.7.8 Table 1 lists the volumes of reagent water needed to concentrate diethyl ether extracts of various volumes less than 10.0 mL to a final volume of 1.0 mL, for both 20 and 25EC.

8.0 QUALITY CONTROL

8.1 Each laboratory that uses this method is required to operate a formal quality control program. The minimum requirements of this program consist of an initial demonstration of laboratory capability and an ongoing analysis of spiked samples to evaluate and document data quality. The laboratory must maintain records to document the quality of the data generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

8.2 With each batch of samples (up to a maximum of 20 environmental samples of a similar matrix), a method blank and a blank spike must be extracted and analyzed. Both of these must be carried through all stages of this procedure.

8.2.1 For water samples, the method blank and spike consists of a 500 mL volume of reagent water for the high sensitivity method or a 30 mL volume for the low sensitivity method carried through the entire analytical procedure. 1mL of the aqueous spike (5.12.1) for waters is added to the blank spike sample.

8.2.2 For soil/sediment samples, the method blank and the blank spike may be prepared from a 20-g aliquot of clean dry sand. The 20-g aliquot is mixed with

20 mL of reagent water mixed well. 1mL of the aqueous spike for sediment (5.12.2) is added to the blank spike sample.

8.2.3 In order to be acceptable, neither the water method blank nor the soil/sediment method blank may contain any P_4 detectable above the method detection limit. All samples associated with a contaminated method blank should be re-extracted and reanalyzed. The blank spike recoveries should fall within the range of 60-125% for sediment and 30-130% for water.

8.3 Prior to the analysis of any sample extracts, the analyst must perform an initial five-point calibration that meets the performance specifications in Sec. 7.2.3. This initial calibration must be repeated at the beginning of each 12-hour analytical shift during which samples are analyzed. The initial calibration must be performed using the same solvent as the sample extracts to be analyzed, i.e., separate initial calibrations are required for diethyl ether and isooctane.

8.4 The analyst must verify the initial calibration periodically during the course of sample analyses to ensure that the response of the NPD has not drifted. The calibration is verified using the mid-point (i.e., third of five) standard from the initial calibration, as described below.

8.4.1 A total of 10 extracts, including blanks, blank spikes, samples, and MS/MSD aliquots may be analyzed following an initial calibration that meets the specifications in Sec. 7.2.3. After the injection of the tenth extract, the mid-point calibration standard must be injected to verify the calibration.

8.4.2 In order for analysis of samples to continue, the %D must be within ± 15%. Otherwise, analysis must be halted until a new initial calibration is performed.

8.4.3 If the calibration verification meets the ± 15% QC limit, then sample analyses may continue, continuing to use the mean CF from the initial calibration for calculating sample concentrations.

8.4.4 The calibration must be verified after the analysis of each set of 10 extracts of sample, blanks, MS/MSD. The injection of the calibration verification standard itself is not counted as part of the 10 injections. Analyses may continue in this fashion, with calibration verification standards analyzed after each 10 sample extracts, until the end of the 12-hour analytical shift, or until the verification standard fails to meet the ± 15% QC limit.

8.5 Initial demonstration of capability
The ability of the analyst to generate acceptable accuracy and precision using this method is demonstrated through the analysis of spiked aliquots of reagent water, as described below.

8.5.1 Four 30mL aliquots of reagent water are spiked with the aqueous spiking solution (Sec. 5.11.1) to produce a concentration of approximately 0.2 µg/L of P_4.

8.5.2 The four aliquots are analyzed according to the procedure used for water samples, beginning in Sec. 7.3.

8.5.3 Calculate the recovery of P_4 in each aliquot, using the formula below.
where:
C = Measured concentration of the spiked sample aliquot s
C = Nominal (or theoretical) concentration of the spiked sample aliquot n

8.5.4 Calculate the mean recovery and the standard deviation of the four recoveries.

8.5.5 The mean recovery must be within the range 30-130%, and the standard deviation of the recoveries must be less than or equal to 30%. These specifications were developed from data provided by the U. S. Army Corps of Engineers, and represent a 95% confidence interval for the recovery of P_4 spiked into four aliquots at approximately 0.01 μg/L (See Table 3). Data from the Corps of Engineers suggest that recoveries in water other than reagent water (i.e., pond water, tap water, etc.) may be higher than in reagent water, perhaps because of the effects of ionic strength or dissolved constituents on the solubility of P_4.

8.5.6 If the mean recovery or the standard deviation of the recoveries falls outside of these limits, then the analyst must examine the entire analytical process, correct problems or inconsistencies, and repeat this test, beginning at Sec. 8.5.1.

8.6 The laboratory must, on an ongoing basis, prepare and analyze matrix spike and matrix spike duplicate samples to assess the precision and accuracy of the procedure. The MS/MSD aliquots are prepared and analyzed as described in Secs. 7.3.6 and 7.4.8. MS/MSD aliquots should be prepared each batch of samples (up to a maximum of 20 environmental samples of a similar matrix). For laboratories analyzing one to ten samples per month, at least one pair of MS/MSD must be analyzed each month. The laboratory should develop QC limits for MS/MSD recoveries and precision (RPD), using the procedures in SW846 Method 8000B. The MS/MSD aliquots must have recoveries in the range 60-125% and an RPD less than or equal to 30% for sediment and 30-130% with a RPD less than or equal to 30% for water.

9.0 METHOD PERFORMANCE

9.1 The Method Detection Limit (MDL) is defined in Sec. 5.0 of SW846 Chapter One. MDL values for the high level water method were determined in reagent water spiked at approximately 0.2 μg/L, and are shown in Table 4. These MDL values were calculated from the results of 8 spiked aliquots

9.2 MDLs for the sediment method were determined using clean sand and MilliQ reagent water spiked with an aqueous solution containing P_4. These soil samples were spiked with P at concentrations of approximately 0.5 μg/kg.

10.0 WASTE DISPOSAL

10.1 Whenever possible, samples are returned to the project for disposal.

10.2 Water samples-

10.2.1 Water samples with no detectable white phosphorus are collected with the water waste stream.

10.2.2 Water samples with detectable white phosphorus are extracted with toluene. After extraction, the water is disposed of into the water waste stream and the toluene is collected with white phosphorus solvent waste.

10.2 Sediment samples-

10.2.1 Unused sediment samples are disposed of through the sediment waste stream.

10.2.2 For sediments that have been extracted, the water/solvent layer is decanted and the remaining sediment is disposed of through the sediment waste stream. All the water/solvent layers that are removed are placed in a seperatory funnel to separate the layers. The water is disposed of in the water waste stream and the solvent is disposed of in the white phosphorus solvent waste stream.

10.3 Extracts and standards-

10.3.2 All expired solvent standards are disposed of as white phosphorus solvent waste.

10.3.3 All expired water standards are extracted with toluene. The water is then disposed of through the water waste stream and the solvent is disposed of with the white phosphorus solvent waste.

10.5 All laboratory waste streams (water, sediment, and solvent) are tested if necessary then transferred to the ERDC-WES Property Office for disposal at a hazardous waste disposal facility.

11.0 REFERENCES

1. Walsh, M.E. and B. Nadeau, "Preliminary Evaluation of the Analytical Holding Time for White Phosphorus in Surface Water," U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH, CRREL Report 94-13.
2. Taylor, S. and M.E. Walsh, "Optimization of an Analytical Method for Determining White Phosphorus in Contaminated Sediments," U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH, CRREL Report 92-21.
3. Walsh, M. E., and S. Taylor, 1993, "Analytical Method for White Phosphorus in Munitions-Contaminated Sediments," Analytica Chimica Acta, 282: 55-61.
4. Walsh, M.E., 1995, "Analytical Method for White Phosphorus in Water," Bulletin of Environmental Contamination and Toxicology, 54(3).
5. Budavari, S., et al., eds., 1989, The Merck Index, Merck & Co., Rahway, NJ.

TABLE 1
VOLUME OF REAGENT WATER REQUIRED TO CONCENTRATE
DIETHYL ETHER EXTRACTS TO A 1.0 mL FINAL VOLUME AT 20°C AND 25°C

Volume of Diethyl Ether	Volume of Reagent Water Required at 20°C	Volume of Reagent Water Required at 25° C
10.00	91.7	99.2
9.75	89.3	96.4
9.50	86.9	93.7
9.25	84.5	90.9
9.00	82.1	88.2
8.75	79.7	85.4
8.50	77.3	82.7
8.25	74.8	79.9
8.00	72.4	77.1

7.75	70.0	74.4
7.50	67.6	71.6
7.25	65.2	68.9
7.00	62.8	66.1
6.75	60.4	63.4
6.50	57.9	60.6
6.25	55.5	57.9
6.00	53.1	55.1
5.75	50.7	52.4
5.50	48.3	49.6
5.25	45.9	46.8
5.00	43.5	44.1
4.75	41.0	41.3
4.50	38.6	38.6
4.25	36.2	35.8
4.00	33.8	33.1
3.75	31.4	30.3
3.50	29.0	27.6
3.25	26.6	24.8
3.00	24.1	22.0
2.75	21.7	19.3
2.50	19.3	16.5
2.25	16.9	13.8
2.00	14.5	11.0
1.75	12.1	8.3
1.50	9.7	5.5
1.25	7.2	2.8

Solubility of diethyl ether in water is 6.05% (w/w) at 25EC and 6.89% at 20EC.
Density of diethyl ether is 0.7076 g/mL at 25EC and 0.7133 g/mL at 20EC.
Density of water is 0.997 g/mL at 5EC and 0.9982 g/mL at 20EC.

TABLE 2
RECOVERY OF P4 FROM SPIKED WATER SAMPLES
(ALL VALUES GIVEN AS PERCENT RECOVERY)

	Reagent
	82.1
	78.4
	80.9
	82.4
	79.4
	73.8
	87.0
	86.8
Mean Recovery	81.4
Standard Deviation	0.26
Spike Level	0.2 (µg/L)

The concentration results for these replicate samples were used to calculate the MDL values in Table 4.

TABLE 3
RECOVERY OF P4 FROM SPIKED SOIL SAMPLES
(ALL VALUES GIVEN AS PERCENT RECOVERY)

Sand

68.9
70.3
72.3
61.5
66.7
69.2
70.4
63.1

Mean
Recovery 67.8
Standard
Deviation 3.7
Spike Level 0.5 (μg/kg)

The concentration results for these replicate samples were used to calculate the MDL values in Table 4.

TABLE 4
METHOD DETECTION LIMITS AND LABORATORY REPORTING LIMITS

	MDL(ng)	LRL(ng)	MDL	LRL
Water	0.78	6.0	0.026ng/mL	0.2ng/mL
Sediment	2.27	20.0	0.057ng/g	0.5ng/g

ATTACHMENT B

PREVIOUS WASTE PROFILE

Safety-Kleen®

October 1, 2001

Ed Henson
USACE, Charleston District Former Camp Croft
177 Red Hill Road
Pacolet, SC 29372

RE: Quote Number – 100101ef

Dear Mr. Henson:

Safety-Kleen (TS), Inc. is pleased to offer the enclosed price estimate for the removal and disposal of bulk material. Please note that this letter fulfills the requirement under 40 CFR 264.12(b) to inform you that Safety-Kleen (TS), Inc. has the appropriate permits for and will accept the waste referenced within upon completion of the waste analysis procedures specified in the facility's Waste Analysis Plan, and as determined in the approved waste profile submitted for this waste. As a representative for the generator, it is Sepata Engineering's responsibility to provide the regulatory information detailed above to the generator.

Items of particular interest to Sepata Engineering regarding the estimate follow.

- Safety Kleen will provide the manifest, labels, and LDR form for pickup.

Our technically trained sales and customer service staffs are prepared to assist you with profiling, approving, scheduling and transporting your wastestreams to either recycling, fuels blending, or disposal facilities, as appropriate. Our turnkey services are conducted in accordance with all applicable Code of Federal Regulations.

Safety-Kleen is experienced at providing integrated chemical collection, treatment, and disposal services for public and private sectors with pickup sizes ranging from single drum shipments to multiple truck loads shipments. Our coordinated network of facilities located throughout the United States, Mexico, and Canada ensures customized service at competitive pricing. One call to Safety-Kleen provides you with complete and compliant waste management services. Our commitment to environmental protection, regulatory compliance, health and safety awareness are unparalleled. In addition to the capabilities discussed above, Safety-Kleen offers the following services:

- Recycling, treatment, and disposal capabilities for all RCRA and non-RCRA wastes and radioactive materials
- Remedial consulting and cleanup services
- On-site dedicated waste management teams
- Waste tracking and reporting services
- Generator site audits
- Training programs

We recognize that our continuance as a premier service provider depends on our performance and your level of satisfaction. Our dedicated staff is eager to assist Sepata Engineering with meeting your waste management needs. If you have any questions or need additional information, please feel free to contact Cheri McLeod or myself at the Reidsville Customer Service Center. The Customer Service Center telephone and FAX numbers are 800-334-5953 and 336-361-6101. Thank you for considering Safety-Kleen (TS), Inc.

Sincerely,

Emily Foeller
Customer Service Representative

cc: Cheri McLeod
File

Quote Number: 100101ef
Date: 10/01/01

safety-kleen
Chemical Services Division

PROFILE #	WASTE STREAM DESCRIPTION	UNIT OF MEASURE	UNIT PRICE*
RVYKY101	Old Decomposed Smoke Canisters	Per Pound	$1.10

*There will be a 200lbs. minimum per 55 gallon container.

TRANSPORTATION:

$39.00 per container > 20 gallon

FUEL SURCHARGE:

$4.00 per pallet/cubic yard box
$1.00 per 30,55,85 gal containers
$0.50 per 29 gal or less containers

MATERIALS:

$104.00 per 85 gallon overpack (if needed)

LABOR:

$73.00 per man per hour - straight time
$109.50 per man per hour - overtime (after 8 hours on site)

CONDITIONS:

1. The above prices are contingent upon receipt of signed and completed material profile sheet(s), profile addendum(s), and disposal site approval for bulk materials.
2. Pricing shall remain firm and valid for a period of thirty (30) days from the date of this estimate. Any additional applicable federal, state/provincial, and local taxes not included in this estimate will be the responsibility of the customer.
3. Billing will be based on actual units incurred. Payment terms are net thirty (30) days from the receipt of the invoice.
4. Safety-Kleen requires that a signed and fully executed contract exist prior to the provision of services.
5. A purchase order must be issued when an order is placed for work to be scheduled. Verbal purchase orders are acceptable, but must be followed by a written purchase order prior to provision of services.
6. This estimate is based on the assumption that all waste materials have been correctly identified. The generator is responsible for any additional charges assessed by Safety-Kleen due to non-conforming waste. It is understood that such charges may be assessed after the regular Safety-Kleen billing.
7. An EPA identification number should be in place prior to pickup.
8. Material must be shipped in DOT approved shipping containers and free of waste on the exterior. Additional costs may be incurred for material in non-shippable containers.
9. Each material should be identified and labeled with 100% of the chemical constituents contained therein. Any prepackaged laboratory items require 100% verification of all container contents by Safety-Kleen personnel.
10. The Safety-Kleen, Reidsville service center cannot accept for shipment any unknown, explosive, radioactive, pathogenic, or PCB containing waste with an out-of-service date greater than 6 months, however, arrangements to ship these materials direct to the final disposal can be made.

Quote Number: 100101ef
Date: 10/01/01

safety-kleen
Chemical Services Division

11. To comply with the requirements of 49CFR172.604, Safety Kleen personnel will need to FAX copies of the generator's manifest to an emergency contact number. Safety Kleen requests the opportunity to utilize the generator's FAX machine and phone to make the notification.

