Environmental
Science &
Engineering, Inc.
A GILCORP Company

P.O. Box 1703, Gainesville, Florida 32602-1703 (904)332-3318

Letter of Transmittal

To: U.S. Army Engineering and Support
Center, Huntsville
4820 University Square
Huntsville, AL 35816-1822

Date: December 6, 1996
Attention: CEHNC-OE-DG (Ms. Patti Berry)
Re: Former Camp Croft

Project Number 3195165G-0700-3100

We Are Sending You
[X] Attached
[ ] Under Separate Cover via

Copies	Description
6	Final Work Plan for the Engineering Evaluation/Cost Analysis (EE/CA), Former Camp Croft

These Are Transmitted as Checked Below:

- [ ] For Approval
- [ ] For Your Information
- [ ] As Requested
- [ ] For Review and Comment
- [ ] Review and Correct
- [ ] Review and File
- [ ] Returned for Corrections
- [ ] Prints Returned after Loan to Us
- [ ] Other

Remarks:
copies to: (10) U.S. Army Engineer District, Charleston, ATTN: CESAC-EN-PR (Mr. Wayne Bogan)
(1) Headquarters, U.S. Army Corps of Engineers, ATTN: CEMP-RF (Mr. James Huang)
(1) Commander, 547th Explosive Ordnance Detachment
(2) Park Superintendent, Croft State Park, ATTN: Mr. Gerry Perry

Copy to: file

Signed: Dianne Davis, Tech. Ed.

If Enclosures Are Not as Noted, Please Notify Us at Once.

Final
Work Plan
Former Camp Croft
Army Training Facility
Spartanburg, South Carolina

Prepared for:
U.S. Army Engineering and Support Center,
Huntsville

Prepared by:
Environmental Science & Engineering, Inc.
Gainesville, Florida

December 1996

ESE Project No. 3195165G

Table of Contents

Table of Contents (continued)

Table of Contents (continued)

Table of Contents (continued)

List of Tables

List of Figures

List of Appendices

List of Acronyms and Abbreviations

AOI	areas of interest
AR	Army Regulation
ARAR	Applicable or Relevant and Appropriate Requirement
ASR	Archives Search Report
cal	caliber
CCATF	Camp Croft Army Training Facility

Table of Contents (continued)

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CWM	chemical warfare material
dB	decibel
DEM	digital elevation models
DERP	Defense Environmental Restoration Program
DoD	U.S. Department of Defense
DTIC	Defense Technical Information Center
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
ERPP	Environmental Resources Protection Plan
ESE	Environmental Science & Engineering, Inc.
ft-bgs	feet below ground surface
ft	foot
FUDS	Formerly Used Defense Site
GIS	geographic information system
H.E.	high explosive
HEAT	high explosive anti-tank
HFA	Human Factors Applications, Inc.
lb/acre	pounds per acre
mm	millimeter
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NTCRAs	non-time-critical removal actions
ODC	other direct cost
OE	ordnance and explosives
OECert	OE Cost-Effectiveness Risk Tool
OES	Ordnance/Explosives Environmental Services
OOU	ordnance operable unit
ORS	ordnance-related scrap
OSHA	Occupational Safety and Health Administration
PPE	personal protection equipment
PRSC	post-removal site control
QA/QC	quality assurance/quality control
QAM	quality assurance manager

Table of Contents (continued)

QCS	quality control specialist
QuantiTech	QuantiTech, Inc.
RAC	risk assessment code
ROE	right-of-entry
SAR	synthetic aperture radar
SASR	Supplemental Archive Search Report
SCDPRT	South Carolina Department of Parks, Recreation, and Tourism
SM	safety manager
SOP	Standard Operating Procedure
SOW	Statement of Work
SRA	Safety Risk Assessment
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
TCRA	time-critical removal action
TEU	Technical Escort Unit
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USGS	U.S. Geological Survey
UXO	unexploded ordnance
WP	Work Plan

1.0 Introduction

1.1 Project Authorization

Environmental Science & Engineering, Inc. (ESE) received Contract No. DACA87-92-D-0018, Delivery Order No. 0028, Annex AA, from the U.S. Army Engineering and Support Center, Huntsville (USAESCH), to conduct an Engineering Evaluation/Cost Analysis (EE/CA) at the former Camp Croft Army Training Facility (CCATF), Spartanburg, South Carolina. The EE/CA will be conducted in accordance with the National Contingency Plan (NCP), related Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) guidance, the Defense Environmental Restoration Program (DERP) for Formerly Used Defense Sites (FUDS), and relevant U.S. Army regulations and guidance for ordnance and explosives (OE) programs. The purpose of the EE/CA is to select non-time-critical removal actions necessary to reduce public safety risk associated with OE/unexploded ordnance (UXO) at the former CCATF.

1.1.1 This EE/CA investigation will further characterize areas contaminated or potentially contaminated with OE/UXO, including sampling and data collection at 76 sites to quantify the amount and location of remaining subsurface OE/UXO. Approximately 183 sampling grids of 100 by 100 feet (ft) will be necessary to adequately delineate the extent of OE/UXO at former CCATF.

1.2 Purpose and Scope

This Work Plan (WP) details the OE remedial activities as stipulated in the USAESCH Statement of Work (SOW) for Delivery Order No. 0028, Annex AA, Modification No. 002806. The EE/CA will focus on conventional OE/UXO risks requiring non-time-critical removal actions (NTCRAs) within the boundaries of the former CCATF. The objective of this WP is to present the site background, objectives, procedures, personnel, and equipment to be used for the EE/CA activities. During the EE/CA, sampling and data collection will be conducted at 88 sites to determine or classify those sites that are contaminated or potentially contaminated with OE/UXO and to estimate the type and density of OE/UXO contamination. This WP will concentrate on the entire area of the former CCATF which includes the area that is now known as Croft State Park and the privately owned developing and non-developing areas; the objective is to determine appropriate corrective actions in areas of greatest OE/UXO risk to the public. A copy of the SOW is included in Appendix A.

1.2.1 This WP was specifically prepared to meet the SOW requirements and other tasks necessary for the completion of the Final EE/CA for former CCATF, which include the following:

- Reviewing existing data, including the Archives Search Report (ASR), Supplemental Archive Search Report (SASR), Supplemental Engineering Report, and other data that may be provided by the USAESCH.
- Visually inspecting the site, and collecting any additional relevant data that may be locally available.
- Location surveys and mapping at each sampling site.
- Preparing a WP (this document) for the field investigation that specifically includes the following subplans: an OE/UXO Operational Plan and a Demolition/Disposal Standard Operating Procedure (SOP); a Site Safety and Health Plan (SSHP); a Field Investigation Equipment Plan; an Environmental Resources Protection Plan (ERPP); a quality control (QC) plan; a work, data, and cost management plan; and a geophysical investigation plan.
- Determining the presence or absence of OE contamination, and the disposal of any conventional OE encountered at 88 sampling locations (generally each grid area will be 100 by 100 ft).
- Preparing an EE/CA for the entire former CCATF in accordance with the U.S. Environmental Protection Agency (EPA) *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, 1993). The EE/CA activity will include sampling and data collection at 88 specific sites to provide a database for EE/CA analyses. The EE/CA report will document the investigation and evaluation and provide recommendations for additional OE removal actions at the former CCATF.
- Preparing an EE/CA Action Memorandum in accordance with EPA Guidance Documents, Superfund Removal Procedures, Action Memorandum Guidance, OSWER Dir. 9360.3-01, December, 1990; and Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA (EPA, 1993).
- Collecting and tabulating data for input into the Safety Risk Assessment (SRA) model.
- Providing technical support to the government for public meetings.
- Providing project management.
- Attending meetings.

1.3 WP Organization

This WP is organized to provide each of the required plan components in the SOW (Table 1). Each of the required plan components are highlighted by bolding in the table. The WP adheres to a general WP format previously found acceptable to the USAESCH.

2.0 Site Description And Previous Investigations

2.1 Project Location

The former CCATF, consisting of approximately 19,000 acres, is located south of Spartanburg, Spartanburg County, South Carolina. Figure 1 shows the boundaries and major features of the former CCATF and Croft State Park.

2.2 Site Description

Camp Croft was established in January 1941 as an army training facility. The camp consisted of two general areas: a series of training, firing, and impact ranges (approximately 16,929 acres), and a troop housing (cantonment) area with attached administrative quarters (approximately 167 acres). The firing ranges at the former CCATF consisted of pistol, rifle, machine gun, mortar, anti-aircraft, and anti-tank ranges. OE/UXO that may be encountered at the former CCATF include: .30-caliber (cal) and .50-cal small arms; 20-millimeter (mm) hand and rifle smoke, tear gas, and incendiary grenades; 60- and 81-mm high explosive (H.E.), practice, smoke, tear gas, and illumination mortar rounds; and 2.36-inch high explosive anti-tank (HEAT), smoke, incendiary, and practice rockets. The former CCATF also contained a gas chamber/gas obstacle course area (approximately 199 acres) where realistic chemical warfare training was conducted.

2.2.1 In 1947, the entire acreage of the former CCATF was declared surplus by the War Assets Administration. By 1950, the Army sold the land by pieces to organizations and businesses. This sale also included the transfer of 7,088 acres of land to the South Carolina Commission of Forestry for the creation of the Croft State Park. The remaining acreage has been converted to residential housing, churches, and industrial and commercial businesses. The gas chamber and gas obstacle course have been removed, and no ordnance or other evidence of past chemical training are found at the site.

2.3 Previous CCATF OE/UXO Investigations

2.3.1 1984 Site Survey of Former CCATF

In 1984, the Charleston District conducted a site survey of the former CCATF. This study concluded that the "potential for unexploded and dangerous bombs, shells, rockets, mines and charges either upon or below the surface" could be found at the former CCATF.

2.3.2 1990 Site Screening Investigation

In 1990, a report by the South Carolina Bureau of Solid and Hazardous Waste Management, Department of Health and Environmental Control, documented a site screening of the domestic landfill located near the former CCATF. This landfill was first used in 1971, and no records were

available to indicate any use of this landfill by the U.S. Department of Defense (DoD) or the existence of any previous U.S. Army landfill at this site.

2.3.3 1991 Preliminary Assessment

In 1991, the U.S. Army Corps of Engineers (USACE), Charleston District conducted a Preliminary Assessment Study of this site. This study determined that the site was eligible for further investigation under the DERP for FUDS. This study also determined that the site contains several locations where drums were placed inside wells during the closure procedures conducted at the site. The report generated by this assessment did not indicate the presence of soil or groundwater contamination due to medical, ordnance, or chemical weapons.

2.3.4 1994 OE ASR

In 1994, the USACE, Rock Island District conducted a site inspection and archives search of the former CCATF (USACE, 1994). The final report, dated April 1994, outlined the nature and degree of OE/UXO contamination to be found at the former CCATF. This report listed the ordnance that may be found at or below the surface (see Section 2.2 of the ASR). This report also stated that the gas chamber and gas obstacle course no longer exist, and that no historical recorded evidence was located to document and confirm the presence of chemical ordnance since site closure. It did state, however, that based on the nature of the former CCATF's training mission, the potential for chemical ordnance or chemical contamination of the area's soil does exist. It is believed that chemical training during that period would have involved the use of CN, a tear agent, as the training chemical.