12. A minimum rejection fee of $250.00 per wastestream or labpack shipment will be charged for any material being returned. This fee may increase to cover auxiliary transportation or other associated fees.

13. The information contained in this estimate, including, but not limited to pricing, is considered confidential and proprietary and is to be used solely for purposes of determining award of work quoted herein. Any copying, faxing or otherwise communicating this information to any third party is strictly prohibited.

safety-kleen
Chemical Services Division

Dedicated to servicing you

SK REFERENCE NO: ____________

Safety-Kleen.

MATERIAL PROFILE

Safety-Kleen (SK) Use Only	If applicable, Intercompany Billing Facility #	Customer Number: RVYKY	SK Line Of Business #:	Facility Profile #: RVYKY101

A. GENERATOR INFORMATION

☐ Check if Billing Information is same as Generator Information

Generator Name: USACE, CHARLESTON DISTRICT FORMER CAMP CRAFT
Billing Company: HUMAN FACTORS APPLICATIONS, INC.

Facility Address (No P.O. Box): 177 RED HILL ROAD
Billing Address: P.O. BOX 615

City/State/Zip: PACOLET, SC 29372
City/State/Zip: HOLICONG, PA 18928-

Technical Contact: MICHAEL WINNINHAM
Billing Contact: F. J. DRUMMOND

Phone: (301) 705-5044 Fax: (301) 705-7591
Phone: (215) 794-3535 Fax:

E-mail: ____________ Generator Location *(if different from above)* ____________

SIC/NAIC: 9999/ ☐ CESQG ☒ SQG US EPA ID#: SCR000006288 State Generating ID#: ____________

B. SHIPPING INFORMATION

☐ *DOT Assistance Requested* ☐ *Check if SK Transportation Services are requested*

US DOT Proper Shipping Name: Hazardous waste, solid, n.o.s.
Technical Constituent(s): (HEXA CHLOROETHANE, ZINC OXIDE)
Hazard Class / Division #: 9 ID # (UN / NA): NA3077 Packing Group (PG): III RQ: ____________

Non-Bulk Shipping Containers

Size		Steel	Poly	Fiber	Quantity & Frequency
55	Gal	☒	☐	☐	1.00 / AN
	Gal	☐	☐	☐	
	Gal	☐	☐	☐	
	Gal	☐	☐	☐	

Bulk Shipping Containers

Container Type	Quantity, Size & Frequency
☐ $Yd.^3$ Box or ☐ Super Sack	
☐ Hard Top or ☐ Tarped Bin	
☐ End Dump (Tarped) Trailer	
☐ Tank or ☐ Vacuum Trailer	

C. GENERAL MATERIAL & REGULATORY INFORMATION

Name of Material: OLD DECOMPOSED SMOKE CANISTERS

Process Generating The Material: REMOVAL OF OLD SMOKE CANISTERS FROM LANDFILL CLEANUP

Odor: ☒ None ☐ Mild ☐ Strong; Describe ____________

Yes	No	
☐	☒	Regulated or Licensed Radioactive Waste
☐	☒	Regulated Medical / Infectious Waste
☐	☒	Regulated Benzene NESHAP Waste
☐	☒	TSCA Regulated PCB Waste (List any PCB level in Sec.D)
☒	☐	Regulated Subpart CC Waste (VOs ≥ 500 ppm)
☐	☒	Regulated Ozone Depleting Substance
☐	☒	CERCLA Regulated (Superfund) Waste
☐	☒	Hazardous Debris (Subject to alternate LDR treatment standards)
☒	☐	Waste Contains UHCs/Constituents of Concern

If yes, list in ☒ Sec. D or ☐ Constituent Addendum

Yes	No	
☐	☒	Meets LDR Standards or ☐ Partially Meets (Landfill Only)
☐	☒	Commingled Waste (2 or more hazardous wastes mixed as one)
☐	☒	Sorbent Added; If Yes, is sorbent biodegradable? ☐ Yes ☐ No
☐	☒	Exempt Waste; If Yes, list reference, 40 CFR ____________
☐	☒	State Hazardous Waste; State Code: None
☒	☐	EPA Hazardous Waste

EPA Waste Codes (including any LDR subcategories, e.g., D003 Water Reactive): D034

EPA Haz Waste Only Origin Code ☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 Source Code: G49 Form Code: W409 Mgmt Method: H141

D. MATERIAL COMPOSITION

1. **Chemical/Physical Constituents**: List all detectable components by chemical name, including physical material, e.g., sorbent, debris.

Material Components & Composition	ppm	☒ wt % ☐ vol %	Material Components & Composition	ppm	☒ wt % ☐ vol %
PARTIALLY DECOMPOSED SMOKE CANISTERS					
(3" x 7" AND <2.5 LBS)					
Hexachloroethane		30-40			
Grain Aluminum		4-6			
Zinc oxide		30-40			
Metal cans		20-30			

Section D continues on the next page for Elemental Constituents

Range Total >= 100%

SAFETY-KLEEN MATERIAL PROFILE (continued): **SK REFERENCE NO:** (RVYKY101)

Note: Completion of Section D.2 & F is optional for: ☐ Analytical Profile (representative sample submitted; test results used to complete D.2 & F)
Completion of Sections D.2, E, & F is optional for: ☐ Standard Industry Profile (Safety-Kleen historical data utilized to complete D.2, E, & F)

D. MATERIAL COMPOSITION *(Continued)*

2. **Elemental Constituents** ☐ *Check if this waste contains No Detectable Elements / Metals, unless listed below.*

Check either: ☐ Total Analysis or ☐ TCLP Method or ☒ Generator Knowledge, then enter data below.

Constituent	ppm	Constituent	ppm	Constituent	ppm	Constituent	ppm	Constituent	ppm
Aluminum	<5.00%	Cadmium		Fluorine		Nickel		Sodium	
Antimony		Chlorine		Lead		Phosphorous		Sulfur	
Arsenic		Chromium		Lithium		Potassium		Thallium	
Barium		Cobalt		Manganese		Selenium		Titanium	
Beryllium		Copper		Mercury		Silicon		Vanadium	
Bromine		Iodine		Molybdenum		Silver		Zinc	<30.00%

E. REACTIVE CHARACTERISTICS ☒ *Check if this waste exhibits No Reactive Characteristics*

Yes	No		Yes	No		Yes	No		
☐	☒	Explosive	☐	☒	Oxidizer	☐	☒	Reactive Cyanide	______ ppm
☐	☒	Shock Sensitive	☐	☒	Water Reactive	☐	☒	Reactive Sulfide	______ ppm
☐	☒	Pyrophoric	☐	☒	Air Reactive	☐	☒	Polymerizable	

Other Incompatibles; Describe ____________

F. MATERIAL PHYSICAL CHARACTERISTICS @ 70° F.

# of Phases: SINGLE
Liquid %: ____
Sludge %: ____
Solid %: 100
Powder %: ____
Gas %: ____

Color: GRAYISH TO RUST SOLID CANNISTS
Specific Gravity: 1.200
Viscosity cps: >300
Density: 30-40 ☐ lbs/ gal. ☒ lbs/ cu. ft.

Flash Point ______ °F (if < 73°F)
☐ 73 - < 100°F ☐ 100 - 141°F
☐ 142° F.-<200° F ☒ ≥200°F
Boiling Point (if < 130°F) >95F
Ash % (Bridgeport Only) ______

pH ☐ Liquids > 20% H_2O or pH ☒ Non-Aqueous
☐ ≤ 2 pH ☐ > 2 - 4 pH ☒ > 4 - 10 pH
☐ > 10 - < 12.5 pH ☐ ≥ 12.5 pH
BTUs/ lb. or Range <5000

Comments ____________

G. GENERATOR PROFILE CERTIFICATION

I hereby certify that I am an authorized agent of the generator, and warrant on behalf of the generator that the information supplied on this form and on any attachments or supplements hereto is complete and accurate, and that all known or suspected hazards of the material(s) described herein have been disclosed. I agree that if the sample test results indicate a discrepancy with any information supplied on this form, that either Safety-Kleen or the generator may initiate further testing and evaluation in accordance with the terms and conditions of the contract between Safety-Kleen and the generator and that this profile certification may be amended accordingly.

X ____________ ____________ ___/___/___

Generator's Authorized Signature — Name & Title (Printed or Typed) — Date

Comments ____________

SK Use Only ☐ SKOS ☐ SKVS ☐ Non-Haz Evaluation ☐ Standard Industry Profile SIP Index # ______

SK Sales Rep. Name ______ Employee # ______ Territory Branch # ______

Process Approval # KDY Product Code or Part # INC482 TRI Flowpath # ______ Pricing ______

Waste Approval & Certification

We certify acceptability of this waste stream and that all appropriate permits have been obtained, as indicated by Safety-Kleen's facility approval below:

____________ ____________ ___/___/___

SK Authorized Facility Signature — Name & Title (Printed or Typed) — Date

SUPPLEMENTAL CERTIFICATION

A. GENERATOR INFORMATION *(Always complete)*

Generator Name USACE, CHARLESTON DISTRICT SK Reference # (RVYKY101)

Name of Material OLD DECOMPOSED SMOKE CANISTERS

B. SUPPLEMENTAL INFORMATION *(Always complete)*

Yes	No	NA (Not Applicable)	
☐	☐	☒	*For Gas Cylinders To Clarence, NY (BDT) & Deer Park, TX:* Is a completed Cylinder Profile Worksheet attached?
☐	☐	☒	*For styrene containing waste:* Has the waste been properly stabilized with TBC (tert-butyl-catechol) to prevent polymerization?
☐	☐	☒	*For Hazardous Waste To Lone Mtn, OK:* Are you aware that prior to the first shipment, generators must have submitted to the Oklahoma Department Of Environmental Quality a completed Disposal Plan application?
☐	☐	☒	*For Non-Hazardous Waste To Lone Mtn, OK:* Is a completed Oklahoma Certificate Of Non-Hazardous Waste Affidavit attached?
☐	☒		DEA Controlled Substance
☐	☒		Waste Subject To HON Group 1 Wastewater Regulations (40 CFR 63.132)
☐	☒		Waste Subject To APHIS Foreign Soils / U.S. Quarantined Soils Compliance Agreement
☐	☒		Is this a non-RCRA listed wastewater or a waste mixed with a non-RCRA wastewater generated from an electroplating, aluminum conversion coating or similar processes? If 'Yes', will Safety-Kleen's subsequent treatment of this waste create a sludge that is a RCRA listed waste, e.g., F006 sludges from the treatment of electroplating wastewaters, F019 sludges from aluminum chemical conversion coating wastewaters? ☐ Yes ☒ No

B. 1. Additional Information Required By North Andover, MA *(In addition to the above, complete if shipping to North Andover)*

Yes	No		Yes	No	
☐	☒	Is the material stored in vented drums?	☐	☒	Is the material poisonous by inhalation? (40 CFR 171.8)
☐	☒	Is the material regulated as a Marine Pollutant? (49 CFR 171.8)			

Oral Toxicity LD50 (Mg/Kg) For Solids: ☐ ≤ 5 ☐ > 5 - ≤ 50 ☐ > 50 - ≤ 200 ☐ > 200 For Liquids: ☐ > 50 - ≤ 500 ☐ > 500

Dermal Toxicity LD50 (Mg/Kg): ☐ ≤ 40 ☐ > 40 - ≤ 200 ☐ > 200 - ≤ 1000 ☐ > 1000

C. TREATMENT, STORAGE, & DISPOSAL FACILITY (TSDF) INFORMATION *(Complete if shipping directly to a SK TSDF)*

Yes	No	NA (Not Applicable)	
☐	☐	☒	*For PCB Material To Grayback Mtn., UT:* Has the waste been deliberately diluted from an original concentration > = 500 ppm or deliberately mixed with soil in order to avoid the incineration requirements of 40 CFR 761.60(a)(1)?
☐	☐	☒	*For Antioch & Chattanooga, TN & Holly Hill, SC:* Does this waste contain hazardous air pollutants regulated under the Clean Air Act? If 'Yes', is a completed Hazardous Air Pollutant (HAP) form attached? ☐ Yes ☒ No
☐	☐	☒	*For Artesia, MS:* Does this waste contain, or is it derived from, dioxin-listed wastes with F020-F023, F026 or F027 waste codes?
☐	☐	☒	*For Empty Containers To Rosemount, MN only:* Do the empty containers meet the MPCA Hazardous Waste Rule definition of empty?

D. GENERATOR CERTIFICATION *(Always complete)*

I hereby certify that I am an authorized agent of the generator, and warrant on behalf of the generator that the information supplied on this form and on any attachments or supplements hereto is complete and accurate, and that all known or suspected hazards of the material(s) described herein have been disclosed.

______________________ ______________________ ____ / ____ / ____

Generator's Authorized Signature Name & Title (Printed or Typed) Date

South Carolina Department of Health and Environmental Control

Bureau of Solid & Hazardous Waste Mgt.
2600 Bull Street, Columbia, SC 29201
Phone: (803) 734-5200
Emergency & Holidays: (803)253-6488

PLEASE PRINT or TYPE (Form designed for use on elite (12-pitch) typewriter) Form Approved OMB No. 2050-0039 Expires 9-30-91

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's U.S. EPA ID No.: S C R 0 0 0 0 0 6 2 8 8 — Manifest Document No.: 0 0 0 0 2
2. Page 1 of 1

Information in the shaded areas is not required by Federal law, but is by State law.

3. Generator's Name and Mailing Address
USACE, CHARLESTON DISTRICT
177 RED HILL ROAD, PACOLET, SC 29372

4. Generator's Phone (301) 705-5044

A. State Manifest Document Number RVXKY-00002

5. Transporter 1 Company Name: SAFETY KLEEN (TG) INC
6. U.S. EPA ID Number: S C D 9 8 7 5 7 4 6 4 7

7. Transporter 2 Company Name:
8. U.S. EPA ID Number:

9. Designated Facility Name and Site Address
SAFETY-KLEEN (TS) INC.
208 WATLINGTON IND. ROAD
REIDSVILLE, NC 27320

10. U.S. EPA ID Number: N C D 0 0 0 6 4 8 4 5 1

11. U.S. DOT Description (including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	
a. HAZARDOUS WASTE, SOLID, N.O.S.,9 X NA3077,III (HEXA CHLOROETHANE, ZINC OXIDE) (TP)	0 0 3	D M	~~0 0 5 0 0~~ 1500	P	D034
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above
a. b. c. d.

K. Handling Codes

15. Special Handling Instructions and Additional Information
a. RVXKY101 (001-003) SWO #: 49215 Vehicle #: 47964
Emergency Contact: 1-800-~~535-5053-590~~ 468-1760

Public reporting burden for this collection of information is estimated to average: 37 minutes for generators, 15 minutes for transporters, and 10 minutes for treatment storage and disposal facilities. This includes time for reviewing instructions, gathering data, and completing and reviewing the form. Send comments regarding the burden estimate, including suggestions for reducing this burden, to Chief, Information Policy Branch, PM-223, U.S. Environmental Protection Agency, 401 M St., S.W., Washington, D.C. 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503.

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations and the laws of the State of South Carolina.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name: Timothy J Hendrix — Signature: [signature] — Month Day Year: 1 1 1 2 9 8

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Van Mathews — Signature: Van Mathews — Month Day Year: 1 1 1 2 9 8

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name: — Signature: — Month Day Year:

19. Discrepancy Indication Space
a. lbs. c. lbs.
b. lbs. d. lbs.

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name: Kathy Hall — Signature: Kathy Hall — Month Day Year: 1 1 1 6 9 8

HUMAN FACTORS APPLICATIONS, INC.
Ordnance & Explosive Remediation
1 Post Office Road, Suite 103
Waldorf, MD 20602-2710
(301) 705-5044: Fax (301) 705-7561

FACSIMILE COVER SHEET

TO: Suzy FROM: Michael	DATE: 9/26/01
SUBJECT: HC Smoke	ORIGINALS TO FOLLOW BY MAIL YES: ☐ NO: ☑
TOTAL PAGES (INCLUDING COVER SHEET): 2	FAX NUMBER: 704-358-8342

If transmittal error occurs, contact Nancy Perdun at (301) 705-5044

MESSAGE:
Suzy,
Here is the copy of the latest Haz waste manifest.
Michael

APPENDIX F
FORMS

Forms

The following forms are provided to record and collect data while performing the current task:

1. SUXOS/Site Daily Journal (2 Pages)
2. Safety Meeting Attendance Log
3. SSO Daily Inspection Log
4. SSO Wet Bulb Glove Thermometer (WBTG) Log
5. Daily QC Journal
6. QC Inspection Record
7. Daily Team Leader Journal
8. Magnetometer Check Sheets (Schonstedt)
9. Magnetometer Check Sheets (Foerster)
10. Grid Location Form
11. Magazine Data Card (DD Form 3020-R)
12. Explosives Consumption Certificate
13. Vehicle Check Sheet
14. Site Visitors Log
15. Correspondence Log
16. Telephone Log
17. USACE Accident Investigation Report and instructions (2 pages)
18. Accident/Injury Investigation
19. Supervisor’s Employee Injury Report (2 pages)
20. General Liability, Property Damage, and Loss Report
21. Vehicle Accident Report
22. 1348-1A Scrap Turn-In Certificate
23. Geophysical Anomaly Dig Sheet
24. Daily Quality Control Summary Report
25. Chain of Custody

ZAPATAENGINEERING SUXOS DAILY JOURNAL

DATE:	**PROJECT:**
SUXOS:	**SSO:** **QC:**
TOTAL GRIDS CLEARED:	**TOTAL EXCAVATIONS:**
TOTAL UXO:	**TOTAL SCRAP:**
MAG TYPE:	**MAG SETTING:**
CLIENT: US Army Engineering and Support Center, Huntsville	**CONTRACT: DACA87-00-D-0034-0014**
FIELD OPERATION TIME:	**GOV'T. DELAY TIME:**
WEATHER:	**TEMP:**

GRIDS CLEARED	TOTAL OE SCRAP	TOTAL LIVE OE	BIP Y/N	SMALL ARMS	TOTAL DIGS	NON-OE SCRAP	HAZ MAT LOCATED	B/H REQ

COMMENTS:
SUXOS SIGNATURE:

Zapata Engineering		**Safety Meeting Attendance Log**
Date:	Time:	Contract Number: DACA87-00-D-0034
Delivery Order Number: 0014		Location: Former Camp Croft
Weather Conditions:		
I. Safety Meeting Topic(s): Slips, Trips, Falls, and		
II. Attendees:		

Name	Signature	Company	Tick(s)

III. Verification:
I certify that the personnel listed on this roster received the briefing described above. Site personnel not present for this meeting will be briefed prior to the beginning of their duties.

Site Safety Officer:	Date:

Zapata Engineering | Safety Inspection Log

Date: ________ Time: ________ Contract Number: **DACA87-00-D-0034**

Delivery Order**: 0014** Location: Camp Coft, Spartanburg, South Carolina

Weather Conditions: ____________________

Type of Inspection: Daily:_____ Weekly _____ Special: _____ Reinspection ______

Location inspected: ____________________

Activity inspected: ____________________

II. Inspection Requirement	Satisfactory	Unsatisfactory	N/A
Surface Sweep			
Subsurface Sweep			
Excavation Technique			
Personal Protection Equipment			
Work Practices			
Site Control			
First Aid Equipment			
Fire Fighting Equipment			
Explosive Transportation			
Explosive Storage			
Disposal Operations			
Overall Inspection Results			

111. Comments:

- Worked stopped due to safety violations: Yes ___________ No ______________
- Personnel Involved: ____________________
- Corrective Measures: ____________________
- Reinspection required : Yes ___________ No ______________

IV. Signatures: I acknowlege that I have been briefed on the results of this inspection and will take corrective actions (If required)

____________________ ____________________
Site Safety Officer | Sr. UXO Supervisor/Project Manager

SITE SAFETY OFFICER (SS0)
WET BULB GLOBE THERMOMETER (WBGT)
LOG

DATE	TIME	DRY BULB TEMP	WBGT TEMP	RECOMMENDED WORK/REST REGIMEN (PER HOUR) WORK REST
				/
				/
				/
				/
				/
				/
				/
				/
				/
				/

Permissible WBGT Heat Exposure Threshold Limit Values
Values are given in ºF

Work/Rest Regimen (each hour)	Work Load		
	LIGHT	MODERATE	HEAVY
Continuous Work	**86**	**80**	**77**
75% Work - 25% Rest	**87**	**82**	**78**
50% Work – 50% Rest	**89**	**85**	**82**
25% Work – 75% Rest	**90**	**88**	**86**

ZAPATAENGINEERING
DAILY QUALITY CONTROL JOURNAL

DATE:	**PROJECT:**
SUXOS:	**PM:**
SSO:	**QCS:**
MAG TYPE USED:	**MAG SETTING USED:**

AREA/ITEMS QC'D	**TEAM**	**SAT**	**UNSAT**
Proper work attire (PPE)			
Morning Magnetometer check			
Vehicle condition			
Equipment condition			
Emergency equipment, first aid kit, burn kit, fire ext.			
Proper grid layout			
Proper search techniques			
Proper use of grubbing equipment			
Proper tamping techniques, demo shot			
Team leaders daily paper work			
Office paper work			
Mapping and UXO data			
Field office, inside			
Field office grounds			

QCS SIGNATURE:

ZAPATAENGINEERING **QC Inspection Record**

Work Area	Grid Number	Date
Start (Date/Time)	Completion (Date/Time)	Page 1 of _____ Pages

Personnel

Position	Name	Hours
UXO Supervisor		

Remarks:

Quality Control Results

Item	Yes	No	Qty
OEW Encountered			
Anomalies Detected			
Passed Inspection:			

Draw the approximate location(s) of above items where answered Yes

Southwest Corner 100’ x 100’ Grid

QC Officer:	Signature

DAILY TEAM LEADER JOURNAL

TEAM#_______

DATE:	**PROJECT:**	
SUXOS:	**SSO:**	**QCS:**
TOTAL GRIDS CLEARED:	**TOTAL EXCAVATIONS:**	
TOTAL UXO:	**TOTAL SCRAP:**	
MAG TYPE:	**MAG SETTING:**	
CLIENT:	**CONTRACT: DACA87-00-D-0034-0014**	
FIELD OPERATION TIME:	**GOV'T. DELAY TIME:**	
WEATHER:	**TEMP:**	

GRIDS CLEARED	TOTAL OE SCRAP	TOTAL LIVE OE	BIP Y/N	SMALL ARMS	TOTAL DIGS	NON-OE SCRAP	HAZ MAT LOCATED	B/H REQ

COMMENTS:

TEAM LEADERS SIGNATURE:

MAGNETOMETER/METAL DETECTOR CHECK SHEET

SITE: Camp Croft, South Carolina **CONTRACT: DACA87-00-D-0034-0014**
PROJECT NO.: ZE036000

TEAM#: **TEAM LEADER:**

INSTRUMENT TYPE: SCHONSTEDT **SERIAL#:**

DATE	OPERATIONAL CHECK	SAT	UNSAT	REMARKS

MAGNETOMETER/METAL DETECTOR CHECK SHEET

SITE: Camp Croft, South Carolina	**CONTRACT: DACA87-00-D-0034-0014** **PROJECT NO.: ZE036000**
TEAM#:	**TEAM LEADER:**
INSTRUMENT TYPE: FOERSTER	**SERIAL#:**

DATE	OPERATIONAL CHECK	SAT	UNSAT	REMARKS

GRID LOCATION FORM

TEAM	**DATE**
GRID	**SITE**

100																				
95																				
90																				
85																				
80																				
75																				
70																				
65																				
60																				
55																				
50																				
45																				
40																				
35																				
30																				
25																				
20																				
15																				
10																				
5																				
SW	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100

Note: Record any additional information on the back of the sheet.

1. DODIC	2. NSN	3. LOT NO.	4. LOCATION	B.	D.
5. DESCRIPTION			A.	C.	E.

6 DATE	7 DOCUMENT NO	8 ACTION/PURPOSE	A QUANTITY		10 BALANCE	11 PRINTED NAME
			A GAIN	B LOSS		

DA FORM 3020-R, AUG 89 MAGAZINE DATA CARD Continued on Reverse

For use of this form see AR 710-2, proponent agency is DCSLOG PREVOUS EDITION IS OBSOLETE

1. DODIC	2. NSN	3. LOT NO.	4. LOCATION	B.	D.
5. DESCRIPTION			A.	C.	E.

6 DATE	7 DOCUMENT NO	8 ACTION/PURPOSE	A QUANTITY		10 BALANCE	11 PRINTED NAME
			A GAIN	B LOSS		

DA FORM 3020-R, AUG 89 MAGAZINE DATA CARD Use Other Side First

EXPLOSIVES CONSUMPTION CERTIFICATE

EXPLOSIVE CONSUMPTION CERTIFICATE				
ENVIRONMENTAL HAZARDS SPECIALISTS INTERNATIONAL, INC.			SITE AND GRID NUMBER	
DATE		ISSUE DOCUMENT SER.#	GRID(S):	
ITEM#	MANUFACTURE	NOMENCLATURE	LOT NUMBER	QUANTITY CONSUMED

CERTIFYING OFFICIAL	
I CERTIFY THAT I SAW THE ABOVE ITEMS CONSUMED DURING DEMOLITION ON	DATE
NAME (TYPED OR PRINTED)	SIGNATURE
ZAPATAENGINEERING	POSITION

ZAPATAENGINEERING VEHICLE CHECK SHEET

SITE: Camp Croft **CONTRACT: DACA87-00-D-0034-0014**
PROJECT NO.: ZE036000

TEAM#: **TEAM LEADER:**

DATE	UNDER HOOD*	WALK AROUND	SAFETY EQUIP*	REMARKS

Indicate the condition of each check by stating SAT or UNSAT whichever is appropriate.

**Under the hood checks will include:*
Fluid Levels
Belts
Hoses
Checks for leaks

** Safety equipment checks will include:*
Windshield wipers
Fire Extinguishers
First Aid Kits
Vehicle horn and Lights
Tires

SITE VISITORS LOG

CONTRACT NO: DACA87-00-D-0034-0014
PROJECT NO: ZE036000
LOCATION: Camp Croft – South Carolina

DATE	NAME	TITLE	COMPANY	SAFETY BRIEF: Y/N	US CITIZEN Y/N	TIME		REMARKS
						IN	OUT	

CORRESPONDENCE LOG

NUMBER	DATE	FROM	TO	SUBJECT

TELEPHONE LOG

DATE	TIME	PHONE NO.	FROM	TO	SUBJECT

(For Safety Staff only)	REPORT NO.	EROC CODE	**UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT** *(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)*	**REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)**

1. ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2. PERSONAL DATA

a. Name *(Last, First, MI)*
b. AGE
c. SEX ☐ MALE ☐ FEMALE
d. SOCIAL SECURITY NUMBER
e. GRADE

f. JOB SERIES/TITLE

g. DUTY STATUS AT TIME OF ACCIDENT
☐ ON DUTY ☐ TDY
☐ OFF DUTY

h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER
☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL
☐ TEMPORARY ☐ STUDENT
☐ OTHER *(Specify)* ____________

3. GENERAL INFORMATION

a. DATE OF ACCIDENT *(month/day/year)*
b. TIME OF ACCIDENT *(Military time)* hrs
c. EXACT LOCATION OF ACCIDENT
d. CONTRACTOR'S NAME
(1) PRIME:
(2) SUBCONTRACTOR:

e. CONTRACT NUMBER
____
☐ CIVIL WORKS ☐ MILITARY
☐ OTHER *(Specify)* ____________

f. TYPE OF CONTRACT
☐ CONSTRUCTION ☐ SERVICE
☐ A/E ☐ DREDGE
☐ OTHER *(Specify)* ____________

g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ SUPERFUND ☐ DERP
☐ IRP ☐ OTHER *(Specify)*
____

4. CONSTRUCTION ACTIVITIES ONLY *(Fill in line and corresponding code number in box from list - see help menu)*

a. CONSTRUCTION ACTIVITY ____________ (CODE) #
b. TYPE OF CONSTRUCTION EQUIPMENT ____________ (CODE) #

5. INJURY/ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see help menu)*

a. SEVERITY OF ILLNESS/INJURY ____________ (CODE) #
b. ESTIMATED DAYS LOST
c. ESTIMATED DAYS HOSPIT-ALIZED
d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED
PRIMARY ____________ (CODE) #
SECONDARY ____________ (CODE) #

f. NATURE OF ILLNESS/INJURY ____________ (CODE) #

g. TYPE AND SOURCE OF INJURY/ILLNESS
TYPE ____________ (CODE) #
SOURCE ____________ (CODE) #

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see help menu)*

a. ACTIVITY AT TIME OF ACCIDENT ____________ (CODE) #
b. PERSONAL FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE
☐ PICKUP/VAN ☐ AUTOMOBILE
☐ TRUCK ☐ OTHER *(Specify)*
____

b. TYPE OF COLLISION
☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END
☐ BROADSIDE ☐ ROLL OVER ☐ BACKING
☐ OTHER *(Specify)* ____________

c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
(1) FRONT SEAT			
(2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see help menu)*

a. TYPE OF VESSEL/FLOATING PLANT ____________ (CODE) #
b. TYPE OF COLLISION/MISHAP ____________ (CODE) #

10. ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

11. CAUSAL FACTOR(S) *(Read Instruction Before Completing)*

a. (Explain YES answers in item 13)	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12. TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	(Month) (Day) (Year)

13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).

DESCRIBE FULLY:

15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.

a. BEGINNING (Month/Day/Year)	b. ANTICIPATED COMPLETION (Month/Day/Year)		
c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT CORPS ____ CONTRACTOR ____	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL

16. MANAGEMENT REVIEW *(1st)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17. MANAGEMENT REVIEW *(2nd - Chief Operations, Construction, Engineering, etc.)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE	TITLE	DATE

19. COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE	DATE

*U.S. GOVERNMENT PRINTING OFFICE: 1993-0-791-757

10. ACCIDENT DESCRIPTION *(Continuation)*

13a. DIRECT CAUSE *(Continuation)*

13b.	INDIRECT CAUSES *(Continuation)*

14.	ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S) *(Continuation)*

MUST BE COMPLETED WITHIN 72 HOURS
ACCIDENT/INJURY INVESTIGATION

Date ________________ Project ________________________________ Date of Accident/Injury __________________

Employee Name ____

Supervisor Name ____

Project Number/Location ____

Description (Provide facts, describe how incident occurred, provide diagram or photos)

Analysis 1 (What unsafe acts or conditions contributed to the incident?)