2.3.5 1995-1996 EE/CA

In 1995 and 1996, ESE performed an EE/CA at the former CCATF (ESE, 1996a). The purpose of this EE/CA was to analyze removal alternatives to reduce the risk of public exposure to OE/UXO at sites previously identified in the 1994 ASR (USACE, 1994). The EE/CA addressed nine ordnance operable units (OOUs) where OE/UXO was either previously confirmed or suspected. Six OOUs were within Croft State Park. The remaining three OOUs were private property sites located outside the park but within the former CCATF boundary.

2.3.5.1 From the investigation and data developed after the investigation, numerous additional areas of suspected potential contamination were identified. However, due to the limited scope of the EE/CA, these areas were not addressed at that time.

2.3.5.2 UXO contamination was confirmed during the EE/CA investigation at five of the nine OOUs. Three of the five contaminated OOUs were within Croft State Park (OOU1B, OOU2, and OOU7). The other two were on private property (OOU3 and OOU6).

2.3.5.3 OOU1B, OOU2, and OOU7 were each confirmed as former mortar impact areas. Several 60 and 81mm unexploded mortars were discovered. Evidence of 2.36-inch rockets and 4.2-inch mortars were also discovered; however, only as ORS and not as UXO. No UXO was discovered in OOU1A, OOU4, or OOU8.

2.3.5.4 At OOU1A, a 1,020-acre wooded area located in the northwest corner of the park, findings were limited to inert 37mm and 57mm projectiles (scrap). No UXO was found. The USAESCH risk contractor, QuantiTech, Inc. (QuantiTech) estimated a zero exposure probability.

2.3.5.5 Because the activities in OOU1A are generally limited to recreational surface uses (hiking and horseback riding), and since no UXO was discovered during the investigation, the No Further Action alternative was proposed for implementation at OOU1A.

2.3.5.6 At OOU1B, a 65-acre forested area located within the center of the park, twelve 60mm and one 81mm mortars (UXO) were discovered. QuantiTech estimated a maximum UXO density of 12 per acre for OOU1B, based on the size of the area, percent of area that was sampled, and the number of UXO found within the sampled area.

2.3.5.7 Activities in OOU1B are generally limited to recreational surface use (hiking and horseback riding), with little potential for intrusive subsurface activities. Therefore, the Surface Clearance alternative was proposed for implementation at OOU1B.

2.3.5.8 At OOU2, a 325-acre area located on the east side of the park, approximately 0.7 mile from State Highway 295, nineteen 60mm and one 81mm mortars were discovered. A single piece from a 4.2-inch mortar discovered during the investigation suggests that the area may have also been used as a 4.2-inch mortar target. However, no unexploded 4.2-inch mortars were found. QuantiTech estimated a maximum UXO density of nine per acre for OOU2.

2.3.5.9 Activities in OOU2 are generally limited to recreational surface use (hiking and horseback riding) with little potential for intrusive subsurface activities. Therefore, the Surface Clearance alternative was proposed for implementation at OOU2.

2.3.5.10 OOU7, located near the park office and campgrounds, is the busiest area of the park. Sixty 60mm and two 81mm mortars (UXO) were discovered during the EE/CA investigation and a follow-up time-critical removal action (TCRA) performed by USAESCH's removal contractor, Human Factors Applications, Inc. (HFA). The TCRA was limited to surface clearance. Evidence of 2.36-inch rockets was discovered at OOU7 during the TCRA, but only as parts and not as UXO. Based on the data developed during the EE/CA investigation combined with data from the

TCRA, Quantitech estimated a maximum UXO density of 49 per acre and an exposure probability of 1/2 to 1/3.

2.3.5.11 UXO was discovered in this high activity area where potentially intrusive activities are planned. Therefore, the Clearance to Depth alternative was proposed.

2.3.5.12 At OOU4, a small area located in the center of the park near the swimming pool, findings were limited to .30-caliber slugs. No other ORS or UXO was found.

2.3.5.13 Activities in OOU4 are generally limited to recreational surface use (hiking and horseback riding) and since no other evidence of ORS or UXO was found, the No Further Action alternative was proposed.

2.3.5.14 At OOU8, a small area located in the northwest corner of the park just north of Dairy Ridge Road, the only ORS finding consisted of 14 empty mine shipping containers found by HFA during an earlier investigation directed by USAESCH. No OE or UXO was discovered during the EE/CA investigation.

2.3.5.15 Activities in OOU8 are generally limited to surface use and since no evidence of OE or UXO was found during the EE/CA investigation, the No Further Action alternative was proposed.

2.3.5.16 OOU3 is in a private residential area north of the park. The area was investigated due to past reports that hand grenade parts had been found. Findings during the EE/CA investigation included one MK-2 fragmentation grenade, numerous practice hand grenades, and grenade parts, suggesting that the area may have been a former grenade practice area. QuantiTech estimated a maximum UXO density of 7 per acre for OOU3 and an exposure probability ranging from zero to 1/300,000.

2.3.5.17 For OOU3, the Clearance to Depth alternative was proposed. A negligible exposure probability was estimated for this OOU. However, because it was a private residential property and prevention of intrusive activities (e.g., children digging, planting, pool construction, installation of utility lines) is impracticable, action was considered warranted at OOU3.

2.3.5.18 OOU5 is also in a private residential area north of the park. It was investigated for similar reasons as OOU3. However, findings were limited to one rifle grenade part (tail boom). No UXO was found.

2.3.5.19 Since no UXO was found at OOU5, the No Further Action alternative was proposed.

2.3.5.20 OOU6 contains an area of approximately 340 acres of privately owned land that is currently being developed for agricultural and industrial purposes, including tree farming and industrial landfills. It was investigated due to reported findings of 105mm Howitzer rounds. UXO findings as a result of a USAESCH-authorized TCRA and a limited EE/CA investigation included nine 105mm smoke canisters, two 105mm fuzed ejection rounds, one explosive burster, two 60mm mortars, and one 81mm illumination mortar. QuantiTech estimated a maximum UXO density of 1.31 per acre for OOU6 and a probability of exposure of zero to 1/2.

2.3.5.21 For OOU6, the Government Buyback alternative was proposed and rejected. The Government is pursuing a design effort to identify areas for no further action, surface clearing, and clearance to a specified depth.

2.3.6 1995-1996 Evaluation and Mapping

In 1995-1996, ESE performed orthophotography and geographic information system development for evaluation and prioritization of OE removal at Former CCATF (ESE, 1996b). The purpose of the assignment was to develop a plan of action that could be used in the future to facilitate the efficient investigation, identification, and removal of suspected OE at the former CCATF with the prediction of the presence and location of OE to be accomplished through the study of historical records and the evaluation of past and current land use at the former CCATF.

2.3.6.1 This report presented the results of analyses for the former CCATF. The analyses focused on the characterization and prioritization of potential OE and included geographic information system (GIS) development, historical records evaluation, and the integration of synthetic aperture radar (SAR) data. SAR data were evaluated as a potential technological tool in OE detection. The analysis outlined in the report was designed to compliment the April 1994 ASR (USACE, 1994) and to supplement ongoing OE investigations at the former CCATF.

2.3.6.2 The initial investigation focused on the identification of select areas of interest (AOI) and used historical and current information. These AOI form the basis for subsequent evaluations and analyses. Aerial photography and orthophotography, SAR image analysis, and digital elevation models (DEM) were used to identify potential OE (sites) and adjacent properties.

2.3.7 1996 Supplemental Archive Search Report (SASR)

In March 1995, USAESCH authorized ESE to prepare a SASR in an effort to locate possible additional firing, bombing, and strafing ranges at the former CCATF (ESE, 1996c). The following activities were conducted from April through August 1995 as a part of the SASR:

- Searches of national, regional, and local archives;
- Searches of databases including the Department of Defense database-Defense Technical Information Center (DTIC), Lexis, and Nexis;
- Placement of notices in national and local publications;
- Operation of a toll-free telephone number to receive information from persons knowledgeable of past CCATF activities;
- Onsite interviews with the local populace;
- Hosted a Public Open House near the former CCATF; and
- Conducted Windshield Surveys or driveby surveys to locate possible OE sites.

2.3.7.1 As a result of the SASR, one hundred and thirty-four sites were identified as having potential OE contamination (Table 2).

2.3.8 1996 Supplemental Engineering Report

In October and November 1995, ESE performed a site reconnaissance of each of the 134 sites where a right-of-entry (ROE) was available from the owner(s) (ESE, 1996d). ROEs were available and a site reconnaissance conducted at 97 sites. The reconnaissance consisted of a non-intrusive, magnetometer survey and visual inspection of each site that could be identified. Each two-person reconnaissance team included a senior-UXO specialist to assist in identification of OE and /or ordnance training sites. Windshield Surveys or driveby visual surveys were conducted at 19 sites. ESE was unable conduct a site reconnaissance or Windshield Survey at 18 sites. A Final Supplemental Engineering Report was submitted to USAESCH in March 1996.

2.3.8.1 The Final Supplemental Engineering Report provided a completed copy of the Site Reconnaissance Field Form, along with a site sketch and photographs of each site investigated. Based on available site information, each site was evaluated as follows:

- Further Reconnaissance — High Priority
  - — Live and/or fragmented OE was discovered onsite.
  - — Abundant and/or large magnetic anomalies were recorded onsite.
  - — Documented historical information exists of OE reported onsite.
  - — The site was not investigated completely or at all and the potential is high for some OE onsite.
  - — High population usage exists in the area, along with some OE potential.

One or more of these criteria warranted a high priority rating for further reconnaissance and/or OE sampling.
Twenty-six sites received a High Priority rating.

- Further Reconnaissance — Medium Priority
  - The entire site could not be completely investigated during the site reconnaissance due to its large size.
  - ROEs were unavailable and the potential for OE exists onsite.
  - Scattered and/or deep magnetic anomalies were recorded onsite.
  - Some population usage exists onsite.

  One or more of these criteria warranted a medium priority rating.
  Twenty-eight sites received a Medium Priority rating.

- Further Reconnaissance — Low Priority
  - No evidence of OE was found onsite.
  - Only a few scattered, small magnetic anomalies were recorded onsite.
  - The site was not completed investigated, but historical information suggests that the potential for OE is remote.

  One or more of these criteria warranted a low priority rating.
  Thirty-four sites received the Low Priority rating.

- No Further Reconnaissance
  - No evidence was discovered onsite during the site reconnaissance.
  - No magnetic anomalies were recorded, except for what was believed to be metallic trash or metallically composed "hot rocks".
  - Only small caliber (rifle) ordnance is suspected onsite.