Analysis 2 (What systematic or management deficiencies contributed to the incident)

Corrective Action(s) (List corrective actions, responsible person, scheduled completion date)

Witnesses (Attach statements or indicate why not available)

Investigated by _______________________________ _________________________________ ________________

(Print Name) (Signature) (Date)

SUXOS ____________________________________ _________________________________ ________________

(Print Name) (Signature) (Date)

SUPERVISOR'S EMPLOYEE INJURY REPORT

This is an official document to be initiated by the employee's supervisor. Please answer all questions completely. This report must be forwarded to the Safety Manager's office within 24 hours of the injury.

Injured Name _______________________________ Sex___ SSN ________________________ DOB______________

Home Address ______________________________ City __________________State _________Zip _______________

Phone _____________________ Job Title ____

SUPERVISOR

Date of Incident _____________ Time __________ Time Reported _________ To Whom? _______________________

Project __________________________ Project Address ____

Exact Location of Incident _________________________ Did employee leave work? ______ When? _______________

Has employee returned to work ( ) Yes ( ) No When? ________________________

Doctor/Hospital name ____________________________ Address ____

Witness name(s) ____ Statement attached? ( ) Yes ( ) No

Nature of injury ____ Exact body part ___________________________

Medical attention: ( ) None ( ) First Aid on-site ( ) Doctor's office ( ) Hospital

Job assignment at time of incident ____

Describe incident ____

____

What corrective action has been taken to prevent recurrence? ____

____

Supervisor ____________________________ ___________________________________ ________________

(Print) (Signature) (Date)

Senior UXO Supervisor

Comments on incident and corrective action ____

____

____

SUXOS ________________________ __________________________________ ________________________

(Print) (Signature) (Date)

Safety Manager

Concur with action taken? ( ) Yes ( ) No Remarks ____

____

____

OSHA Classification:

( ) Incident Only ( ) First Aid ( ) No lost workdays ( ) Lost Workdays ( ) Fatal

Days away from work _________________ Days restricted work ___________________ Total days charged ________

Coding: A. Injury type or illness ______ B. Injured body part ______ C. Activity at time of accident ___________

D. Injury cause code ______ E. Safety rule violated code ______ F. Accident prevention code _________

Name ___________________________ ______________________________________ ____________________

(Print) (Signature) (Date)

GENERAL LIABILITY, PROPERTY DAMAGE, AND LOSS REPORT

Project Location ____________________ Task Order #__________ Date ____________

How did the damage or loss occur: ______________________________________

Description of damage or loss: ______________________________________

Identification of damaged or lost property: ______________________________

Location of damaged or lost property (before loss): ____________________

Date and time of damaged or lost property: ______________________________

Owner of damaged or lost property:

Name ______________________________ Phone # ____________________

Address ___________________________ City/State _________________

Employer name & address ______________________________________

Injured Parties (Also complete a Supervisor Employee Injury Report)

1. Name ______________________________ Phone # ____________________
   Address ___________________________ City/State _________________
   Employer name & address ______________________________________
2. Name ______________________________ Phone # ____________________
   Address ___________________________ City/State _________________
   Employer name & address ______________________________________

Witnesses:

1. Name ______________________________ Phone # ____________________
   Address ___________________________ City/State _________________
   Employer name & address ______________________________________
2. Name ______________________________ Phone # ____________________
   Address ___________________________ City/State _________________
   Employer name & address ______________________________________

Were pictures taken? ( ) Yes ( ) No

Were police notified? ( ) Yes ( ) No Dept. ______________________________

Employee ____________________ ____________________ __________
(Print Name) (Signature) (Date)

SUXOS ____________________ ____________________ __________
(Print Name) (Signature) (Date)

VEHICLE ACCIDENT REPORT

Vehicle

Driver ________________________ Accident Date _______________ Driver's License/State ________________

Address ____

City ____________________ State ___________ Zip _____________ Phone ____________________________

Vehicle # _____________________ Year _______ Make ___________ Model _________ Plate # ____________

State ____________ Vehicle Owner: ( ) GSA ( ) Leased/Rent ( ) Private Vehicle

Vehicle Damage ____ Est. Repair Cost $_________________

Other Vehicles

Driver ________________________ Driver's License __________________________ State ________________

Address ____

City ______________________________ State __________________ Zip __________________

Phone ______________________________ SSN ___________________

Owner's Name (Check if same as driver { }) ____

Address ____________________________ City ________________________ State ______ Zip _____________

Insurance Company ____________________________________ Policy # ____________________________

Vehicle: Year ___________ Make _____________ Model _____________ Plate # _____________ State ______

Vehicle Damage ____

Passenger(s) ( ) Yes ( ) No (List on back) Injuries ( ) Yes ( ) No (List names and address on back)

Accident Description

Date ________________ Time _____________

Location ____

Description ____

____

____

____

____

Witness ___________________________ Address ____

Phone # ___________________________

Police Officer's Name ____ Dept. ___________________________

Employee __________________________________ ___________________________ ____________
(Print Name) (Signature) (Date)

SUXOS __________________________________ ___________________________ ____________
(Print Name) (Signature) (Date)

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3 DOC IDENT	4 5 6 RI FROM	7 M&S	23 24 UNIT ISS	25 26 27 28 29 QUANTITY	45 SER	46–50 SUPPLEMENTARY ADDRESS	51 SIG	52 FUND	53–55 DISTRIBUTION	56–57 PROJECT	60 PRI	61–63 REQD DEL DATE	64–66 ADV	67–69 RI	70 O/P	71 COND	72 MGT	74–80 UNIT PRICE (DOLLARS / CTS)

1. TOTAL PRICE (DOLLARS / CTS)	2. SHIP FROM	3. SHIP TO	4. MARK FOR	
5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS
10. QTY. REC'D	11.UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC / 15. SL
16. FREIGHT CLASSIFICATION NOMENCLATURE				
17. ITEM NOMENCLATURE				
18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE	
22. RECEIVED BY			23. DATE RECEIVED	

24. DOCUMENT NUMBER & SUFFIX (30-44)

25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27. ADDITIONAL DATA

This certifies that the Ammunition, Explosives and Dangerous Articles (AEDA) Residue, Range Residue and /or Explosive Contaminated Property has been 100 percent properly inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related material.

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

Geophysical Anomaly Dig Sheet

DIG SHEET

Former Camp Croft, South Carolina Team ______ Date ______

Flag # ______ Grid ______ Sector ______ Instrument ______

Burial Pit ☐ Yes ☐ No

Item Description
☐ 60mm ☐ AN-MK23
☐ 81mm ☐ MK5
☐ 105mm ☐ Other ______

Type
○ HE
○ Flare
○ Practice
○ Mortar

Choose Only One Item Type
○ OE ○ UXO
○ OE Scrap ○ Non OE Scrap
○ CWM ○ Small Arms Ammunition
○ Frag # of frag items: ______

Length ______
Width ______
Approx Weight (lbs) ______

Body
○ Complete ○ Partial ○ Absent

Fins
○ Complete ○ Partial ○ Absent

Physical Condition
○ Minimal/No Rust
○ Rusted
○ Very Rusted

Depth in Inches to:
Top of Item ______
Center of Mass ______

Orientation
○ N ○ S ○ E ○ W
○ NE ○ NW ○ SE ○ SW
Inclination (90 to -90) ______

Offset (ft)
Distance North ______
Distance East ______

Initial Condition Determination
○ Live ○ Inert

Final Condition Determination
○ Live ○ Inert

Initial Disposition
○ Scrap Bin ○ Demo ○ Blast in place

Final Disposition
○ Scrap Bin ○ Demo ○ Blast in place

Demo
○ Completed
○ Required
○ Not Required

Comment ______

PhotoID ______

Team Leader ______

ZAPATA ENGINEERING

Daily Quality Control Report

DAILY QUALITY CONTROL REPORT

JOB NUMBER ____________________ DATE ______________________ REPORT NUMBER __________________

PROJECT & LOCATION ____

WEATHER ____________________ TEMPERATURE RANGE _______________ WIND ________________

TIME ON SITE ____

SUMMARY OF SITE ACTIVITIES ____

____

____

LEVEL OF HEALTH & SAFETY PROTECTION ____

____

INSTRUMENTATION USED ____

____

CALIBRATION(S) PERFORMED ____

____

INSTRUMENT PROBLEMS/REMEDIES ____

____

SAMPLES COLLECTED ____

____

____

____

SAMPLE COLLECTION METHOD(S) ____

____

____

QUALITY CONTROL SAMPLES* ____

____

____

ADDITIONAL REMARKS ____

____

SIGNATURE: ________________________________

*INDICATE SAMPLE MEDIA: GROUNDWATER, SURFACE WATER, SOIL OR SEDIMENT; SAMPLE TYPE: COMPOSITE, GRAB, DUPLICATE, RINSATE; AND SAMPLE I.D. NUMBERS

ZAPATAENGINEERING, P.A.

GPL LABORATORIES, LLLP

202 Perry Parkway
Gaithersburg, MD 20877
(301) 926-6802
Fax (301) 840-1209

Contract #/Billing Reference	of Pgs.

Project:	Turnaround Time
Client:	# of Containers
Send Results To:	Container Type
Address:	Preservative Used
	Type of Analysis
Phone:	Lab Cooler No.

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials											CLIENT COMMENTS

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. ______________

APPENDIX G
MSD CALCULATIONS SHEETS

Minimum Separation Distances
Camp Croft
M15 WP Grenade
12 September 2003

655

REQUESTED BY: Plyler McManus
PREPARED BY: Michelle Crull, PhD, PE

This form shows calculated distances only. It does not constitute approval. Concurrence of CEHNC-OE-S is required to determine the applicable distance for a specific site.

In accordance with (IAW) EM 1110-1-4009, the minimum separation distance for unintentional detonations shall be the largest of the maximum fragment range, the K50 ($50W^{1/3}$ where W is the total net explosive weight for the detonation) overpressure distance or 200 ft. In accordance with (IAW) EM 1110-1-4009, use of the range to no more than 1 hazardous fragment/600 sq ft as the minimum separation distance for unintentional detonations requires written justification, a risk analysis, calculation of this distance by CEHNC-ED-CS-S, and concurrence of CEHNC-OE-S.

IAW EM 1110-1-4009, the minimum separation distance for intentional detonations shall be the largest of the maximum fragment range, the K328 ($328W^{1/3}$ where W is the total net explosive weight for the detonation) overpressure distance or 200 ft.

CALCULATED FRAGMENT DISTANCES

Maximum Fragment Range = 517 ft
Range to No More Than 1 Hazardous Fragment/600 sq ft = 200 ft

CALCULATED OVERPRESSURE DISTANCES BASED ON OE ITEM'S EXPLOSIVE WEIGHT ONLY (i.e. NO DONOR CHARGE)

Range to 0.9 psi Overpressure (K50) = 17 ft
K328 Overpressure Range = 111 ft (based on munition NEW only, no donor)

The primary fragmentation characteristics used in the calculation of the values listed above were computed IAW DDESB Technical Paper 16. The maximum fragment range was calculated using the maximum weight fragment and the initial velocity from these characteristics in the computer software TRAJ. The range to no more than 1 hazardous fragment/600 sq ft was calculated IAW DDESB Technical Paper 16.

Minimum Separation Distances
Camp Croft
M15 WP Grenade
12 September 2003

BARRICADE MATERIAL INFORMATION

Thickness of Aluminum Required to Prevent Perforation = 0.22 in

Thickness of Steel Required to Prevent Perforation = 0.09 in (12 gage)

Thickness of LEXAN Required to Prevent Perforation = 1.44 in

Thickness of 4000 psi Concrete Required to Prevent Spall = 0.58 in

Thickness of Plexiglas Required to Prevent Perforation = 0.66 in

Thickness of Bullet Resistant Glass Required to Prevent Perforation = 0.46 in

MINIMUM SEPARATION DISTANCES WHILE USING MOFB DURING INTRUSIVE ACTIVITIES

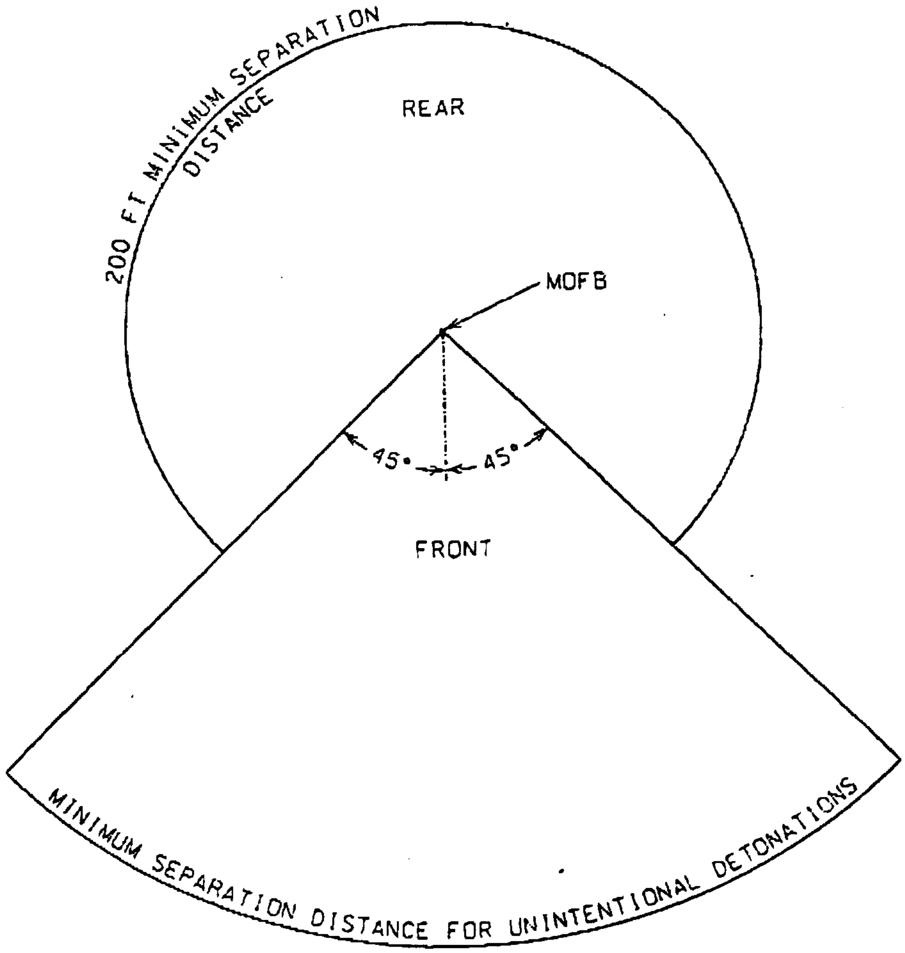
Design of the Miniature Open Front Barricade (MOFB) is in accordance with HNC-ED-CS-S-98-8, "Miniature Open Front Barricade". A copy of this report must be available on site. DDESB has placed certain restrictions on the approved usage of the MOFB. These are listed in the approval letter in the front of the report.

Thickness of Aluminum Required to Prevent Perforation = 0.22 in

The MOFB is designed to defeat fragments to the rear and sides of the MOFB in the case of an accidental/unintentional detonation during intrusive activities. The fragment distances to the front of the MOFB are the same as the fragment distances without the MOFB (see figure). The MOFB is not designed to reduce the effects of blast overpressure. The MOFB may not be used for intentional detonations. The minimum separation distances to the rear and sides of the MOFB must be maintained based on the expected throw distance of the MOFB itself.