  One or more of these criteria warranted a no further reconnaissance rating.
  Forty-six sites received a No Further Reconnaissance rating.

3.0 Project Plan

3.1 Project Management Plan

The Project Management Plan defines the project objectives, identifies key personnel and their responsibilities, defines project communications and reporting requirements, and outlines a schedule for implementing the project.

3.1.1 Project Objectives

The objective of Delivery Order No. 0028 is to conduct an EE/CA for the entire former CCATF. To accomplish the goals of the EE/CA, OE/UXO sampling will be conducted at 76 representative sites within the former CCATF boundaries, including excavation and removal of any OE/UXO discovered during the sampling efforts. Sufficient information will be developed from the EE/CA sampling efforts to provide recommendations for future OE/UXO removal actions.

3.1.2 Project Organization

The project team consists of the USACE, Charleston District life cycle manager, the USAESCH technical manager, and ESE. Figure 2 is a project organization chart showing key personnel and project organization details. Individuals assigned to the project team meet the requirements of project job descriptions as outlined in this section of the WP.

3.1.3 Project Personnel

The following sections describe the specific responsibilities of key project personnel shown on the project organization chart.

3.1.3.1 Project Manager

The ESE project manager is responsible for communicating with USAESCH through the USAESCH technical manager, executing all directions received from USAESCH, managing all aspects of the project, overseeing the overall performance of all individuals on the project team, coordinating all contract and subcontract work, and resolving problems. The project manager is also responsible for controlling the contractual cost and schedule targets. The project manager will coordinate the preparation of the WP, implementation of onsite field investigation activities, and implementation of the EE/CA process including preparation of the EE/CA Report.

3.1.3.1.1 The project manager will interface directly with subcontractor project managers to keep subcontractor teams advised of scope of work, schedule, and budgets. The project manager is also responsible for ensuring that the subcontractor costs are within budget and schedule commitments are achieved.

3.1.3.2 Site Manager

The ESE site manager is responsible for managing and executing project field operations. Daily duties will include scheduling and executing a daily tailgate safety meeting, scheduling and coordinating subcontractor field team activities, and submitting a daily activities report to the ESE project manager. Site manager duties will also include enforcing compliance with the SSHP and general daily field operating procedures. The site manager will also be responsible for monitoring the execution of project field activities by subcontractors. The site manager will report all QC failures and corrective actions to the project manager and quality assurance (QA) manager.

3.1.3.3 Site Administrator

The site administrator will be responsible for tracking and reporting daily field financial and schedule activities. The site administrator will report daily activities directly to the ESE project manager. Additional site administrator duties will include inventorying and ordering field equipment and expendable items, staff logistics, daily report preparation, and daily contact and status update reports to the ESE project manager.

3.1.3.4 EE/CA Manager

The EE/CA manager will be responsible for managing the EE/CA process for the former CCATF, including interpreting and tabulating the EE/CA site characterization database, completing each step of the EE/CA process as defined in this WP, preparing the EE/CA Report, and preparing the EE/CA Action Memorandum. The EE/CA manager will use additional technical staff, as necessary, to complete the EE/CA subtasks. The EE/CA manager will also work closely with the ESE project manager, who will provide senior technical consultation to the EE/CA task along with other defined project responsibilities.

3.1.3.5 QA Manager

The QA manager is independent of the project team and is responsible for the following:

- Reviewing all quality assurance/quality control (QA/QC) procedures to be used in the project.
- Reviewing subcontractor system audits and QC procedures to ensure compliance with the project QC guidelines in the WP.
- Performing a quality review to ensure the quality of deliverables from the project team to USAESCH.
- Interaction and communication with subcontractor and USAESCH QA personnel.

The QA Manager will be provided by Osiris Incorporated.

3.1.4 Subcontractor Management

ESE anticipates using three subcontractors to complete this project successfully. OE/UXO geophysical surveys, excavation of geophysical anomalies, and UXO venting/destruction and disposal will need to be performed by Ordnance/Explosives Environmental Services (OES). Ellis Environmental Group (EEG), will provide land survey and site administration services. Osiris Incorporated will provide the QA Manager.

3.1.4.1 Daily supervision of subcontractor field activity will be the responsibility of the ESE site manager, with the ESE project manager providing overall supervision. Subcontractors will adhere to all applicable safety and health and QC requirements. The project SSHP is appended to this WP (Appendix D) and specifies individual requirements for OE/UXO safety and health referenced in the SOW and other USAESCH health and safety requirements.

3.1.5 UXO Personnel Qualifications

UXO personnel required for this project will include EOD-qualified UXO supervisors and specialists, all of whom possess a minimum of 3 years of relevant U.S. military EOD experience. Non-UXO qualified personnel will not perform any handling of OE/UXO or be within the fragmentation zone at any time or under any conditions. Any additional personnel who may be assigned to the project field team will meet the qualifications required in the SOW.

3.1.6 UXO Subcontractor Personnel

The following paragraphs describe the specific responsibilities of UXO subcontract personnel assigned to the project team.

3.1.6.1 UXO Project Manager

The UXO project manager is responsible for communication with and execution of all instructions received from the ESE project manager, managing all UXO subcontract requirements of the project, overseeing the performance of all individuals on the UXO project team, coordinating contract work, and overseeing UXO-specific task identification and resolutions. The UXO project manager is also responsible for achieving the subcontract cost and schedule requirements. The UXO project manager will coordinate the preparation of detailed work order specifications and schedules as required by the ESE project manager. The UXO manager will also schedule field efforts, identify the UXO technical and site personnel to accomplish the specific tasks as defined in the WP, implement project quality and safety procedures, and direct UXO personnel to achieve successful and timely completion of the WP tasks. The UXO project manager will interface directly with the ESE project manager to keep him advised of progress and to promptly implement approved and authorized changes to ongoing work orders, as necessary.

3.1.6.2 Senior UXO Supervisor

The senior UXO supervisor and must have a minimum of 15 years military EOD experience, with at least 10 years experience in a supervisory position. The senior UXO supervisor assists in the development of site-specific WPs, identifies personnel and equipment requirements, and directly supervises all daily activities of the field team. The senior UXO supervisor is responsible for the successful performance of the UXO field team, early detection and identification of potential problem areas, institution of corrective measures, and assisting ESE with the preparation of all project reports. The senior UXO supervisor reports to the UXO manager and interfaces daily with the ESE site manager. The senior UXO supervisor is also responsible for the execution of instructions received from the UXO manager, daily communications with ESE, and assisting with documentation of site conditions and activities.

3.1.6.3 Site Safety and Health Officer (SSHO)/Quality Control Specialist (QCS)

The SSHO/QCS must have a minimum of 7 years military EOD experience. The UXO SSHO/QCS is responsible for implementing all site SSHP requirements and onsite training requirements and recommending changes to level of personal protection equipment (PPE) to the ESE site manager as site conditions warrant. The UXO SSHO/QCS has "stop work" authority for safety conditions. The UXO SSHO/QCS evaluates and analyzes any potential safety problems, implements safety-related corrective actions, and maintains a daily safety log. The UXO SSHO/QCS reports laterally to the UXO Certified Industrial Hygienist (CIH) and directly to the UXO manager or his designee. This individual will also convey site conditions to the ESE site manager and to the senior UXO supervisor.

3.1.6.3.1 The SSHO/QCS will also be responsible for implementing the project QC plan (this plan will conform with established UXO policy and meet the quality objectives of this project), maintaining a QC control log, conducting QC data checks, and reporting to the ESE QA manager. The UXO SSHO/QCS will provide the ESE site manager with field audit reports and a copy of field QC control log.

3.1.6.4 Subcontractor Safety Manager/Quality Assurance Manager (SM/QAM)

The SM/QAM will provide office support for the SSHO/QCS and the senior UXO supervisor. The SM/QAM will supervise the site-specific health and safety training as well as conduct a safety and QC audit. The SM/QAM will report the findings from the audit to ESE's QA Manager.

3.1.6.5 UXO Supervisor

UXO supervisors must have a minimum of 10 years combined contractor UXO and military EOD experience. The UXO supervisor performs onsite duties, including locating UXO, site clearing, equipment operation, UXO safety, and escort duties, as required. The UXO supervisor will serve as a team leader and reports to the senior UXO supervisor.

3.1.6.6 UXO Specialist

The UXO specialist must have a minimum of 3 years military EOD experience. The UXO specialist performs onsite duties, including locating UXO, equipment operation, UXO safety, and escort duties, as required. The UXO specialist reports to the assigned team leader/UXO supervisor.

3.1.6.7 UXO Service Support Specialist

The UXO service support specialist is trained in the use of UXO locator equipment, site clearing techniques and equipment, UXO safety, and basic UXO recognition features. The UXO service support specialist is at no time permitted to excavate or handle suspected or known OE/UXO materials. The UXO service support specialist reports to the assigned team leader/site supervisor.

3.1.7 Project Communication and Reports

Verbal (telephone) correspondence with the public or non-USACE governmental agencies and all written correspondence will be documented and routed to the ESE project manager. All written communications from USACE will be addressed to the ESE project manager. Incoming written communications will be annotated with the date received. Telephone communications between the ESE field office and other parties will be recorded on USAESCH-approved ESE telephone conversation or correspondence forms. The most critical correspondence is the documentation of activities that stop work or require USAESCH SOW revisions.

3.1.7.1 The following communications will be documented in a chronological communications log maintained by the ESE project manager:

- Each and every occasion that OE/UXO is encountered,
- When work is stopped for safety reasons,
- Health and safety violations, and
- Personnel changes and reason for changes.

3.1.7.2 The ESE project manager for Delivery Order No. 0028 will be Robert Momberger, P.G.; Gainesville, Florida. Correspondence concerning this delivery order is to be sent to:

Mailing Address	Shipping Address
ESE P.O. Box 1703 Gainesville, FL 32602-1703 Telephone: (352) 333-3628 Attn: Mr. R. Momberger, P.G.	ESE 14220 Newberry Road Gainesville, FL 32607

3.1.8 Project Work Schedule

The project schedule was initiated with the Notice to Proceed date of March 30, 1995, and ends with the technical completion of the Final Action Memorandum on May 9, 1997. The current overall schedule is presented chronologically with major milestones in Appendix B to this WP. The actual technical completion date will depend on the approved number of sampling sites and the possible addition of the preparation of the EE/CA Action Memorandum to the current SOW.

3.1.8.1 A milestone that could potentially alter this schedule is the receipt of rights-of-entry (entry permission) for several proposed sampling sites at the former CCATF. These sites exist within the boundaries of the former CCATF but are located outside the current Croft State Park boundary. To maintain the project schedule, these rights-of-entry must be received in a timely manner. The USACE, Charleston District will be responsible for obtaining rights-of-entry.

3.1.8.2 The ESE site manager, OES site supervisor, and SSHO/QCS will be onsite during the EE/CA sampling, estimated to be 5 to 6 weeks. This management team will supervise and manage the efforts of two UXO teams, each consisting of four people. Each team will be responsible for completing brush clearing, magnetometer surveys and flagging of anomalies, excavating anomalies, and disposing of OE/UXO. Based on an estimated average of three grids per day per team for clearing, surveying, and excavation, and an estimated total of 183 sampling grids, it is estimated that clearing, surveying, and excavation of anomalies will require approximately 31 working days or 8 weeks (basis: 40 hour, 4-day work week). This estimate is based on an average and will depend on the degree of clearing required and the number of anomalies excavated. The number and location of anomalies to be excavated will be established in the field as the magnetometer surveys are completed.

3.1.8.3 Project management activities will occur frequently throughout the project period. These activities will include monthly progress reports, periodic project meetings, and other non-specified activities.

3.1.9 Project Deliverables

Project deliverables will meet the schedule requirements of the project and will be prepared in the format indicated in the SOW. Major deliverable and QC review milestones for the project are shown in the project schedule (Appendix B). Deliverables will include VHS videotapes and photographs where required. Deliverables will receive thorough internal ESE and external USACE QC reviews to ensure correctness and provide necessary senior oversight.

3.1.9.1 Sampling Data

Sampling data will be compiled daily onsite on a personal computer. All data compilation and tabulation will be in accordance with the approved Data Management Plan incorporated into this WP. At the completion of field activities, sampling data will be input into the EE/CA process as the primary OE/UXO site database. VHS video and photographic records of field activities will also be obtained, as appropriate.

3.1.9.2 Sampling Data for SRA

During sampling activities, sampling data will be compiled in a format specified by the USAESCH for input into a USAESCH SRA model. The model output will then be input into the EE/CA process to assist in determining appropriate remedial actions at the former CCATF.

3.1.9.3 EE/CA Report

ESE will prepare a single EE/CA Report for all three areas (Park Area, Developing and Non-developing Areas) that summarizes previous site work and documents the work performed during the EE/CA process under this delivery order, including the sampling effort. The report will describe field activities (clearing, surveys, excavation, disposal, etc.) performed at the site, the nature and extent of anomalies found, all materials encountered during surface and subsurface sweeps/clearance, remedial alternatives developed for additional NTCRAs, technical comparison and cost analysis for remedial alternatives, and recommendations for further removal actions derived from the EE/CA process.

3.1.9.4 EE/CA Action Memorandum

Using the recommendations from the EE/CA Report, an EE/CA Action Memorandum will be prepared in accordance with EPA and USACE guidance.

3.1.10 Cost Accounting

Office and field costs will be tracked by the project manager. ESE's BST accounting system will provide a project detail report to the project manager notifying him of charges posted to his project on a weekly basis. The field effort charges will be recorded daily on a computer

spreadsheet. All daily charges for both expendable and non-expendable purchases will be posted on a non-expendable or expandable expense logsheet. These copies of the daily charges will be sent on a weekly basis to the ESE project manager.

3.2 Overall Project Approach For EE/CA

A single EE/CA document for all three areas (Park Area, Developing and Non-developing Areas) will be performed at the former CCATF in accordance with the USAESCH SOW. All EE/CA activities will also be in accordance with requirements of the NCP for NTCRAs [40 Code of Federal Regulations (CFR) 300.415], specified in the EPA guidance document *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, 1993), and specific requirements of the U.S. Army for EE/CA activities at DERP FUDS.

3.2.1 All EE/CA and other OE/UXO NTCRAs will be under the funding and administrative authority of USAESCH, as the responsible party under authority of the NCP and the CERCLA. Under this authority, the Charleston District will issue all regulatory and public notice statements and documents required by the relevant statutes and regulations and will conduct all public hearings or meetings required by those same statutory and regulatory authorities.

3.2.2 Specific tasks required to complete the EE/CA process are described in the following sections of this WP. Figure 3 schematically shows the EE/CA process that will be used for this project.

3.3 Scope Of Work By Task

Tasks 1, 2, 3, and 4 of the SOW are 100 percent technically complete and Task 5 is approximately 97 percent technically complete as of June 30, 1996. The five tasks were as follows:

Task 1 — Preparation of a Work Plan for the SASR and Site Reconnaissance.
Task 2 — Preparation of the SASR.
Task 3 — Perform Site Reconnaissance of Additional Sampling Areas.
Task 4 — Public Meetings.
Task 5 — Project management.

ESE was authorized to perform three additional tasks under Modification No. 002806 on May 14, 1996. Those three tasks are discussed in the following sections.

3.3.1 Prepare EE/CA for the Developing Areas (Task 6)

ESE will prepare an EE/CA for the Developing Areas of former CCATF. As a part of this task, ESE is submitting this WP. The proposed sampling locations, sampling grid size and number, along with other site data are detailed in Table 3. The EE/CA Data Management Plan and EE/CA Field Investigation Procedures are detailed in Sections 3.4 and 3.5, respectively.

3.3.2 Prepare EE/CA for the Park Areas (Task 7)

ESE will prepare an EE/CA for the Park Areas of former CCATF. As part of this task, ESE is submitting this WP. The proposed sampling locations, sampling grid size and number, along with other site data are detailed in Table 3. The EE/CA Data Management Plan and EE/CA Field Investigation Procedures are detailed in Sections 3.4 and 3.5, respectively.

3.3.3 Prepare EE/CA for the Non-Developing Areas (Task 8)

ESE will prepare an EE/CA for the Non-Developing Areas of former CCATF. As part of this task, ESE is submitting this WP. The proposed sampling locations, sampling grid size and number, along with other site data are detailed in Table 3. The EE/CA Data Management Plan and EE/CA Field Investigation Procedures are detailed in Sections 3.4 and 3.5, respectively.

3.3.3.1 Single EE/CA Document for Entire Former CCATF

As stated previously, a single EE/CA document will be prepared for the entire former CCATF, which includes all areas of Tasks 6, 7, and 8. The EE/CA process will be conducted for those areas of the entire former CCATF where NTCRAs may be required to reduce the threat of remaining OE/UXO. The EE/CA process will be conducted in accordance with NCP requirements, EPA guidelines for EE/CA implementation (EPA, 1993), and U.S. Army DERP FUDS regulations and guidance as applicable to the former CCATF site. The steps of the EE/CA process are shown in Figure 3 and include site characterization, identification of removal action objectives, identification/analysis of removal action alternatives, comparative analysis of removal action alternatives (including cost analysis), and selection of recommended removal action alternative.

3.3.3.1.1 Following completion of the EE/CA field efforts, an EE/CA Report and an EE/CA Action Memorandum will be prepared that document each step of the EE/CA process, provide conclusions and recommendations for selected NTCRAs, and provide regulatory approval mechanisms to implement the selected EE/CA alternative. NTCRAs will then be implemented as recommended at the former CCATF, based on DERP FUDS funding priorities.

3.3.3.1.2 To supplement existing site characterization information, EE/CA sampling described in other sections of this WP, along with any additional site reconnaissance information gathered

during the field investigation will supplement the OE/UXO database and provide the necessary information to complete the EE/CA process. This data will be incorporated into the EE/CA process and used to develop a recommended EE/CA alternative for NTCRAs.

3.3.3.2 Develop Removal Action Objectives

A risk assessment code (RAC) of 2 was established for the former CCATF (USACE, 1994). A RAC 2 rating was determined based on a Category II (Critical) Hazard Severity and a Level B (Probable) Hazard Probability. Although specific removal action objectives have not been stated in the SOW, suggested actions may include the following:

- Reduce the OE/UXO hazard severity from "Critical" to "Marginal" or "Negligible", and
- Reduce the OE/UXO probability from "Probable" to "Remote."

3.3.3.2.1 A reduction to "Negligible" and ""Remote" would result in a RAC 5 rating, which corresponds to a recommendation of "No Further Action."

3.3.3.2.2 These EE/CA removal action objectives will apply to prioritized land uses at the former CCATF, with highest priority applied to public exposure via residential, commercial, agricultural, and recreational land uses.

3.3.3.3 Develop EE/CA Removal Action Alternatives

Limited removal action alternatives are typically considered for EE/CA NTCRAs at OE/UXO sites. These alternatives are considered a reasonable list of technically feasible and established methods that can be employed immediately (based on availability of equipment and materials) and have demonstrated ability to achieve the removal objectives. The following four alternatives, at a minimum, will be developed for evaluation at the former CCATF:

- Alternative 1: No further action;
- Alternative 2: Institutional controls (e.g., fencing, signage);
- Alternative 3: Surface clearance; and
- Alternative 4: Clearance to a specified depth.

3.3.3.4 EE/CA of Alternatives

In accordance with EE/CA guidance (EPA, 1993), the NTCRA alternatives will be subjected to an engineering evaluation and cost analysis to develop relative technical and cost advantages and disadvantages. The standard EE/CA evaluation criteria to be used in this analysis are summarized in Table 4.

3.3.3.4.1 Particular attributes of OE/UXO that are important in the EE/CA alternatives evaluation process and that will be considered in the EE/CA evaluation and cost analysis include:

- Explosive hazards of UXO,
- Location of OE/UXO relative to land use and public exposure,
- Accessibility to OE/UXO discoveries,
- Density of OE/UXO at various former CCATF locations,
- Depth of burial of OE/UXO in soil,
- State of degradation of OE/UXO casings,
- Type of OE/UXO explosive fill, and
- Distance to appropriate UXO detonation zone.

3.3.3.4.2 Each removal alternative will be evaluated relative to the required EE/CA criteria and OE/UXO attributes to determine technical feasibility. Specific advantages and disadvantages of each alternative will be delineated.

3.3.3.4.3 Statutory requirements of the NCP (40 CFR 300.415) require that certain removal actions attain Applicable or Relevant and Appropriate Requirements (ARARs) for the location and type of removal action to be completed. ARARs analysis will be completed for each removal action alternative, emphasizing EOD Military Technical Manual Safety Regulations, DERP requirements, and related ARARs. State and local ARARs related to waste management, water pollution control, and air quality will also be evaluated.

3.3.3.4.4 The EE/CA cost analysis will estimate and compare capital, operational, and post-removal site control (PRSC) costs for each EE/CA alternative, using information on OE/UXO density as a baseline for quantifying the extent of removal actions required.

3.3.3.5 Selection of Removal Action Alternative

Once the alternatives have been evaluated against specific EE/CA criteria, a comparative analysis will be conducted to evaluate the relative merits of each alternative. This process will identify key tradeoffs involved in selection of any particular alternative. An outline of the selected alternative implementation plan will be developed including scope of work, preliminary schedule, and order of magnitude cost estimate.

3.3.3.6 EE/CA Report

The EE/CA Report will be prepared documenting the EE/CA process completed for each site at the former CCATF. The selected alternative implementation plan will be included in the report. Individual sites selected for NTCRAs will be designated and mapped in an appropriate format for future identification and management purposes.