Minimum Separation Distance to sides and rear = 200 ft
Minimum Separation Distance to front = 517 ft
K50 distance = 17 ft

Minimum Separation Distances
Camp Croft
M15 WP Grenade
12 September 2003



MINIMUM SEPARATION DISTANCE FOR UNINTENTIONAL DETONATIONS
USING MINIATURE OPEN FRONT BARRICADE DURING INTRUSIVE ACTIVITIES

SIGNATURES:

Michelle Crull 9/15/03
Subject Matter Expert Date

Sherrie Jaschka 9/15/03
QA Reviewer Date

FORM DATE 1 AUGUST 2003

Minimum Separation Distances
Camp Croft
Mk II Hand Grenade
15 October 2003

REQUESTED BY: Plyler McManus
PREPARED BY: Michelle Crull, PhD, PE

This form shows calculated distances only. It does not constitute approval. Concurrence of CEHNC-OE-S is required to determine the applicable distance for a specific site.

In accordance with (IAW) EM 1110-1-4009, the minimum separation distance for unintentional detonations shall be the largest of the maximum fragment range, the K50 ($50W^{1/3}$ where W is the total net explosive weight for the detonation) overpressure distance or 200 ft. In accordance with (IAW) EM 1110-1-4009, use of the range to no more than 1 hazardous fragment/600 sq ft as the minimum separation distance for unintentional detonations requires written justification, a risk analysis, calculation of this distance by CEHNC-ED-CS-S, and concurrence of CEHNC-OE-S.

IAW EM 1110-1-4009, the minimum separation distance for intentional detonations shall be the largest of the maximum fragment range, the K328 ($328W^{1/3}$ where W is the total net explosive weight for the detonation) overpressure distance or 200 ft.

CALCULATED FRAGMENT DISTANCES

Maximum Fragment Range = 650 ft
Range to No More Than 1 Hazardous Fragment/600 sq ft = 400 ft

CALCULATED OVERPRESSURE DISTANCES BASED ON OE ITEM'S EXPLOSIVE WEIGHT ONLY (i.e. NO DONOR CHARGE)

Range to 0.9 psi Overpressure (K50) = 27 ft
K328 Overpressure Range = 174 ft (based on munition NEW only, no donor)

The primary fragmentation characteristics used in the calculation of the values listed above were computed IAW DDESB Technical Paper 16. The maximum fragment range was calculated using the maximum weight fragment and the initial velocity from these characteristics in the computer software TRAJ. The range to no more than 1 hazardous fragment/600 sq ft was calculated IAW DDESB Technical Paper 16.

NOTE THAT ALL MITIGATION METHODS FOR INTENTIONAL DETONATIONS ARE BASED ON THE USE OF COMMERCIAL SHAPED CHARGES FOR INITIATION. IF ANY OTHER DONOR CHARGE IS TO BE USED THIS INFORMATION MUST BE PROVIDED TO CEHNC WITH A REQUEST FOR NEW CALCULATIONS!

Minimum Separation Distances
Camp Croft
Mk II Hand Grenade
15 October 2003

SANDBAG ENCLOSURE FOR INTENTIONAL DETONATIONS

Required Sandbag Thickness = 12 in. with 6" standoff between munition and sandbags
Sandbag Throw Distance = 25 ft
Minimum Separation Distance = 200 ft

The required sandbag thickness and the sandbag throw distance were calculated IAW CEHNC-ED-CS-S-98-7. A copy of HNC-ED-CS-S-98-7, "Use of Sandbags for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions" must be available on site.

WATER MITIGATION FOR INTENTIONAL DETONATIONS

Water Containment System (see HNC-ED-CS-S-00-3)	Minimum Separation Distance (ft)
Inflatable pool	200
5 gallon carboys	200

The water containment system and the minimum separation distance were determined IAW HNC-ED-CS-S-00-3. A copy of HNC-ED-CS-S-00-3, "Use of Water for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions" must be available on site

MINIMUM SEPARATION DISTANCES WHILE USING MOFB DURING INTRUSIVE ACTIVITIES

Design of the Miniature Open Front Barricade (MOFB) is in accordance with HNC-ED-CS-S-98-8, "Miniature Open Front Barricade". A copy of this report must be available on site. DDESB has placed certain restrictions on the approved usage of the MOFB. These are listed in the approval letter in the front of the report.

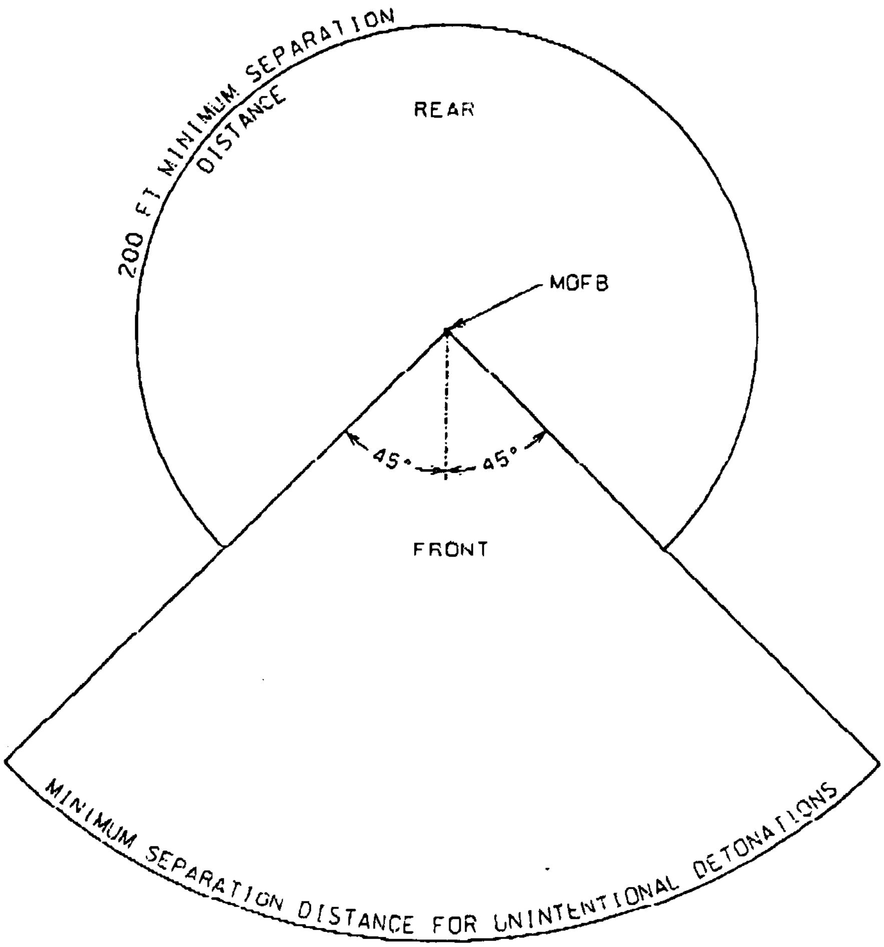
Thickness of Aluminum Required to Prevent Perforation = 1.00 in

The MOFB is designed to defeat fragments to the rear and sides of the MOFB in the case of an accidental/unintentional detonation during intrusive activities. The fragment distances to the front of the MOFB are the same as the fragment distances without the MOFB (see figure). The MOFB is not designed to reduce the effects of blast overpressure. The MOFB may not be used for intentional detonations. The minimum separation distances to the rear and sides of the

Minimum Separation Distances
Camp Croft
Mk II Hand Grenade
15 October 2003

MOFB must be maintained based on the expected throw distance of the MOFB itself.

Minimum Separation Distance to sides and rear = 200 ft
Minimum Separation Distance to front = 650 ft
K50 distance = 27 ft



MINIMUM SEPARATION DISTANCE FOR UNINTENTIONAL DETONATIONS
USING MINIATURE OPEN FRONT BARRICADE DURING INTRUSIVE ACTIVITIES

SIGNATURES:

Michelle Crull 10/15/03 — Subject Matter Expert, Date

Sherene Jelicka 10/15/03 — QA Reviewer, Date

APPENDIX H
RESUMES

SUZY CANTOR-MCKINNEY
VICE PRESIDENT OE PROGRAMS

SUMMARY OF CAPABILITIES

- Unexploded Ordnance (UXO) Program Management
- Subcontract Management
- Engineering Evaluation/Cost Analysis (EE/CA)
- Footprint Reduction
- CERCLA Time and Non-Time Critical Removal Actions
- Geophysical Data Collection and Analysis
- Technical Report Preparation and Review

EDUCATION

MS, Land and Water Resource Management, University of North Texas, 1983
BS, Biology, Marshall University, 1982
OSHA 40-Hour Health and Safety Training Instruction
OSHA 8-Hour Supervisor Course 29 CFR 1910.120 (e) (4)

PROFESSIONAL EXPERIENCE

Ms. Cantor-McKinney has more than 15 years of technical and project management experience in all phases of environmental investigations. She currently serves as Program Manager for the $60M Ordnance and Explosives (OE) Response and Services contract. As Program Manager, she manages and directs multiple, simultaneous field investigations, subcontractor activities, and in-house engineering teams at OE sites throughout the CONUS and OCONUS. She ensures project execution within prescribed budgets, adherence to project schedules, and in conformance with the rigorous standards mandated by the client. In this capacity, she serves as the central point of contact with the client and ensures the quality of all project deliverables. Current task orders are valued at more than $16M.

REPRESENTATIVE PROJECTS

Program Manager. OE EE/CA at the Former Lake Bryant Bombing Range, Ocala, FL. US Army Engineering and Support Center, Huntsville. Manages the execution of the Technical Project Planning (TPP) process and EE/CA development on the 40,500-acre project site, which encompasses a national forest. Site characterization via geophysical mapping, site reconnaissance, and intrusive sampling over approximately 200 acres will support recommendations for risk reduction alternatives. Historical, archaeological, and ecological issues present unique challenges at this site.

Program Manager. OE EE/CA at Heeia and Pali Combat Training Areas, Island of Oahu and OE EE/CA at Makawao Gunnery Range and Opana Point Bombing Range, Island of Maui, HI. US Army Engineering and Support Center, Huntsville and USACE Honolulu District. Provides oversight of two EE/CA projects in Hawaii to determination the extent of remaining OE and residual risk to the public, and present an analysis of risk reduction alternatives. Concurrent field activities (geophysical surveys, location surveying, brush clearing, OE sampling) on the two islands, utilizing multiple subcontractors presents unique logistical challenges for effective project execution. Ms. Cantor-McKinney supports the Technical Project Planning process (TPP) at each site, providing a mechanism for regulators, landowners and stakeholders to be actively involved in the planning phase of OE response actions. This effort involves extensive coordination for a series of community meetings throughout the project design phase.

Program Manager. OE Site Investigation and EE/CA at the Former Armstrong Air-to-Air Gunnery Range, SD. US Army Engineering and Support Center, Huntsville and USACE Omaha District. Provides oversight of the OE investigation and EE/CA at the former Armstrong Gunnery Range in preparation for Title VI land transfer to the Bureau of Indian Affairs. Two tracts of land impacted by air-to-air gunnery activities adjacent to Lake Oahe and the Cheyenne River Arm were visually and geophysically investigated. Recommendations for land use and consideration of risk reduction alternatives were presented in a Site Specific Final Report and Engineering Evaluation/Cost Analysis Report for the respective parcels of land.

Project Manager. Engineering Evaluation/Cost Analysis (EE/CA). Fort McClellan, AL. US Army Engineering and Support Center, Huntsville and USACE Mobile District. Managed all fieldwork and analyses required for the EE/CA conducted on the proposed Eastern Bypass through the former Fort McClellan. She effectively managed multiple subcontractors (brush clearing, surveying, and geophysical) in the field performing multiple, simultaneous and concurrent tasks. This project necessitated the presentation of acceptable risk reduction alternatives based on regulator concerns. Approved risk reduction alternative(s) will be implemented during roadway construction activities to protect construction personnel from encounters with unexploded ordnance. During the EE/CA activities, she also responded to a Time Critical Removal Action and constructed institutional controls.

Project Manager. Engineering Evaluation/Cost Analysis (EE/CA). The former H. Smart Field, Macon, GA. US Army Engineering and Support Center, Huntsville and USACE Savannah District. Responsible for conducting detailed record reviews, performing a site reconnaissance, and presenting the findings and risk reduction alternatives and associated costs for implementation for this suspected chemical warfare materiel site in the EE/CA document. The findings of the EE/CA will be presented during a public meetings.

Project Manager. Ordnance Characterization and Prioritization. The former Camp Beale, CA. US Army Engineering and Support Center, Huntsville, USACE Sacramento District. Ms. Cantor-McKinney was responsible for an ordnance evaluation effort of more than 60,000 acres that will included: extensive records reviews; conducting personal interviews; conducting a site walkover in order to compare historical data with land use patterns and population trends to identify and prioritize sites for additional actions. She managed the in-house development of a database to manage historical and current land use data. The resulting MicroStation/ArcView maps and associated database were provided to the US Army Engineer District, Sacramento to support subsequent EE/CA activities.

Project Manager. Intrusive Site Investigation and EE/CA at Chemical Agent and Conventional OE Site, Laurinburg, NC. US Army Engineering and Support Center, Huntsville and USACE Wilmington District. Responsible for geophysical and intrusive site suspected to contain a buried chemical warfare agent. She manages multiple subcontractors for the site investigation and ensures close coordination with the Technical Escort Unit and the Edgewood Chemical and Biological Command. In addition to the chemical agent-related activities, she managed the reacquisition and sampling of the conventional ordnance area at this site. Non-intrusive investigations and conventional munitions field efforts were completed ahead of schedule and under budget.

Project Manager. OE Recurring Review, Former Camp Elliott – Mission Trails, San Diego, CA. US Army Engineering and Support Center, Huntsville and USACE Los Angeles District. Managed a project team responsible for preparation of the Recurring Review monitoring report for this formerly used defense site. The Recurring Review evaluated changes in land use and surface features and recent OE finds to determine the effectiveness of existing institutional controls. Project tasks include participation in the site investigation, conduct of stakeholder interviews, development of informational materials, development and maintenance of a project website, and preparation of a technical report. All work was directly coordinated with the USAESCH, USACE Los Angeles District, and local community officials.

Program Manager. OE Removal at the Motlow State Community College, Tullahoma, TN. US Army Engineering and Support Center, Huntsville and USACE Mobile District.
Oversight of a removal action on approximately 113 acres of open and wooded land encompassing fields, agricultural areas, and a community college campus. Removal is being conducted by both mag-flag-dig operations and through geophysical mapping and anomaly reacquisition. An accelerated schedule to accommodate college campus schedules to minimize the impact to the public will be implemented.

Project Manager. OE Removal at OOU6, Former Camp Croft, Spartanburg, SC. US Army Engineering and Support Center, Huntsville and USACE Charleston District.
Managed the OE removal of approximately four acres of private property determined to be an impact area for 105mm artillery. Execution of this project included management of digital geophysical mapping, mag-and-dig, and the use of remotely-operated earthmoving and sifting equipment. Approximately 1,700 cubic yards of dirt were removed from the project area and processed through a mechanized sifter. During the removal action, 690 ordnance items, including expended 105 millimeter base-ejection artillery rounds, fuzes, smoke canisters, and 60 and 81 millimeter mortars were removed. More than 7,000 pounds/tons of scrap metal were removed from the site and recycled. A substantial cost and time savings was realized through aggressive project management.

Program Manager. OE Removal Action, Nansemond Ordnance Depot, Suffolk, VA. US Army Engineering and Support Center, Huntsville and USACE Norfolk District. Provided oversight of an OE removal action on mixed land-use properties. OE removals at the site have included surface and subsurface clearance, excavation of burial pits, and TNT removal. Challenges presented at this site include the presence of extensive amounts of construction debris, asbestos pipe insulation and suspect creosote roofing membrane.