3.3.3.6.1 SRA

A safety risk assessment will be performed as part of the EE/CA process. the safety risk assessment uses the data collected during the EE/CA field effort to mathematically determine the expected number of exposures and the associated risk to the population from exposure to UXO at the site. ESE will use the OECert model by Quantitech and supplied to ESE by USAESCH to complete the SRA.

3.3.4 Site Characterization (Task 9)

ESE will conduct a site characterization to determine the existence and estimated quantity of OE contamination at approximately 76 sites across the former CCATF. The site characterization will include a geophysical investigation and analysis of the results in support of the EE/CA report.

3.3.5 EE/CA Action Memorandum (Task 10)

After the EE/CA Report has been approved by the USAESCH, an EE/CA Action Memorandum will be prepared in accordance with EPA guidance (EPA, 1990).

3.3.5.1 The EE/CA Action Memorandum will provide a written record of the decision to select the recommended removal action and will also identify the proposed action and the rationale for the removal action selection.

3.3.5.2 A public meeting or hearing will be conducted after the EE/CA Report is completed and approved by the USAESCH, to comply with NCP requirements for public involvement in EE/CA removal actions. The EE/CA Report will be made available to the public at conspicuous local depositories to solicit comments. Appropriate comments received from the public via the public meeting process will be incorporated into the EE/CA Action Memorandum.

3.4 EE/CA Data Management Plan

3.4.1 EE/CA Field Data Management

Significant data will be generated by the EE/CA sampling field investigations. A formal Data Management Plan has been developed for this project to accommodate this volume of data. This data management plan describes the procedures ESE will follow to track and store the data collected during the EE/CA field effort.

3.4.1.0.1 OE discoveries and associated remediation activities can be expected to produce significant public interest from property owners and other interested parties. OE survey results will be strictly controlled by the project field investigation team to preclude any possible inappropriate public disclosure. Disclosure of any information to the public will not be allowed without approval of the Contracting Officer.

3.4.1.1 Field Data Collection and Processing Facilities

There are three categories of data to be maintained during the field effort. These categories include cost tracking, safety, and site activity records. The field investigation team will record all data and field measurements in non-erasable written format in field daily logbooks.

3.4.1.1.1 Cost tracking records include all labor, field equipment rental and purchase, and all other direct costs (ODCs) charged to the field task and will be tracked by the site administrator. These data are important in determining the "burn rate" of the field effort and is important to projecting the 75 percent financial completion date of the field effort. These records will be maintained in a cost tracking logbook.

3.4.1.1.2 Site safety records include all safety aspects of the project including training, inspections, and accident/incident records. These records will be maintained in the Site Safety, Safety Inspection, and Accident Report Logbooks.

3.4.1.1.3 Site activity records include all field data and activity records. This category can be further divided into four subcategories including site investigation data, ordnance /explosives records, land survey data, and administrative records.

3.4.1.1.4 Site investigation data include all data collected for the purpose of the EE/CA report. These data include site maps showing geophysical anomalies, Gridstats data, weight and description of ordnance-related scrap (ORS), and QA data.

3.4.1.1.5 Ordnance/explosives records include accountability records of ordnance and explosives. These data are included in Ordnance Accountability logs, Explosives Accountability Logs, and records of detonations (Blast Records).

3.4.1.1.6 Survey data include records from the land surveyor including logbooks, maps, and GPS data. These data are not required to be maintained onsite, but must be turned over to the USAESCH project manager within 30 days of the completion of the field effort. The land survey subcontractor will be responsible for installing and documenting all grids and survey control markers.

3.4.1.1.7 Administrative data include all records collected during the administration of the field effort. These data are included in Daily Reports, Team Leader Logbooks, Telephone Logs, the Site Manager Logbook, correspondences, and photographic logs. Time logs of site activities must also be maintained in the appropriate administrative logbooks.

3.4.1.1.8 The initial processing of the field data will be conducted in the field by members of the field investigative team. The data will be checked for completeness and the results reviewed by the ESE site manager. Hard copies of field notes, tabulations, maps, or other data products will be processed and stored in the appropriate logbooks.

3.4.1.2 Onsite EE/CA Field Data Management

ESE's site manager will be responsible for the review and tracking of all field documentation. All field data will be reviewed for completeness by ESE's site manager prior to posting into a central data library. Each logbook/3-ring binder will be individually named and numbered. The number and name of each logbook or binder will be included on a document control log which will be maintained at the site. The document control log will also have the name of the person(s) responsible for the upkeep of each logbook/binder.

3.4.1.2.1 Only bound notebooks will be allowed for use as daily logbooks. Each page of the logbook will be consecutively numbered and all writing will be in black ink. Field forms and computer data will be maintained in three ring binders and identified or referenced by consecutive numbering, date of generation, and/or document control number.

3.4.1.2.2 A central data library will be maintained by ESE for all field sampling data and logbooks. This data library will be used to store, log, and retain all field investigation data collected during the project. The central data library will be established at the former CCATF field office to provide working copies of the data in support of the field investigation activities.

3.4.2 Office Management Of Field Data

After the field phase of the project is completed, the data library will be shipped in its entirety to the Gainesville, Florida ESE office for further processing and storage. All field data will be maintained under the control of the project manager. The project manager will be responsible storing the field data library.

3.4.3 Project Deliverables

All written project deliverables prepared during this project will be produced in PC-DOS WordPerfect® Version 5.1 software format and submitted in both hard copy and in electronic format on 3.5-inch diskettes (final versions only). Quality reviews will be completed by independent review teams prior to submittal to USAESCH. Archive copies of all deliverables will be maintained by ESE for future reference.

3.4.3.1 The land survey deliverable will include a tabulated list of all control points, a list of all adjusted coordinates, and one electronic copy of all drawing files. All surveyor's drawings will be

delivered in electronic format compatible with Intergraph® Version 5.0. Data will be delivered to USAESCH in either 8-mm tape or preferably CD-ROM format.

3.5 EE/CA Field Investigation Procedures/Site Characterization

The field investigation activities for this EE/CA project will include the sampling site layout, clearing of vegetation, OE geophysical sensor survey, OE excavation and removal as necessary, and OE removal/disposal procedures. The methods and procedures to be used during the field phase of the EE/CA investigation are described in the following subsections.

3.5.0.1 The work performed during this field effort will be in accordance with the OE Operations Plan and the SSHP (Appendix D), unless the procedures are modified and approved in writing by the USAESCH onsite representative. If there is no onsite USAESCH representative, the USAESCH technical manager must provide written approval.

3.5.1 Site Prioritization And Grid Location

Supplemental investigations at the former CCATF included in the document *Former Camp Croft Final Supplemental Engineering Report* (ESE, 1996c), included the prioritization of suspected ordnance sites. In the report, the sites were ranked as requiring no further action, low priority, medium priority, or high priority, based on the likelihood of ordnance in the area. All of the low, medium, and high priority sites were selected for investigation during this EE/CA sampling effort. Table 3 presents the 76 sites to be investigated, their priority, and other pertinent data used to determine the number and size of sampling grids to be included in each of the sites. Figure 4 includes the identification number and the location of the investigation sites.

3.5.1.1 The number of grids at each site was chosen based on the review of the total acreage, site prioritization, site accessibility and topographic features. Larger sites are allotted more grids than the smaller sites. Sites of higher priority are more intensively investigated than the lower priority sites. Sites with high accessibility to the public and to the field crews are given more grids than sites that are difficult to access. Topography only slightly influenced the number of grids as only a few of the sites had steep slopes.

3.5.1.2 As a result of the analysis, ESE anticipates the need for approximately 183 grids to be investigated during the EE/CA investigation.

3.5.1.3 Due to the number of grids required to investigate the site, ESE determined that a standard grid size of 100 by 100 ft would be adequate to obtain density data for most of the sites. Some sites were not large enough to contain the standard size grid and will require further manipulation of the grid size.

3.5.1.4 The grids will be located by ESE in the field during the investigation with the assistance of local agencies and personnel to verify the location of the grids will neither affect threatened plant or animal species nor will the locations affect potential archeological sites.

3.5.2 Sampling Site Layout And Field Survey Activities

Land survey activities include field survey and mapping of each sampling site, after location and staking of each by the ESE field team. The corners of each site shall be referenced to the South Carolina State Plane Grid System based on the North American Datum of 1983 (NAD83).

3.5.2.1 A field survey of each sampling site will be conducted to accurately locate, identify, and map features of interest within individual EE/CA sampling sites. The features of interest will include area boundaries, fixed and temporary structures, roads, buildings, above- and below-ground utilities, and sampling site reference points. Each feature and reference point will be mapped with other information obtained during the field investigation activities, using field survey information (e.g., sketches) and survey control points, as appropriate, to accurately locate features. Features of interest will be provided on maps previously prepared by ESE for former CCATF investigations.

3.5.2.2 During all intrusive land survey activities, field team members will be accompanied by at least one UXO specialist. In all areas suspected of having possible UXO contamination, the UXO specialist will inspect the areas where personnel or vehicular traffic may transit. A magnetometer check of all points where location stakes or posts are to be driven into the soil, or where permanent survey monuments are to be located, will be accomplished prior to placement of stakes. If the magnetometer indicates a positive reading (via audio/visual signal), no monuments, stakes, or posts will be driven into the ground at that specific location.

3.5.2.3 Site layout activities will be planned prior to the start of field investigations. The size of the sites will generally be 100 by 100 ft, but may be modified slightly from their originally proposed size and locations due to extreme terrain conditions, such as excessively thick brush and steep grades.

3.5.2.4 Prior to sampling the sites, the ESE- and an EOD-trained field team will meet with representatives of the South Carolina Department of Parks, Recreation, and Tourism (SCDPRT) for their approval of the locations. Their major concerns relate to preservation of archaeological and historic attributes as well as damage to the environment that could potentially result from brush clearing, excavation, and detonation of UXO. Another obvious concern is safety of the park campers and visitors. State representatives will review the map of the proposed site locations to identify possible safety concerns.

3.5.2.5 Site survey activities will be conducted during the geophysical investigation. EEG survey personnel, accompanied by a UXO qualified person, will follow behind the geophysical investigation team and survey the site corners.

3.5.2.6 Site survey activities will include establishing NAD83 coordinates of site corner stakes by approved survey methods. The sampling site location will be surveyed to the nearest benchmark or permanent monument, and the grid locations will be determined by hand-held GPS methods. However, due to the thick brush and trees and heavy foliage over the majority of sites, conventional survey methods may be employed. All activities will be conducted in accordance with the SSHP and the Demolition/Disposal SOP (Appendix E).

3.5.2.7 The coordinate system used for the land survey activities will be the state plane coordinate system referenced to NAD83. A control network is required to merge the relative positions of individual survey data and related sampling site features information. A primary land survey control point for each EE/CA sampling site will be identified and marked by the land surveyor. Secondary control points will be the corner reference points established at each EE/CA sampling site.

3.5.3 Site Clearing

Because most sampling sites are heavily vegetated, it is anticipated that most of the total sampling site acreage will require some degree of clearing prior to conducting geophysical surveys. Site clearing operations will be completed prior to startup of activities at each sampling site to avoid time delays. Two teams will be scheduled to complete clearing efforts at designated sampling sites, prior to scheduled geophysical survey efforts. Each site clearing and site investigation team will consist of one UXO supervisor, two UXO specialists, and one UXO service support specialist. One senior UXO supervisor will supervise and manage the field investigation teams.

3.5.3.1 Tree Removal

Trees (3 inches in diameter and smaller) will be removed on a case-by-case basis and only as required to accomplish the tasks outlined in the SOW. A botanist and/or biologist familiar with the species found in Croft State Park will be onsite prior to the location of grids to assist in the identification of protected species. The botanist will identify areas of protected tree populations.

3.5.3.1.1 During the investigations, trees requiring removal will be cut with chain saws. The tree will be sectioned, if necessary, to remove it from the immediate area, so that it does not interfere with OE detection or survey activities. If trees larger than 3 inches in diameter are determined to impact the investigation, ESE will advise USAESCH and SCDPRT. No further site action will be taken without full coordination and approval of USAESCH and SCDPRT.

3.5.3.2 Brush Cutting

Brush clearance will be accomplished with gas-powered string trimmers with saw blade attachments and ditch axes. The brush will be cut to a height of no greater than 6 inches above ground surface to eliminate interferences with OE sampling operations.

3.5.3.3 Grass Cutting

If encountered, grass will be cleared using a gas-powered string trimmer with a saw blade or line attachment. The grass will be cut to a height of no greater than 6 inches above ground surface to eliminate interferences with OE sampling operations. If possible, other equipment, such as a bush hog, may be used to clear grass upon approval by USAESCH.

3.5.4 Geophysical Survey Procedures

This section describes standard practices and procedures for collecting, processing, and controlling the data associated with OE geophysical surveys at each of the sampling sites.

3.5.4.0.1 The geophysical survey techniques to be used at the former CCATF incorporate a hand-held magnetometer and flagging (mag & flag). Use of any other technique may require SOW amendment and modifications of project budget and schedule. Features of this technique are described in Appendix F.

3.5.4.1 Geophysical Survey

The geophysical survey will be conducted using a Schonstedt GA-72 Cd flux-gate magnetometer. A description of the analysis leading to the choice of geophysical equipment to be used is described in the Equipment Plan (Appendix F). The equipment response will be checked daily and at each grid prior to use to verify the equipment is working properly.

3.5.4.1.1 Standard Response Checks

The standard response of the magnetometer will be checked daily using two methods. A 60-mm projectile or equivalent will be buried 2 to 3 ft-bgs. The instrument will be checked each morning to verify the ability of the instrument to detect the object.

3.5.4.1.1.1 Subsequently, a standard test will be performed at each grid site to determine the ability of the instrument to detect a metallic object in a standard testing apparatus. The standard testing apparatus will consist of a 3-ft-long, 2-inch diameter PVC pipe filled with compacted soil. An iron nail or small piece of iron will be placed in one end of the testing apparatus prior to capping. A mark will be placed on the PVC with indelible ink at the nail, at 1 ft, at 2 ft, and at a point on the opposite end cap.

3.5.4.1.1.2 The testing apparatus will be laid on the ground within the grid at a location where no magnetic anomalies are detected. The magnetometer response will be tested by holding the instrument perpendicular over the marks previously placed on the apparatus. The response at 3-ft will be tested at the end farthest away from the source by holding the testing apparatus perpendicular to the ground and placing the magnetometer on the mark on the end cap in line with the apparatus. The magnetometer unit number and the results of the standard response check will be recorded in the field logbook either by noting the response level at each marked location on the testing apparatus or by noting a response was detected. If there is a marked decrease in the response levels from a previous response check of an individual unit, the batteries will be changed and the unit retested. If the source of the problem is not found, the magnetometer will be taken out of service until a standard response is attained (after repair).

3.5.4.1.2 Other Geophysical Equipment

If problems arise that result in proving the survey method to be ineffective or incapable of providing the required data quality and resolution, the site may require resurveying using other approved portable magnetometer methods. Onsite trials may be required before the final decision can be made as to which method will perform best at a particular site.

3.5.4.2 Mag and Flag Procedures

The field team will subdivide each sample grid into parallel sensor survey lanes approximately 5 ft apart. The lanes will be marked with a rope, paint, or other device. The magnetometer operator (technician) will walk the survey line assuring the magnetometer probe covers the entire area within the two ropes marking the lane. The magnetometer probe will be held at a constant height of no more than 6-inches above the ground over entire survey lane. The technician will walk at a speed that will provide complete coverage of the site (i.e. less than 1 ft between magnetometer passes).

3.5.4.2.1 The technician will stop his survey at each anomaly encountered to determine the extent of the anomaly and location. A small surveyor's flag will be placed in the ground at the exact location of each detected anomaly. After each lane is surveyed, the total number of anomalies encountered on that lane will be calculated and recorded on the survey map. Upon completion of the grids, the total number of anomalies detected will be calculated and recorded on the map and in the field log books. This number is critical for the GridStats calculations.

3.5.4.2.2 The locations of all surface and buried UXO and significant UXO fragments encountered during the investigation will be identified on the geophysical investigation map. These items will be identified and their condition determined. These data will be included as

comments on the map. Also included as comments on the map will be an identification of the type of ORS found (i.e., 4.2-inch mortar frag).

3.5.5 Access and Excavation

Access to and excavation of OE items will be completed only after a 200-ft exclusion zone is established and all preparatory actions required in the Demolition/Disposal SOP (Appendix E) are completed. Once a UXO is identified, the exclusion zone will be adjusted to meet the fragmentation distance for the particular UXO.

3.5.5.1 Access to suspect subsurface OE targets will be granted to perform identification and to determine the need for detonation. All access activities will be performed by the UXO specialist under the direct supervision of the UXO supervisor. Only UXO qualified personnel will be allowed to perform UXO access procedures.

3.5.5.2 Manual or equipment methods (e.g., hand tools) as specified in the Demolition/Disposal SOP (Appendix E) will be used to perform all excavation activities. Soil removed from the disposal area will be stockpiled in the immediate area for later backfilling of excavations.

3.5.5.3 If circumstances allow, photographs of the unearthed OE item may be taken for documentation purposes prior to in-place detonation.

3.5.5.4 If UXO items are confirmed and the situation precludes detonating the UXO item in-place, the USAESCH safety representative will be notified.

3.5.6 Field Data Analysis

Data collected in the field during the grid investigation will be entered into the GridStats and SiteStats computer programs (developed by Quantitech) to determine when a statistically significant number of samples have been collected at each grid site.

3.5.6.1 The GridStats program will randomly choose 1 of 100 previously prepared sampling sequence lists containing a random selection of the 36 equivalent area subgrids. The approximate location of each subgrid will be located in the field and one anomaly from each selected subgrid will be excavated to a depth of no more than 4 ft or until the anomaly has been recovered.

3.5.6.2 The results of the excavation will be entered into the GridStats program in the order of sample collection. Each surface UXO, subsurface UXO, ORS, and each false positive detected during the investigation will be identified and logged into the program. The program will indicate when a statistically significant number of samples have been collected to characterize each grid. If

additional grids were sampled past the grid characterization, the additional data will also be added to the GridStats database.

3.5.6.2.1 The SiteStats program will be used to calculate the expected density of ordnance and error factors. These values will be added to the SRA model. The GridStats program may be used to decrease the number of grids in an investigation site.

3.5.6.3 Hard copies of the data will be collected and stored in a three-ring binder by site and grid location number. The three-ring binder will be labeled as the EE/CA data logbook.

3.5.7 OE Handling and Disposal

Handling and Disposal of OE will be undertaken by the field investigation team, with only UXO specialists handling any OE items in accordance with the SSHP and the Demolition/Disposal SOP (Appendix E). The UXO supervisor will evaluate all encountered and suspected UXO and determine if the work planned for the area can safely continue or what actions must occur prior to commencing OE handling and disposal efforts. Such recommendations will be made immediately to the site supervisor, who will contact the onsite ESE site manager and appropriate action taken.

3.5.7.0.1 Relevant training requirements of 29 CFR 1910.120e(i) will apply to all OE handling and disposal activities conducted during the field investigation [Occupational Safety and Health Administration (OSHA), 1994].

3.5.7.0.2 If an OE item is discovered and identified as potential chemical warfare material (CWM), all field operations will be stopped immediately at the particular sampling site and the area will be secured by two UXO specialists, in accordance with SSHP requirements. The UXO personnel shall evaluate encountered UXO/CWM and immediately notify the USAESCH safety officer, who will in turn notify EOD for management of the occurrence.

3.5.7.1 UXO Disposal

All OE disposal activities involving detonation or the use of explosives will be completed in-place and will be completed in accordance with the Demolition/Disposal SOP (Appendix E) by UXO specialists only.

3.5.7.2 Disposal of Metal Debris

Inert OE items, including all OE metallic debris, shrapnel or fragments, will be collected, transported to the onsite explosives/inert OE storage area and placed in an approved holding container, such as a Raleigh box.

3.5.7.2.1 The storage area will be secured by temporary fencing and other security measures that prevent vandalism or contact with the public. If portable magazines are used for this purpose, they will be kept locked except during loading and unloading.

3.5.7.2.2 Inert metallic debris will be disposed of through a local civilian scrap dealer.

3.5.8 Accounting

A detailed accounting of all OE materials encountered during the geophysical surveys will be completed. This accounting will include the number of items of UXO, identification numbers for UXO items, mapping of discovery location, description of condition with photographs (as appropriate), date, and disposal method.

3.5.8.1 The scrap material accounting process will include all OE shrapnel, and all non-OE metallic debris encountered. All identifiable ORS items will be listed in the field data for each site. All non-OE items will also be identified and listed. The total metallic OE and non-OE debris will be accounted for by gross weight per sampling site and converted to pounds per acre (lb/acre). Suitable weighing methods will be used to determine weights of metallic debris (e.g., truck scales).

3.5.8.2 The accounting system will also account for all explosives expended in the disposal of UXO items. This information will be maintained by Ordnance/Explosives Environmental Services (OES), who will supply all explosives for this purpose.

4.0 QC PLAN

The QC Plan described in this section will be used for all work performed during completion of the EE/CA activities at the former CCATF. The site-specific QC system was designed to manage, control, and document performance of work efforts in accordance with the USAESCH SOW. The QC Plan will achieve the following objectives:

- Ensure USAESCH notifications as required by the USAESCH SOW,
- Document the quality of work efforts via audits and independent staff reviews of deliverables,
- Ensure the proper use of explosives and procedures,
- Ensure the development of an appropriate ordnance accountability ledger and appropriate OE scrap chain-of-custody and disposal,
- Ensure data integrity through implementation of data management QC procedures, and
- Ensure data precision through implementation of field equipment calibration and use procedures.