Project Manager. Restoration Advisory Board (RAB). The former Camp Croft, Spartanburg, SC. US Army Engineering and Support Center, Huntsville and USACE

Charleston District. Ms. Cantor-McKinney established and continues to coordinate the activities of the RAB, which is comprised of diverse community members. Coordination of activities for this site includes: development and implementation of the community relations plan, preparation and presentation of relevant project-related materials, conduct of public meetings, and serving as a liaison between the RAB, US Army Corps of Engineers, and the community.

Project Manager. Education and Awareness Program Support, Former Camp Elliott, Tierrasanta/Murphy Canyon, CA. US Army Engineering and Support Center, Huntsville and USACE Los Angeles District. Managed the development of an OE education and awareness program as follow-up to the Recurring Review of the former Camp Elliott, CA. Ms. Cantor-McKinney provided direction in the design and production of educational materials informing the community of the potential dangers presented by OE and the appropriate response if a suspect item is found. Educational materials included refrigerator magnets, fact sheets and brochures, coloring books, and videotape.

Program Manager. Blast Chamber Test for Destruction of Chemical Warfare Materiel & Shape Charge Evaluation of High-Explosive Ordnance. US Army Engineering and Support Center, Huntsville. Provided oversight of the planning and execution of testing to prove the concept for the safe and efficient destruction of CWM ordnance utilizing a blast containment structure within a vapor containment system. Concurrent with conducting the blast chamber tests, separate test efforts to determine the effectiveness varying configurations of commercially available shape charges for detonation of conventional high explosive ordnance were conducted. She coordinated ZAPATAENGINEERING's engineering team as well as two subcontractors in the planning and execution of the tests.

DAVID A. SMITH
SENIOR GEOPHYSICIST

Education

BSC, EARTH PHYSICS AND EXPLORATION GEOPHYSICS, UCLA, 1960
PETROLEUM GEOLOGY, COLORADO SCHOOL OF MINES, 1950 - 1952

Professional Registrations

REGISTERED GEOPHYSICIST NO. 671 CALIFORNIA 1972
REGISTERED GEOLOGIST NO. 4002 CALIFORNIA 1985

Professional Affiliations and Honors

AUSTRALIAN SOCIETY OF EXPLORATION GEOPHYSICISTS
AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, (PUBLICATIONS EDITOR, 1982)
EUROPEAN ASSOCIATION OF EXPLORATION GEOPHYSICISTS
SOCIETY OF EXPLORATION GEOPHYSICISTS

Summary of Capabilities

- DESIGN OF AIR AND GROUND GEOPHYSICAL SURVEYS
- SPECIALIST IN HIGH RESOLUTION AEROMAGNETIC (HRA) SURVEYS
- AIRBORNE AND GROUND GEOPHYSICAL DETECTION OF INTRA-SEDIMENTARY AND BASEMENT FAULTS
- GEOPHYSICAL DATA COLLECTION SUPERVISION AND QUALITY CONTROL
- GEOPHYSICAL DATA PROCESSING, ANALYSIS AND INTERPRETATION
- GEOPHYSICAL INVESTIGATION OF GEOLOGIC INFLUENCES ON THE ENVIRONMENT
- ENGINEERING APPLICATION OF GEOPHYSICS, CONTAMINATION SOURCE AND PATHWAY STUDIES
- EVALUATION OF MINERAL POTENTIAL

Experience Overview

Mr. Smith serves as Project Manager, Senior / Project Geophysicist on Ordnance and Explosives Engineering Evaluation projects. His responsibilities include the design and management of geophysical surveys, and collection, quality control, data processing and analysis/interpretation of geophysical data. His experience includes airborne geophysical surveys that are directly relevant to the development of airborne surveys in the detection of UXO over large areas.

Mr. Smith has over 30 years of direct, personal technical involvement in geophysical exploration on four continents, working in various social cultures in arctic, alpine, desert and jungle environments. He has served as consultant to more than 25 major and independent mineral and petroleum exploration companies. In conjunction with client staff, or as an independent client representative leading teams of US staff and local personnel, he has planned geological/geophysical investigations; designed, executed, and interpreted airborne and ground geophysical data; and delivered understandable reports on more than 100 projects.

PROFESSIONAL EXPERIENCE

PROJECT MANAGER AND GEOPHYSICIST OF RECORD. OE REMOVAL AND AERIAL GEOPHYSICAL MAPPING AT THE FORMER CAMP WELLFLEET, CAPE COD, MA. US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE AND USACE NEW ENGLAND DISTRICT. Performed site visit and worked with Oak Ridge National Laboratory (ORNL) Business Manager and the Huntsville Technical Manager to establish specific support and quality control steps to satisfy the scope of work. Mr. Smith supported the helicopter geophysical survey team, worked closely with the Oak Ridge staff, examined daily results and participated in data reduction. He reviewed the draft report of the survey in Oak Ridge with the ORNL project geophysicist, prepared the preliminary Technical Project Plan, and coordinated meetings with Huntsville staff to plan ground follow up of airborne results. He reviewed the ORNL Final Report, prepared the data presentation and participated in preparation of the project Explosives Safety Submission (ESS) and Work Plan.

PROJECT GEOPHYSICIST. GEOPHYSICAL PROVE-OUT FOR OE EE/CA. HEEIA COMBAT TRAINING AREA AND PALI TRAINING CAMP, ISLAND OF OAHU, HI. US ARMY ENGINEERING & SUPPORT CENTER, HUNTSVILLE AND USACE HONOLULU DISTRICT. Led the effort to acquire sufficient OE to carry out the Geophysical Prove-Out (GPO) for Pali and for the following Prove-Out on Maui. Was responsible for the design and execution of both GPOs. Provided subsequent geophysical investigation support for the Heeia / Pali sites.

PROJECT GEOPHYSICIST. GEOPHYSICAL PROVE-OUT FOR OE EE/CA. MAKAWAO GUNNERY AND OPANA POINT BOMBING RANGES, ISLAND OF MAUI, HAWAII, US ARMY ENGINEERING & SUPPORT CENTER, HUNTSVILLE AND USACE HONOLULU DISTRICT. Responsible for the design and execution of the Geophysical Prove-Out (GPO) and was on site for the Prove-Out acquisition. As Project Geophysicist for the geophysical investigation, his responsibilities include the re-test of the GPO with the proposed ATV / EM61Mk II acquisition system. Ensured timely data processing, transmittal to Huntsville, and data analysis/ dig results feedback into the data processing sequence.

PROJECT GEOPHYSICIST. GEOPHYSICAL PROVE-OUT FOR OE INVESTIGATION AND EE/CA. FORMER ARMSTRONG GUNNERY RANGE, SD, US ARMY ENGINEERING & SUPPORT CENTER, HUNTSVILLE AND USACE OMAHA DISTRICT. Responsible for the design and execution of the Geophysical Prove-Out (GPO) and investigation. Project tasks included supervision of the digital EM61 geophysical surveying, mapping and evaluation of the 700-acre project site. In coordination with USACE Omaha representatives, he selected transect paths and grid sites to provide basic data for area evaluation. Data acquisition required capture of all positional and instrument data, analysis of the geophysical data, identification of potential UXO anomalies, provision of anomaly identification-sheets, color contour maps, survey trace maps, physical features, map overlays, and analysis to produce color contour maps showing predicted anomalies per acre and UXO per acre, digital target tables, target maps, and survey data.

PROJECT GEOPHYSICIST. ORDNANCE DETECTION AND DISCRIMINATION STUDY (ODDS), FORT ORD, CA. USACE SACRAMENTO DISTRICT. Participated in design, supervision, and execution of the study to evaluate OE detection instruments / systems and search protocols for detecting OE at Fort Ord and discrimination of OE from OE scrap and other scrap. Prior to the Static Tests, he collected, logged, photographed and sequestered all OE to be used in the Static Tests. Physically oriented, leveled and emplaced the Test Stand. For Static Test Stand, measured and documented conductivity and magnetic response of soil beneath the stand and within the grid dedicated to the Static measurements. Conducted and/or supervised all OE placement, positioning and orientation beneath the test stand during measurements. Directed and documented Static Test Stand measure.

Prior to the Field Tests, collected, labeled and photographed all OE and scrap to be used in the ODDS Known Item and Unknown Item Grids. Personally placed, or supervised the placement of, all seeded OE Items in the Grids. Kept field log and photographic record of all items and their locations in the grids. Worked with the Fort Ord land surveyor in GPS and laser survey location of grids and each seeded item. During field tests, observed and documented activities of most contractors' acquisition of test data. Participated in writing the final report.

PROJECT GEOPHYSICIST. LOCATION AND MAPPING OF OE SCRAP TRENCHES AT THE UTAH TRAINING AND TEST RANGE (UTTR). HILL AFB, UTAH. As an independent consultant, was retained to locate several trenches that had been dug in random and unrecorded locations on a 60 to 80 acre site in the Utah West Desert. The trenches had been filled with earth, leveled and grass covered in the 1950s and 1960s. Prior attempts to geophysically map the trenches had been unsuccessful. Using an EM31 electromagnetic instrument and a cesium vapor magnetometer, Mr. Smith mapped all trenches. By using rigorous profile analysis of the geophysical data he was able to establish locations with sufficient resolution to determine both individual trench boundaries and their relative ages at points of intersection. At the final presentation of the Report of Findings, the Utah State Environmental Geophysicist commended Mr. Smith for the profile analysis and assured the client that no further geophysical work was required at the site.

JOHN A. SOYAK, MS, CIH
CERTIFIED INDUSTRIAL HYGIENIST

SUMMARY OF CAPABILITIES

- Industrial Hygiene
- Lead-Based Paint and Asbestos Testing and Abatement Design
- Indoor Air Quality
- Occupational Safety and Health
- Hazardous Waste Management
- Environmental Program Management

EDUCATION, TRAINING, AND PROFESSIONAL AFFILIATION

BS, Biology-Chemistry, Central Michigan University, 1964
MS, Biology, Central Michigan University, 1966
MSPH, Environmental Sciences, University of North Carolina, 1970
40 Hour OSHA Health and Safety Training (29 CFR 1910.120)
8-Hour Supervisor Course (29 CFR1910.120(e)(4))
Advanced Industrial Hygiene Course
Asbestos Control Procedures
Certification Comprehensive Practice of Industrial Hygiene
Diplomate, American Academy of Industrial Hygiene
Member of the American Hygiene Association and the American Chemical Society

PROFESSIONAL EXPERIENCE

As a Certified Industrial Hygienist, Mr. Soyak has been responsible for the management of environmental and remediation projects, toxic materials handling, and industrial hygiene services for public and private clients for more than 30 years. He is an experienced manager responsible for providing oversight and quality assurance for a variety of environmental programs such as Asbestos and Lead projects for government and private clients; and completing and submitting appropriate government-required documentation and permit applications. Mr. Soyak provides interaction between clients and regulatory agencies. As a former military member, he has thorough knowledge of DOD regulations, policies, and procedures.

Mr. Soyak has evaluated indoor firing ranges to determine airborne lead exposures and existing work practices and control measures; developed and coordinated lead medical surveillance programs for personnel involved with lead paint abatement; developed lead training manuals for workplaces; and performed oversight and quality assurance during lead abatement activities.

Mr. Soyak has also directed and performed numerous asbestos surveys and quality assurance evaluations during asbestos projects. While conducting these surveys, Mr. Soyak determined locations, quantities, and physical condition of asbestos.

MICHAEL WINNINGHAM
PROJECT MANAGER

SUMMARY OF CAPABILITIES

- Project Management
- Development and Execution of Quality Assurance and Quality Control Plans
- Environmental Assessments and Investigations
- Environmental Restoration and Remediation
- Ordnance and Explosives
- Geophysical Investigations

EDUCATION

BS, Industrial Safety, University of Southern Illinois, 1988
US Naval Explosives Ordnance Disposal School, Indian Head, MD/Jan 1987

SPECIAL TRAINING

40-Hour OSHA Health and Safety Training, 29 CFR 1910.20, 1988

LICENSES/REGISTRATIONS/CERTIFICATIONS

NAVSACOLEOD, Jan 1987

PROFESSIONAL AFFILIATIONS AND HONORS

ASQ, 1998
Institute of Hazardous Materials Management, 1997
Society of American Military Engineers, 1994-Present

EXPERIENCE OVERVIEW

Mr. Winningham has more than 22 years experience in field actions and project management of Ordnance and Explosive (OE) projects. During his 12-year post military career, he has served as the corporate Safety Manager/Project Manager, Department Manager, and Director of Operations for numerous projects for the Department of Defense projects. Mr. Winningham has provided technical leadership for the management of tasks involving remedial actions for more than 50 OE projects and 10 chemical warfare materiel (CWM) projects. He is fully qualified to establish and manage projects pertaining to both OE and CWM hazards. His expertise in OE methods of remediation, and full knowledge of Army regulations for OE/CWM operations ensure the effective management and execution of projects.

EXPERIENCE

PROJECT MANAGER. OE REMOVAL AT OOU6, FORMER CAMP CROFT, SPARTANBURG, SC. US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE AND USACE CHARLESTON DISTRICT.
Managed an ordnance and explosives (OE) removal action on a parcel of property which was once part of the former Camp Croft Army Training Facility (CCATF). This removal action involved the daily

management of site operations, tracking costs and funding, and providing advice and support to clients on regulatory compliance issues and technology reviews.
(ZAPATAENGINEERING JUL 01 –OCT 02)

PROJECT MANAGER. OE REMOVAL ACTION, NANSEMOND ORDNANCE DEPOT, SUFFOLK, VA - US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE AND USACE NORFOLK DISTRICT.
Management of OE removals at the site, which have included surface and subsurface clearance, excavation of burial pits, and bulk TNT removal operations. Responsibilities included liaison between the client, the USEPA and the applicable state agencies during the preparation of remedial investigation plans and the selection of remediation under the requirements of CERCLA.
(ZAPATAENGINEERING OCT 02 – Present)

PROJECT MANAGER/DEPARTMENT MANAGER. OE INVESTIGATION AT FORMER SPRING VALLEY, WASHINGTON DC - US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE AND USACE BALTIMORE DISTRICT. Project Manager for an Environmental Evaluation/Cost Analysis project addressing multiple sites potentially contaminated with chemical warfare materiel and ordnance. The project involved the development of detailed plans and safety requirements for the assessment of mustard gases and other related contaminants. Extensive soil sampling and intrusive investigation were included for confirmation of the presence of ordnance and chemical waste materials.
(Human Factors Application, Dec 00- JUL 01)

PROJECT MANAGER/DEPARTMENT MANAGER. OE INVESTIGATION AT FORMER BUCKLEY BOMBING RANGE, CO - US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE AND USACE OMAHA DISTRICT The Former Lowry Bombing and Gunnery Range is located approximately 20 miles to the southeast of Denver, Colorado and consists of approximately 65,000 acres. As the Project Manager was responsible for supporting the clearance actions, to include several field efforts were performed including surveying, geophysical data collection and analysis, life-cycle data management, remote sensing, and various OE construction and anomaly avoidance support functions.
(Human Factors Application, Feb 92-Nov 00)

DEPARTMENT MANAGER, CWM EE/CA AT FORMER CLEVELAND PLANT, CLEVELAND, OH - US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE.
(Human Factors Application, Dec 00- JUL 01)

PROJECT MANAGER. CWM INVESTIGATION AND REMOVAL ACTION AT FORMER ENGLAND AFB, ALEXANDRIA, LA – US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE AND UNITED STATES AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
(Human Factors Application, FEB 92 – NOV 00)

PROJECT MANAGER. OE REMOVAL ACTION/UXO CONSTRUCTION SUPPORT AT FORMER RARITAN ARSENAL, NJ - US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE
(Human Factors Application, Feb 92 to Nov 00)

PROJECT MANAGER. OE REMOVAL ACTION/UXO CONSTRUCTION SUPPORT AT NAS MIRAMAR, CA – US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE.
(Human Factors Application, Feb 92 to Nov 00)

EXPLOSIVE ORDNANCE DISPOSAL TECHNICIAN. U.S. NAVY.
Preformed numerous range clearances for NAS Fallon while assigned to Mobile Unit Nine. Senior Enlisted member for Mine Counter Measure team. Responsible for planning and supervising EOD

technicians during diving operations, range clearances, RSP's, and disposal operations.Manager for the following projects: Camp Wellfleet, MA.
(US Navy, JAN 87 – Jan 92)

IITRI/HFA DIRECTOR OF OPERATIONS
Provides a senior management role in the development and execution of programs and projects addressing OE and HTW management and site remediation under DOD, CERCLA, and RCRA requirements, for a wide variety of industrial and government clients. Program development experience includes multi-project clients for DOD programs in restoration of hazardous waste, unexploded ordnance, and chemical warfare materiel sites. Technical direction and project management experience includes engineering evaluation and cost analysis, remedial investigations, and remedial designs under CERCLA and corrective measure studies under RCRA. In addition provides advice and support to clients on regulatory compliance issues and technology reviews.