4.1 Overall QC Management

The overall site QC responsibilities will be under the management of the ESE project manager. The QA manager will be provided by Osiris Incorporated (a small business, QA/QC specialty company). The ESE site manager will report all QC actions to the QA manager. The OES SM/QAM is responsible for the QC of subcontractor OE/UXO operations. The responsibilities and qualifications of all QC roles are provided in Section 3.0 of this WP.

4.1.1 The ESE and OES project managers will have overall responsibility for assigning QC responsibilities and ensuring that QC programs are implemented in accordance with the USAESCH SOW.

4.2 Field Investigation QC Management

4.2.1 Overall Field QC Management

Safety and health QC procedures as established in the SSHP will be the responsibility of the ESE site manager with primary implementation by the designated SSHO/QCS. Overall field QC management will be provided by the UXO subcontractor site QA manager.

4.2.2 SSHO/QCS

The SSHO/QCS will not be directly involved in the UXO operations but will perform as the site safety officer. The SSHO/QCS will advise the site supervisor on all QC matters. Daily QC audits of documentation, work in progress, and monitoring will be conducted and recorded in the QC activity log.

4.2.3 Other QC Responsibilities

All project field team personnel are responsible for performing their QC functions as outlined in this section.

4.2.4 Field Data Management QC

The site supervisor is the onsite field data manager and will be responsible for tabulating all data collected or produced by geophysical survey teams and placing the data under the custody and control of the project data management system.

4.2.5 Equipment Calibration QC

Equipment calibration will be supervised by the SSHO/QCS and recorded in the daily logbook. Calibration will be completed on all field equipment by using the manufacturer's calibration procedures or use-specific equipment check program. Equipment calibrations will be completed on the prescribed schedule, and the calibration results will be recorded in the daily field logbook.

4.2.5.1 Equipment Calibration Procedures

Measurement equipment used onsite will be checked daily for operational reliability and calibration, prior to use at the site. Before beginning geophysical surface searches, source materials will be used to verify the equipment's accuracy. All instruments requiring calibration will be calibrated on a frequency recommended by the manufacturer. Records of these equipment checks will be maintained in the QC activity log. If equipment field checks indicate that any piece of equipment is not operating correctly and field repair cannot be made, the equipment will be tagged and removed from service. The site supervisor will be notified and a request for replacement equipment will be expedited. Replacement equipment will meet the same specifications for accuracy and sensitivity as the equipment removed from service.

4.2.5.1.1 Instrument check-out and calibration will be the responsibility of the UXO subcontractor site SSHO/QCS. All equipment used onsite will be dedicated to the project until completion. The designated site SSHO/QCS is responsible for calibrating, checking, and recording the operational condition of all equipment daily. An equipment calibration check will be performed each day and recorded in the field notebook.

4.3 Field Investigation Documentation

4.3.1 Daily Field Activity Records

Field activity logbooks will be maintained daily, if applicable, and all entries will be recorded in ink. All personnel will use bound and numbered field logbooks with consecutively numbered pages. The following logs will be maintained.

4.3.1.1 Daily Activity Log

- Date and recorder of field information;
- Start and end time of work activities including breaks, lunch, and down times;
- Visitors;
- Weather conditions;
- Relevant events;
- Important phone calls;
- Changes from approved or planned work instructions; and
- Signature of the ESE site manager indicating concurrence.

4.3.1.2 Safety Log

- Date and recorder of log,
- Tailgate safety briefing (time conducted and by whom),
- Weather conditions,
- Significant site events relating to safety,
- Accidents,
- Stop work due to safety,
- Safety audits, and
- Signature of the ESE site manager indicating concurrence.

4.3.1.3 Training Log

- Date and recorder of log;
- Nature of training (personnel will complete the ESE and the UXO documentation of training form);
- Visitor training; and
- Signature of both the ESE and The UXO subcontractor site managers, indicating concurrence.

4.3.1.4 QC Activity Log

- Date and recorder of log;
- Equipment calibration;
- Equipment monitoring results;
- QC audits;
- Nonconformance reports; and
- Signature of the ESE site manager and the site supervisor, indicating concurrence.

4.3.1.5 Ordnance Accountability Log

- Date and recorder of log;
- Assigned identification number;
- Type, condition, and location;
- Disposition; and
- Signature of the ESE site manager and the site supervisor, indicating concurrence.

4.3.2 Photographic Records

Photographic records, in addition to the required site videotape, will be maintained by site personnel. Significant activities will be documented by 35-mm color prints and/or by videotape. Photographic records will be used to supplement information recorded in the daily activity logs, including photographs of equipment prior to use, typical ordnance items, and the condition of sites prior, during, and after any activity. Photographs will be maintained in a photograph logbook with appropriate labels identifying the negative and a complete description of the photograph subject.

4.3.3 Working Map

Working maps or sketches of the sampling sites will be used to document ordnance locations during excavation and removal activities. As UXO is located and identified, the assigned technician will record (on the working map) the location and corresponding log entry number in the Ordnance Accountability Log. If a large number of OE/UXO items are found, such as a burial site, the area will be marked on the working map along with the total number of OE/UXO items found at that site.

4.3.4 Records Of Inert Ordnance Items

Inert ordnance items and nonhazardous scrap will be disposed of through a local civilian scrap yard at no cost to the government. Appropriate documentation will be obtained from the scrap dealer as instructed by USAESCH.

4.3.4.1 ESE will prepare a certificate to be signed by the site supervisor. The certificate will state the following:

> I certify that the property listed hereon has been inspected by me, and, to the best of my knowledge, contains no items of a dangerous nature.
>
> _____ Date: _____
>
> Site Supervisor

4.3.5 Development and Verification Of Drawings

All field investigation-derived drawings submitted to ESE by the UXO subcontractor (in support of the EE/CA site characterization database, EE/CA Report, or used onsite as a working map) will be verified by the site supervisor. Drawings will be checked for content, format, and results (e.g., location of UXO and plots that were geophysically surveyed) against other records and field data.

4.3.6 Field Office/Communications

Field QC procedures will include establishing field office entry requirements and communication protocols. A field office will be established within the property boundaries of the former CCATF, if feasible. All official visitors will report to the project field office to sign in and obtain an escort to the project site. All visitors will be announced to the site via a two-way radio. All internal communications will be by use of Motorola MTX portable and base station equipment, or equivalent. All official external communications shall be via cellular telephone or land line from the field office.

4.4 QC Audits and Surveillance

4.4.1 Initial QC Audit

QC audits are performed periodically on all UXO operational sites to ensure all systems are functioning as planned. Management surveillance of the QC program ensures that nothing is being overlooked. This audit includes a review of all procedures, logs, records. etc. Management audits are necessary to determine if there are gaps in the information collected, or if conditions and practices create the potential for QA problems at an early state, so that corrections can be made to the system before a problems is allowed to occur.

An initial QC and field surveillance audit will be performed within 10 days after field investigation mobilization. Field surveillance will concentrate on sensor survey sweep procedures, proper documentation, and checks of survey data for completeness and accuracy. In addition, a daily check of the monitoring records and survey results will be conducted. This audit will be performed by a qualified UXO individual from the EOD subcontractor.

4.4.2 Weekly QC Audit

At least once each work week, the SSHO/QCS will conduct an audit equivalent in scope to the initial QC audit, to ensure compliance with this WP and the USACE SOW. If noncompliance is discovered, a noncompliance form will be completed and forwarded to the site supervisor and the ESE site manager. Corrective action will be selected and implemented to correct the matter to the satisfaction of ESE and USAESCH.

4.4.3 Field QC Management Audit

The SM/QAM will conduct an unannounced QC audit during the field effort to ensure compliance with all QC protocols and field investigation procedures. QC audits are performed on all UXO operational sites to ensure that all systems are functioning as planned. Management surveillance of the QC program ensures that nothing is being overlooked. This audit includes a review of all procedures, logs, records, etc. Management audits are necessary to determine early in the efforts if there are gaps in the information collected, or if conditions and practices create the potential for QA problems. The results of the QC audit will be discussed with the ESE site manager and the OES site supervisor. A findings report will be forwarded by the SM/QAM to the QA manager.

4.5 Nonconformance/Corrective Action Reports

Any nonconformance to this WP or contractual requirements will be documented. Nonconformance includes, but is not limited to, the following items:

- Delivery of items or services that do not meet the contractual requirements of ESE and any of its subcontractors;
- Errors made in following work instructions or improper work instructions;
- Unforeseeable or unplanned circumstances that result in items or services that do not meet quality, contractual, and/or technical requirements;
- Technical modifications to the project by individuals without the responsibility and authority; and
- Errors in craftsmanship and trade skills.

5.0 Safety Procedures

This section outlines safety and health procedures to be employed for all field investigation activities conducted at the former CCATF. Detailed safety procedures for the use of explosives in detonating OE/UXO at the site are provided with this WP as Appendix C. A detailed SSHP is provided with this WP as Appendix D.

5.1 OE/UXO Safety

Any suspected or known OE/UXO encountered during geophysical survey operations will be clearly marked and its position annotated on the appropriate map. The site safety and health officer and site supervisor will evaluate all encountered UXO and determine if the work planned for the area can safely continue or what actions must occur prior to commencing work. Such recommendations will be made immediately to the ESE site manager who will contact the USAESCH safety representative.

5.1.1 In accordance with the SOW, if a CWM is encountered, all field operations will cease, and the area will be secured by two UXO specialists. The UXO personnel will notify the USAESCH safety representative for guidance.

5.1.2 Except for the survey activities planned at the sampling sites at the former CCATF, no intrusive activities are authorized by personnel at any time without authorized modifications to delivery order SOW.

5.2 Site Control

On discovery of suspected OE/UXO, the immediate site area will be clearly marked and secured as an exclusion zone, personnel will be evacuated to a safe distance, and warnings will be posted to ensure no unauthorized personnel enter the exclusion zone perimeter.

5.2.1 Due to the number of sampling sites and the large size of the former CCATF property, overall site control through one point is not feasible. The rural setting should inhibit frequent trespassing; however, the potential for hikers and horseback riders to enter the immediate site areas exists and must be prevented. If necessary, civilian authorities may be called upon to ensure site security.

5.3 General Site UXO and Safety Procedures

General site safety procedures listed in this section will be followed throughout this project, in addition to USACE safety concepts and considerations for UXO as described in USAESCH's *Safety Concepts and Basic Considerations for Unexploded Explosive Ordnance (UXO)* (Appendix C), SSHP (Appendix D), and Demolition/Disposal SOP (Appendix E).

5.3.1 UXO operations will not be conducted during the hours from sunset to sunrise or during electrical storms or other severe weather conditions.

5.3.2 A minimum of two UXO technicians will be present during all UXO operations, so that one may always act as a safety observer.

5.3.3 All UXO encountered will be reported to the USAESCH representative.

5.3.4 A minimum of two UXO trained team members and one UXO-trained safety observer must be at each excavation. All non-UXO personnel must move to a safe distance from the excavation as per the 1992 version of the USAESCH's *Safety Concepts and Basic Considerations for Unexploded Explosive Ordnance (UXO)* (Appendix C). Work will be permitted on two excavations within the same grid only when the safety observer can have full view of both crews and when the distance between the two excavations is greater than that specified in Appendix C.