PARSONS OE DEPARTMENT MANAGER
As a Department Manager managed and directed multiple, simultaneous field investigations, subcontracting activities, and in-house engineering teams at OE sites throughout CONUS/OCONUS and HTW sites within CONUS. In this capacity, he was also involved with the development and implementation of community relations programs to support work efforts at such sites. Additionally abilities to solicit input from multiple disciplines, evaluate a range of technical approaches and assimilate the information for consistency in meeting project objectives, while considering safety, budget, and schedule. Department Manager for the following projects: Spring Valley, DC; Fort Segarra, USVI; Hilo, HI; Cleveland Plant, OH; and Camp Simms, DC.

IITRI/HFA PROJECT MANAGER
Consistent history of success in improving competitive positions, developing new business, strengthening profitability and cutting costs through the application of appropriate technology and experience. Proven domestic and international management and project development skills including organizing strategic relationships, sales and marketing, on-site supervision, customer relations and making effective presentations to high-level customers. Excellent communications skills supported by the drive and experience to make things happen. Project Manager for the following projects: England AFB; Yellow Jacket Mine Area, UT; Ft. McClellan, AL; Camp Sibert, AL; Spring Valley, DC; Navy DRI Site, CO; and Camp Butner, NC.

IITRI/HFA SAFETY/QUALITY MANAGER
Responsible for developing and writing all HFA's health and safety plans, Explosive Safety Submissions, CWM Safety Submissions, remedial action safety plans, safety policies and procedures, and sampling plans. Certified instructor for teaching all OSHA related courses. Performs safety audits and visits for HFA's sites. Additional, responsible for all activities of a chemical warfare materiel/ordnance & explosives sites, management of both indoor and outdoor air monitoring, characterization of hazardous waste, and risk analysis of explosive hazards. Extensive knowledge in CERCLA/RCRA guidelines and regulations for the effective remediation activities of USAESCH projects. Responsible for all technical and administrative aspects of the section including acquisition, maintenance and operation of scientific instruments; staff recruitment, training and certification; program management including the review of program safety plans; and interactions with clients. HFA's corporate Safety Manager for seven years and HFA's Quality Control Manager for the last three years. Implemented the Contractor Performance Certification Program (CP2) for HFA and have received an interim certification for the Department of the Army.

STAFF TRAINING
Recognized for his leadership skills, staff training and certification. He is a respected instructor and taught numerous courses on OSHA compliance, explosive safety, and other contractual required courses.

IT CORPORATION SITE SAFETY OFFICER

IT Corporation, UXO Supervisor/Health and Safety Officer for IT sites at Fort Meade MD, Subase Bangor WA, Fort McCoy WI, and Mathers AFB CA. Responsible for UXO teams safety to include all employees at these sites. Site Safety Officer at Chemical Insecticide Corporation site for USACE, Kansas City office, responsible for all site personnel safety and developed black powder sampling and testing procedures.

U.S. NAVY

EOD Technician responsible for providing EOD services throughout the Pacific area of Naval operations. Preformed numerous range clearances for NAS Fallon and NWS China Lake while assigned to Mobile Unit Nine.

Senior Enlisted member for Mine Counter Measure team. Responsible for planning and supervising EOD technicians during diving operations, range clearances, RSP's, and disposal operations.

Senior Enlisted in charge of command diving locker and mixed gas diving. Responsible for all diving operations and policies.

TIMOTHY J. HENDRIX
SAFETY/QUALITY CONTROL OFFICER/UXO SUPERVISOR

DATE GRADUATED FROM BASIC EOD SCHOOL: JULY 25, 1975

UXO/EOD ASSIGNMENTS:

4/01 – 7/01 HFA, Inc., UXO Supervisor at Camp Croft; Spartanburg, SC. Remote control operated heavy equipment was used during this removal action.

8/00 – 10/00 USA Environmental Inc., UXO Specialist for UXO removal actions at Massachusetts Military reservations, Massachusetts.

6/00 – 7/00 UXB International, UXO Specialist at Camp Croft SC. A clearance to remove ordnance from a residential area.

2/00 – 3/00 HFA, Inc., UXO Supervisor for Duck Target Facility, NC. A clearance action to remove ordnance from the target area.

8/99 – 10/99 HFA, Inc., UXO Specialist for Illinois Ordnance Plant, Marion IL. A clearance action to remove ordnance from several sites.

6/99 – 8/99 HFA, Inc., UXO Supervisor for Former Camp Grant, Rockford IL. A clearance action to remove ordnance from Atwood Park.

3/99 – 5/99 HFA, Inc., Quality Control/Safety Officer for Duck Target Facility, NC. A clearance action to remove ordnance from the target area, including geophysical mapping under the Defense Environmental Restoration Program – Formerly used Defense Sites (DERP-FUDS)

1/98 – 2/99 HFA, Inc., Site Safety and Quality Control Officer for Camp Croft, SC. A surface and subsurface ordnance removal action including geophysical mapping.

7/97 – 11/97 HFA, Inc., UXO Specialist for Dolly Sods, WV. Ordnance removal in campsites and hiking trails of the Monogohila National Wilderness Area.

5/97 – 7/97 HFA, Inc., Site Safety Officer for Camp Croft, SC. A clearance to remove ordnance from future building sites.

6/96 – 3/97 HFA, Inc., UXO Supervisor for Camp Croft, SC. Ordnance removal actions for several sites at Croft State Park.

2/96 – 4/96 UXB International, UXO Supervisor for Montana De Oro State Park, Baywood, CA. An EECA study and ordnance removal project.

8/95 – 11/95	UXB International, Safety/QC Officer for Former Camp Grant, Atwood Park, Rockford, IL. A surface clearance to remove ordnance from Atwood Park.
6/95 – 7/95	UXB International, UXO Supervisor for Superior Valley Bombing and Gunnery Range, Barstow, CA. A sifting operation to remove ordnance from selected target areas.
2/95 – 6/95	UXB International, Site Safety/Quality Control Officer for Montana De Oro State Park, Baywood, CA. Ordnance removal with strict environmental demands.
12/94 – 1/95	UXB International, UXO Supervisor for American University/Spring Valley, Washington DC. A confined space/soil sampling project at a former chemical weapons testing facility, now an affluent residential area.
7/94 – 9/94	UXB International, Senior UXO Supervisor, Morgan City Depot, Sayerville, NJ. Supervised UXO removal project from elementary school property and adjacent lots.
9/93 – 7/94	UXB International, UXO Specialist at various sites including: Manmouth Beach, NJ – Emergency response to ordnance contaminated beach; Jefferson Proving Ground, IN – Man portable ordnance detection and robotics demonstration; Fort Meade and Graces Quarters Proving Ground, MD – Soil sampling and ordnance avoidance; Seneca Army Depot, JY – Soil sampling and ordnance avoidance; Twin Cities Army Ammunition Plant, MN – Level B PPE, excavation of cyanide contaminated pits and ordnance sorting from lead/mercury treatment plant.
9/92 – 9/93	23rd Civil Engineer Squadron, EOD Flight, Pope AFB, NC. Flight Chief. Organized and managed an EOD program that provided routine and emergency support for worldwide mobility.
9/89 – 9/92	10th Civil Engineer Squadron, BOD Flight, RAF Alconbury, England. Flight Chief. Organized and managed a USAFE EOD program consisting of 12 EOD technicians.
6/84 – 7/89	60th Supply Squadron, EOD Branch, Travis AFB, CA. EOD Branch Chief. Coordinated EOD operations for three military airlift wings.
2/75 – 5/84	43rd MMS, EOD Branch, Anderson AFB, Guam. EOD Technician/Supervisor. Emergency and routine support including WWII ordnance found throughout the island.
5/74 – 2/79	56MMS, EOD Branch, MacDill AFB, FL. EOD Specialist/Technician. Range clearance operations at Avon Park Bombing and Gunnery Range.

NILE A. LUEDTKE
Chemical Data Quality Management

Current Position: Analytical Services Coordinator
Senior Analytical Chemist

SAIC Group/Division/Location: E&EMG, Environmental Services Division (380), Oak Ridge

Years of Experience with SAIC: 11 (9/92 start date)

Years of Experience with Other Firms: 18 (1974-92)

Education:

University of Rhode Island, Kingston, RI: MS, Analytical Chemistry, 1975
Hartwick College, Oneonta NY: BA, Chemistry, 1972

Professional Registrations/Certifications: None

Professional Affiliations:

American Chemical Society
American Society for Quality Control (Environmental Restoration Committee)

OVERVIEW OF EXPERIENCE

Mr. Luedtke's experience encompasses analytical chemistry and Quality Assurance/Quality Control (QA/QC) aspects of a wide variety of environmental issues. His 20+ years of professional achievement have focused on the development and implementation of environmental sampling and analysis programs for the complete scope of governmental organizations, including DOE, DoD, EPA, NSF, and State Agencies. Recently he has developed and implemented programs for the Engineering & Environmental Management Group of SAIC in relation to analytical laboratory interfaces, project chemistry support, project data quality objective development, and project data quality assessment. Mr. Luedtke has directed professional and administrative staffs in the development and implementation of laboratory Quality Assurance oversight, assessment of laboratory analysis, data validation, and field sampling support for programs involving multiple environmental monitoring, RI/FS, RCRA, SARA, and CERCLA projects. Analytical expertise encompasses metal determinations, inorganic analyses, organic methodologies, radiochemical procedures, field analytical methods, and miscellaneous testing such as asbestos and radon monitoring.

DOUGLAS D. MCCUE
UXO SUPERVISOR/SPECIALIST

EOD/UXO Assignments:
May 86-Jul 88
EOD Technician, EODMU One, Barbers Point, HI. Planned, coordinated and supervised a range clearance in Diego Garcia for the recovery and disposal of 40 mm projectiles. Supervised the transfer of ammunition and explosives (including an unexploded missile warhead) of the USS Stark from the USS Lasalle to the USS Camden. Conducted WIF techniques to Stinger BDU's prior to helicopter transfer. Conducted training for ship personnel in Nuclear, Chemical and Biological weapons which included monitoring and decontamination techniques and procedures. Assisted with Kaho'olawe disposal operations and escorts for Ohana visits.

Aug 88-Aug 91
Senior EOD Technician, EODMU Five Detachment Guam, Marianas Islands. Conducted in-field render safe procedures on fifteen (15) unexploded ordnance items and recovered over 3,000 pieces of UXO as duty EOD Technician on the island of Guam. Supervised the recovery and disposal of over 700 pieces of UXO with a net explosive weight of over 14,000 pounds during ten EOD operations in Palau, Yap, Saipan and Kwajalein. Supervised up to ten personnel during monthly disposal operations for retrograde and recovered WWII ordnance which included various bombs, projectiles, rockets,hand grenades, pyrotechnics, fireworks, landmines, blasting caps, small arms ammo and miscellaneous items. Researched, planned and conducted underwater explosive techniques to remove underwater explosive ordnance and navigational hazards in the Kwajalein Atoll

Sep 91-Sep 96
Master EOD Technician, EOD Instructor, and Master Training Specialist, Naval School Explosive Ordnance Disposal Detachment, Eglin AFB, FL. Supervised and evaluated twenty two joint service instructors in CORE Division. Qualified to teach and revise curriculum for EOD Operations Planning (Reconnaissance, both surface and underwater), Basic Electricity, Physics, Explosives and Explosive Effects, EOD Safety, Underwater Ordnance Identification, Protection of Personnel and Property and EOD Publications. Developed curriculum for the Automated EOD Publication System (CD-ROM) –2/96. Instructed approximately 2,600 US and International military students. Taught American Red Cross Community CPR classes.

Oct 96-Apr 01
UXO Supervisor?Specialist, CMS Inc./USA Inc., Ft. Ord Project, CA. Assigned as Tech III on Aug 97. Supervised up to six personnel involving UXO sweep, disposal, soil sampling, backhoe/bobcat/bushhog and manual brush team operations. Qualified backhoe, bobcat and bushhog operator/supervisorwith over 24 months experience on heavy equipment teams. Mask fit tested for the rat nest removal team. Conducted and supervised sweep operations using a Schonstedt Magnetic Locator and disposal operations using both electric and non electric methods of initiation. Responsible for the recording and submission of daily team grid sheets, dig sheets, team equipment inventories and team log books. Taught American Red Cross Community CPR classes.

Apr 01-Sep 01
UXO Supervisor, HFA Inc., Former Camp Croft, Spartanburg, SC . Assigned as Tech III to supervise a UXO team performing mag & flag and/or mag & dig operations to recover and dispose of 105 mm HC smoke and 60 mm HE projectiles.
UXO Specialist, HFA Inc., Camp Bonneville, WA. Assigned as Tech II to provide ordnance avoidance escort for well drilling operations. Work involved using Mk 26 downhole magnetometer checks prior to drilling.

Oct 01
UXO Supervisor, HFA Inc., Armstrong, SD. Assigned as Tech III to supervise a UXO team conducting a surface sweep and locating geophysical flags dispersed over a large area for intrusive investigation. Recovered AN-30 type practice bomb OE scrap, but no explosive items were recovered or disposed of.

Nov 01-Apr 02
UXO Specialist, HFA Inc., Spring Valley, Washington, D. C.. Assigned as a Tech II for level B chemical agent/munitions removal operations. Conducted excavations in a confined space (12 feet deep) using hand tools and a pneumatic jack hammer. Recovered approximately four hundred 75 mm projectiles.

May 02 - Jul 02
Unassigned. Built my house.

Jul 02 - Sep 02
UXO Specialist, HFA Inc., Gadsden, AL. Assigned as a Tech II for soil sampling, backhoe operations and hand excavations at a former chemical training site to verify the presence of chemical munitions, agents or residues. Work was conducted in modified D (slung masks & inner/outer gloves). Was responsible for emergency response and decontamination station operations, as well as operation of agent monitoring equipment.

Oct 02 – Nov 02
UXO Supervisor, Parsons Inc., Dugway Proving Ground, Utah. Assigned as a Tech III to provide UXO avoidance and technical support for angle borings at HWMU 55. Conducted down hole magnetometer checks along the planned boring path. Assisted in personnel decontamination station setup and training for drill team members.

Dec 02 – Jan 03
UXO Supervisor, HFA Inc., Motlow, TN. Assigned as a Tech III to supervise a UXO team in mag/flag/dig operations to recover and dispose of 37 mm projectiles. Operations included both geophysically mapped anomalies and traditional mag/flag and/or dig techniques. Responsible for completing grid sheets, geo dig sheets and team log books.

Jan 03 – Apr 03
UXO Supervisor, Parsons Inc. , Spring Valley, Washington, D.C.. Assigned as a Tech III to supervise trachoe digging operations to remove burial pits/trenches on American University

property. Responsible for daily logs, summaries and grid sheets to accurately document dimensions/ depths of excavations and the locations of items recovered.

Apr 03 – Sep 03
UXO Supervisor, Zapata Engineering, Motlow, TN. Assigned as Tech III to supervise a UXO team in the phase II clearance operation as described above (Dec 02 – Jan 03). Obtained a Tennessee blasters license to conduct demolition operations.

Oct 03
Unassigned. Well deserved vacation.

Nov 03 to present
UXO Supervisor, Zapata Engineering, Charlotte, NC. Assigned as a Tech III to prepare the Motlow Area A final report, conduct research & planning for future operations and other office tasks as necessary.

COE database UXO # 0296

Military Time 10.5 years

Civilian UXO Time 7.75 years

Total EOD/UXO Time 18.25 years

Tel (828) 288-2116
(828) 289-2656

APPENDIX I
GRIDS
40P, GC2, 35P1 AND 35P3

1.0 INTRODUCTION

This appendix addresses the increase in grids for the initial task order. The additional grids are 40P, GC2, 35P1, and 35P3 (Figure I-1 in Appendix I).

2.0 TECHNICAL MANAGEMENT

2.1 SITE PREPARATION

Site preparation will be in accordance with paragraph 2.9 of the Work Plan.

3.0 OE REMOVAL

3.1 GENERAL

Upon the completion of the site preparation, as described in paragraph 2.9, the removal action will commence with geophysical mapping, and OE removal activities.

3.2 SURFACE CLEARANCE

A surface clearance will be conducted IAW Paragraph 2.10.2 of the Work Plan

3.3 GEOPHYSICAL SURVEY

Refer to Geophysical Plan (Chapter 6.0) for a detailed description of any geophysical survey to be performed for this operation.

3.4 ANOMALY ACQUISITION

Anomaly acquisition will be accomplished per paragraph 2.10.4 of the Work Plan.

3.5 ANOMALY REACQUISITION

Anomaly reacquisition will be accomplished per paragraph 2.10.5 of the Work Plan.

3.6 ANOMALY EXCAVATION

3.6.1 ZAPATAENGINEERING will follow the guidance in Paragraph 2.10.6 and the following grid specific information for excavation of anomalies.

3.6.2 GRID 40P. ZAPATAENGINEERING will conduct a subsurface OE removal to a depth of detection of 24.7” on approximately 0.649 acres. The MPM fragmentation distance for a MKII grenade is 650 feet, which will be plotted onto a map (Figure I-1) to determine where the fragmentation distance would fall. Since this area is in a residential area, engineering controls (i.e., miniature open-front barricades) will be required with exclusion areas as per paragraph 2.11.7 of the main work plan.

3.6.3 GRID GC2. ZAPATAENGINEERING will conduct a subsurface OE removal to a depth of detection 0f 24.7” on approximately 3.11 acres. The MPM fragmentation distance for a MKII grenade is 650 feet, which will be plotted onto a map (Figure I-1) to determine where the fragmentation distance would fall. Since this area is in a residential area, engineering controls (i.e., miniature open-front barricades) will be required with exclusion areas as per paragraph 2.11.7 of the main work plan.

3.6.4 GRID 35P1. ZAPATAENGINEERING will conduct a subsurface OE removal to a depth of detection of 24.7" on approximately 0.429 acres. The MPM fragmentation distance for a MKII grenade is 650 feet, which will be plotted onto a map (Figure I-1) to determine where the fragmentation distance would fall. Since this area is in a residential area, engineering controls (i.e., miniature open-front barricades) will be required with exclusion areas as per paragraph 2.11.7 of the main work plan.

3.6.5 GRID 35P3. ZAPATAENGINEERING will conduct a subsurface OE removal to a depth of detection of 24.7" on approximately 0.524 acres. The MPM fragmentation distance for a MKII grenade is 650 feet, which will be plotted onto a map (Figure I-1) to determine where the fragmentation distance would fall. Since this area is in a residential area, engineering controls (i.e., miniature open-front barricades) will be required with exclusion areas as per paragraph 2.11.7 of the main work plan.

4.0 UXO DISPOSITION

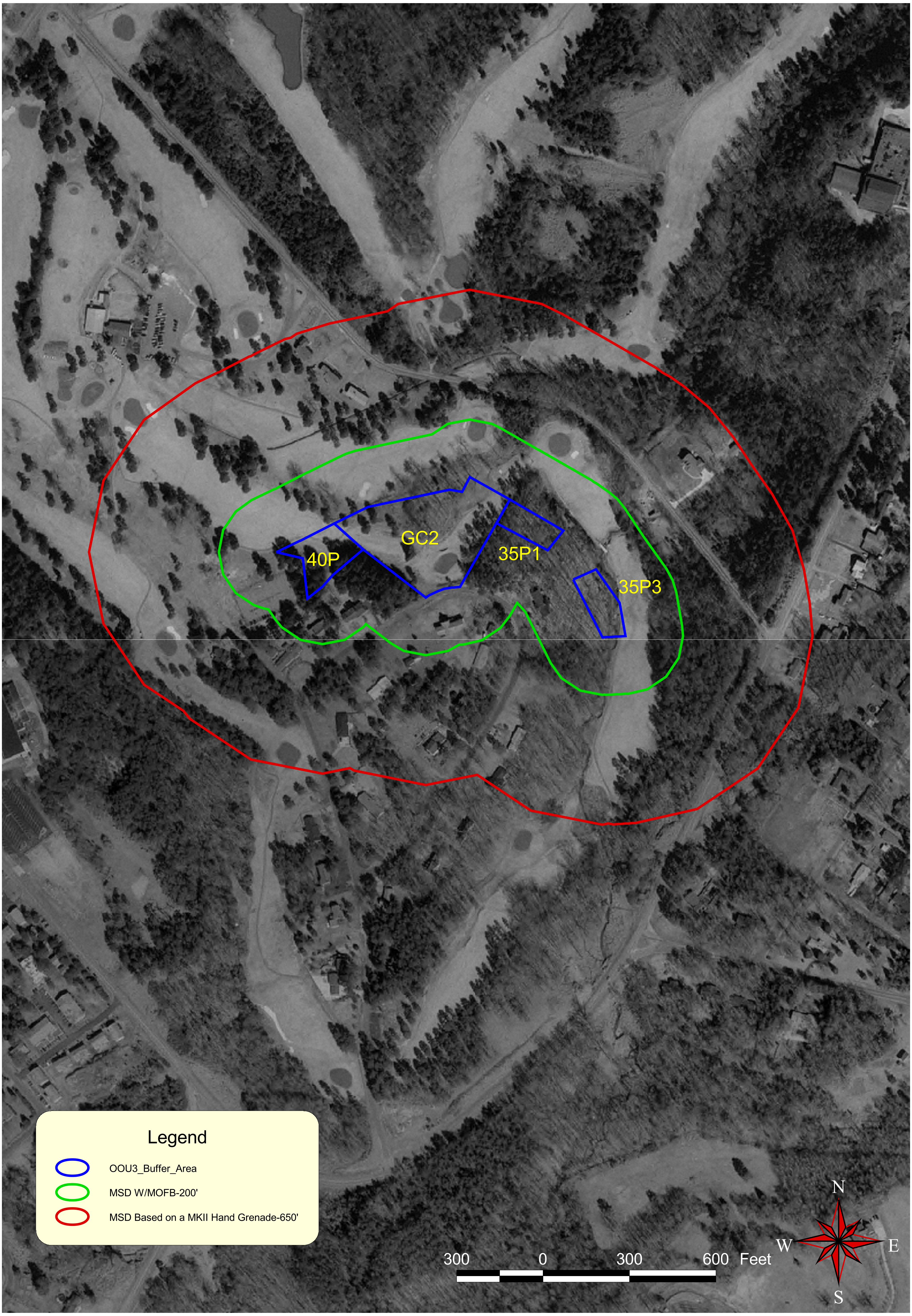
All UXO and related material will be disposed of IAW the procedures outlined in Paragraph 2.11 of the Work Plan.

5.0 MATERIAL MANAGEMENT

All inert OE, OE-related material, and non-OE related material will be managed IAW the procedures outlined in Paragraph 2.12 of the Work Plan.

6.0 OE AND NON-OE SCRAP MANAGEMENT PROCEDURES

All OE and non-OE related material will be disposed of IAW the procedures outlined in Paragraph 2.13 of the Work Plan.



ZAPATA ENGINEERING
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U.S. Army Engineering and Support Center, Huntsville

Former Camp Croft
MSD For Grids 40P,GC2,35P1,35P3

Page:	Project #:	Date:	Drawn By:	Reviewed:	Figure:
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APPENDIX J
OPERATING PROCEDURES
SD-500 REMOTE FIRING DEVICE SYSTEM

OPERATING PROCEDURES
SD-500 REMOTE FIRING DEVICE SYSTEM

1.0 INTRODUCTION

The SD-500 remote firing device system consists of a control box with a handheld radio as the transmitter and multiple receivers. With the whip antenna the firing device can be used up to 1.5 miles. Range with the short antenna is .5 miles. The SD 500 can be used in a manual firing mode or remote firing. Multiple shots can be fired from a single receiver.

2.0 SAFETY PRECAUTIONS

2.0.1 Adhere to all safety precautions for electric blasting systems as stated in the work plan. Follow all applicable electrical demolition safety procedures IAW TM 60A-1-1-31. In addition the following safety precautions are listed per the manufactures guidance.

2.0.2 Do not hold the radio with the antenna very close to, or touching exposed parts of the body, especially the face or eyes, while transmitting. Hold the radio in a vertical position with the microphone two to three inches away from the lips

2.0.3 Do not hold the transmit switch (PTT) on when not actually desiring to transmit.

2.0.4 Do not allow children to play with any radio equipment containing a transmitter.

2.0.5 Do not operate radio transmitters near explosive blasting caps. The transmitted radio energy may trigger a blasting cap.

2.0.6 Do not operate radio transmitters in an explosive atmosphere unless it is a type especially qualified for such use. An explosion may result.

2.0.7 Do not replace or charge batteries in a hazardous atmosphere. Contact sparking may occur while installing or removing batteries and cause an explosion.

2.0.8 Do not dispose of batteries in fire. Batteries may explode when subjected to extremely high temperatures.

2.0.9 Do not short circuit the radio. An accidental short circuit such as a paper clip dropped across battery terminals, may generate enough heat to spark a fire.

2.0.10 Turn radio off when removing or installing a battery.

3.0 OPERATION

3.1 EMERGENCY PROCEDURES

Should the SD-500 fail to initiate the blast, initiate standard safety precautions and the following procedures:

1. Allow the shutdown timer to turn the equipment off automatically. The Shut Down Timer is expected to deactivate the system in 36 minutes.
2. When approaching the SD-500 after a malfunction, observe the "ARMED" light.

   Note: Shutdown disables the arm circuit automatically.

   a. If the "ARMED" light is off, disconnect firing wire(s) from the receiver and remove the remote firing device from service. Initiate the shot using an alternate approved firing method.

   b. If the "ARMED" light is activated, the unit is ready to fire. Leave the area, wait one (1) hour before returning. If unable to leave, cut the shock tube or blasting wire at least ten (10) feet from the radio remote so as not to disturb the electronic unit.

3. Turn the equipment off and return it to the factory immediately for failure analysis.

EMERGENCY TELEPHONE NUMBER 1-800-541-7250
FAX 540-659-0882

3.2 REMOTE OPERATION

Follow all applicable electrical demolition procedures IAW TM 60A-1-1-31.

3.2.1 Operational Test

1. Set code selector switch to desired code numbers
   Example: 1,2,3,4,5,6
2. Power Switch "ON' (receiver.). Do not leave on indefinitely. Automatic shutdown turns off the receiver only. Observe "POWER ON" indicator. Observe "READY" indicator receiver when it comes on line, in five (5) minutes.
3. Power switch "ON" (Transmitter)
   Note: Always listen before transmitting. If another person is talking on the frequency, wait until they are finished or ask them to standby until you transmit your coded signal.
4. Adjust "Squelch" control as necessary.
5. Press the transmit (PTT) switch, count to ten slowly in order to allow the capacitor to charge while observing the "Armed" light.
6. Press transmit (Push to Talk (P")) Switch and press the first five code numbers.
   Example: **1,2,3,4,5,"
7. Press last code number to fire
   Example: " 6"

8. Observe the "Armed" light extinguishes (slowly if no load is across the terminals), or if a code for ABORT (0) is entered or a wrong code is accidentally entered indicating the unit has "`FIRED.
9. In the event the test failed repeat the procedures in steps 1-8. If the second test is successful the firing device is ready for operational use. If the firing device fails a second time, remove the firing device from service and call the manufacture.

3.3 OPERATION

3.3.1 Remote firing is achieved by identical procedures of the manual procedures, with minute exceptions. All Blaster's should be Certified, trained and have a thorough knowledge of all State and Federal laws and regulation.

3.3.2 After testing the blasting caps with a galvanometer and connecting a lead line, the remote system can be connected to the firing circuit.

1. Connect the antennas to the SD 500 and the radio transmitter. The blaster should turn the receiver radio on, ensure it is selected to channel one and turn the volume all the way on and back off ¼ turn. It is important that the volume is NOT all the way up to prevent burn out of the internal circuits. Select a six-digit code and enter it on the rotating dials to use for firing the circuit.
2. The blaster should then move the power toggle switch on the SD-500 to “on” and observe the power on light is illuminated. The time must be observed and recorded as this starts a FIVE-minute delay time for arming to allow for personnel to get back to the firing point. With the electric caps sand bagged or the non-el adapter disconnected from the shot, connect the wires to the terminals on the back of the SD-500.
3. Move the caps to the detonating cord and prime the shot. Ensure the SD 500 is protected from the shot and depart the area to the firing point.
4. After five minutes has elapsed from the time the power switch was turned on, the remote firing system will be armed. There will be thirty one minutes from the “arm” time to fire the shot or the system will shut down and the above procedures would have to be repeated.
5. With the transmitter selected to channel one, press the PTT switch and enter the first five digits of the firing code. Release the PTT switch and a voice call back will indicate the system is armed. Sound all warning signals, press the PTT switch and enter the last digit to fire the circuit.

3.4 MANUAL OPERATION

The SD 500 can be used as a manual-blasting machine.

1. Prepare the firing circuit IAW TM 60A-1-1-31 and the work plan.
2. Connect the firing wire to the blasting machine.
3. Turn the power switch on.
4. Pull back on the toggle switch to “charge “.
5. When the arm light illuminates, push the toggle to fire.
6. In the event there is a misfire, repeat the procedure or use a different blasting machine.

3.5 BATTERY CHECKS

There are two terminals (Pos/Neg) to check the 9V battery banks (Radio circuit/Blasting circuit). A toggle switch enables the operator to check each battery bank from the same terminals. Each radio (transmitter & Receiver) must be charged on a standard radio battery charger.