6.0 Public Affairs

Mr. Wayne Bogan, Charleston District life cycle project manager, will be the overall coordinator for public affairs on this project. The following protocol will be followed during execution of this WP:

- All communications and contacts with the public will be under the direction of Mr. Bogan.
- All public information/contacts made during the project will be documented and forwarded immediately to Mr. Bogan.
- When public meetings are required under this delivery order, ESE will maintain records as requested by USAESCH.

7.0 OE/UXO Operational Plan

Based on data from previous investigations, sampling sites have been selected to provide site characterization data for the EE/CA process at the former CCATF. A geophysical survey layout (generally 100 by 100 ft) will be selected for each site to search for suspected subsurface OE/UXO. The field sampling investigations will be performed using the field investigation equipment described in Appendix F. The following general methods and procedures will be followed for all instances of UXO discovery during EE/CA sampling activities:

7.1 Identification

- Right-of-entry to the sites will be obtained by the Charleston District.
- Excavations greater than 4 ft will not be performed without prior approval from the USAESCH safety representative.
- Any suspected or known OE/UXO encountered during excavation will be clearly marked and its position annotated on the appropriate map. The UXO supervisor will evaluate the UXO item found and immediately report the condition of the item to the OES site supervisor.
- A detailed account of all materials (OE and non-OE) encountered during the surface/subsurface investigation will be maintained.
- If the material is OE, the amounts, identification/condition, and disposition will be accounted for.
- If the material is non-OE (e.g., metallic debris), it will be accounted for as pounds per acre.
- All access holes will be refilled and compacted upon completion of the excavation.

7.2 Safety Procedures

The following safety procedures will be followed during identification of the suspected OE/UXO material at the former CCATF:

- Magnetometer (or other detectors) operators or other non-UXO qualified personnel will not be allowed to perform UXO operations (e.g., gaining access to subsurface UXO, identification, transportation, storage, and disposal of UXO).
- UXO operations will not be conducted during the hours from sunset to sunrise or during electrical storms or other severe weather conditions.
- A minimum of two UXO technicians, trained as per 29 CFR 1910.120e(i), will be present during all UXO operations.
- During all OE/UXO confirmation operations, only the minimum number of personnel (two) required to safely perform the task will be allowed onsite. All others will evacuate to a pre-designated assembly point.

- All access, identification, and disposal/venting procedures of OE/UXO will be accompanied by a UXO specialist.

7.3 Disposal/Venting

The following methods and procedures will be followed for the disposal/venting of OE/UXO encountered during surface/subsurface investigation.

7.3.1 Disposal Areas

All disposal areas will be clearly marked and, during disposal operations, total site control MUST be maintained to ensure that no one is admitted to or gains access to the area other than those involved in the disposal operation. An accountability system will be used for all explosive materials expended in the disposal of UXO.

7.3.1.1 A decibel meter with an impulse adapter will be placed nearby to measure sound levels. Sound levels will be measured to ensure compliance with OSHA and EM 385-1-1 guidelines. Decibel levels will be maintained as low as possible and will not exceed the 140-decibel (dB) range.

7.3.2 OE/UXO Disposal and Explosive Venting

If UXO is encountered that cannot be destroyed in place, the USAESCH safety specialist will be notified, and a decision will be made on the disposal procedure.

7.3.2.1 If possible, prior to the end of each work day, all OE/UXO located, identified, and accounted for that requires disposal by detonation or explosive venting, will be disposed of in place. After explosive charges have been set, the shot will be covered with earth or sand. Destruction of OE/UXO will be accomplished by detonation using electrical firing systems to ensure maximum control and safety. Disposal by detonation will be conducted within approved-EOD procedures and DoD regulations and guidelines (e.g., disposal by detonation will not occur during electrical storms; a 30-minute wait period will be observed for all misfires). All disposed UXO will be set up and detonated one shot at a time. Upon completion of disposal shots, the area will be checked for low orders and/or kickouts in accordance with the SSHP and the OE/UXO Operational Plan. Any fused kickouts and/or low ordered ordnance will be considered armed and will not be moved until a determination has been made that they can be transported safely.

7.3.2.2 This site presents possible explosive hazards from various projectiles. One of the following disposal procedures will be used:

- UXO will be vented using a small-shaped charge placed on top or along side the UXO that will penetrate through the casing. If the projectile is live, it will detonate as designed; if the projectile is inert-filled, it can be considered explosively vented and staged as scrap metal. If there is any doubt after venting as to the condition, the UXO will be disposed of in place. This procedure incorporates the least amount of explosives for disposal. Firing procedures will be determined on a case-by-case basis.
- Using a suitable amount of high explosive, UXO will be destroyed in place.

8.0 Environmental Resources Protection Plan

An ERPP, attached to this WP as Appendix G, has been prepared to ensure compliance with the National Environmental Policy Act (NEPA) and Army Regulation (AR) 200-2, so that activities at the site minimize potential adverse environmental impacts. The ERPP will observe and comply with all applicable South Carolina state and local statutes and regulations.

References

Environmental Science and Engineering, Inc. (ESE). 1996a. *Engineering Evaluation/Cost Analysis Former Camp Croft Army Training Facility, Spartanburg, South Carolina*. Prepared for U.S. Army Engineering and Support Center, Huntsville, January 1996.

Environmental Science and Engineering, Inc. (ESE). 1996b. *Evaluation and Mapping, Former Camp Croft Army Training Facility, Spartanburg, South Carolina*. Prepared for U.S. Army Engineering and Support Center, Huntsville, January 1996.

Environmental Science and Engineering, Inc. (ESE). 1996c. *Former Camp Croft Final Supplemental Archive Search Report*. Prepared for U.S. Army Engineering and Support Center, Huntsville, July 1996.

Environmental Science and Engineering, Inc. (ESE). 1996d. *Former Camp Croft Final Supplemental Engineering Report*. Prepared for U.S. Army Engineering and Support Center, Huntsville, March 1996.

U.S. Army Corps of Engineers, Huntsville Division. 1992. *Safety Concepts and Basic Considerations for Unexploded Explosive Ordnance (UXO) Operations*, December 1992.

U.S. Environmental Protection Agency (EPA). 1993. *Guidance on Conducting Non-time-Critical Removal Actions Under CERCLA*. Publication 9360.0-32, 8/93.

U.S. Environmental Protection Agency. 1990. *Superfund Removal Procedures, Action Memorandum Guidance*, EPA/540/P-90/004, 12/90.

U.S. Army Corps of Engineers (USACE), Rock Island District. 1994. *Ordnance and Explosive Waste Archives Search Report for the Former Camp Croft Army Training Facility*, April, 1994.

U.S. Occupational Health and Safety Administration (OSHA). 1994. *Hazardous Waste Operations and Emergency Response Training Regulations*. 40 CFR 1910.120, 7/94.

Code of Federal Regulations (CFR). 1993. *National Oil and Hazardous Substances Pollution Contingency Plan (NCP)*. 40 CFR 300.415, 7/93.

South Carolina Department of Parks, Recreation, and Tourism (SCDPRT). 1989. *Croft State Park Management Plan.*

Tables

Table 1. Format and Content of CCATF EE/CA Work Plan*	
Section	Content
1.0	INTRODUCTION
2.0	SITE DESCRIPTION AND PREVIOUS INVESTIGATIONS
3.0	**PROJECT PLAN**
3.1	**Project Management Plan**
3.2	**Overall Project Approach for EE/CA**
3.3	**Scope of Work by Task** **Prepare an EE/CA for the Developing Areas (Task 6)** **Prepare an EE/CA for the Park Areas (Task 7)** **Prepare an EE/CA for the Non-Developing Areas (Task 8)** **Site Characterization (Task 9)** **EE/CA Action Memorandum (Task 10)**
3.4	**EE/CA Data Management Plan**
3.5	**EE/CA Field Investigation Procedures**
3.6	**UXO/OE Handling and Disposal Procedures**
4.0	**QUALITY CONTROL PLAN**
5.0	**SAFETY PROCEDURES**
6.0	PUBLIC AFFAIRS
7.0	**OE/UXO OPERATIONAL PLAN**
8.0	**ENVIRONMENTAL RESOURCES PROTECTION PLAN (ERPP)**
APPENDICES	
A	STATEMENT OF WORK
B	**PROJECT SCHEDULE**
C	**EXPLOSIVES SAFETY PRECAUTIONS**
D	**SITE SAFETY AND HEALTH PLAN**
E	**DEMOLITION/DISPOSAL SOPs**
F	**EQUIPMENT PLAN**
G	**ERPP**

*Specific required plan components highlighted by bolding.

Source: ESE.

Table 2. Former CCATF Reconnaissance Site Recommendations

Further Reconnaissance with High, Medium, or Low Priority Rating			No Further Reconnaissance
High Priority	Medium Priority	Low Priority	
Danger Area 1+	2	5	1
Danger Area 2	9	8b	4
3	24	12*	6
8a	27	14+	7
18	30	15+	10
22	39	16	11
32	40	17*	13
33*	41a	19	20
36	44	26	21
50	46*	29	23
56	60	34+	25
61+	67	37	28
68*	71	38a	31
69+	72	38b	35
70+	78	43	41b
74	85	45	42
75	A2	48+	47
77+	A3	57*	49
81+	A5	64	51
82*	A7+	65	52
A16+	A8*	80	53
A28	A15*	86	54
A29+	A23	A9*	55
A30	A25*	A10*	58
A33+	A31	A11+	59
A38	A32*	A12*	62
	A34*	A14+	63
	A39	A17*	66
		A18*	73

Table 2. Former CCATF Reconnaissance Site Recommendations

Further Reconnaissance with High, Medium, or Low Priority Rating			No Further Reconnaissance
High Priority	Medium Priority	Low Priority	
		A20*	76*
		A21*	79
		A22+	83
		A24+	84
		A37	87
			A1
			A4
			A6
			A13
			A19a
			A26
			A27
			A35
			A36
			Ranger House (RH)
			Restroom Area (RRA)
			Ranger Housing Complex (RHC)
Totals 26	28	34	46

*
No right-of-entry (ROE), windsheild survey (WS) only.

+
No ROE or WS.

Source: ESE.

Table 3. Proposed Sampling Locations, Grid Size, and Site Data

Site I.D.	Total Area (ac.)	Priority	Vegetation	Access	Topography	Number of Grids / Size
2	2.1	medium	wooded, no underbrush	difficult access	rolling hills	1/ 100 x 100
5	0.2	low	wooded w/ some underbrush	off road access - mod. difficult	rolling hills w/ steep ravine	1/ 100 x 100
8b	0.8	low	wooded, moderate underbrush	moderately difficult	rolling hills	1/ 100 x 100*
9	2.1	medium	wooded, moderate underbrush	moderately difficult	rolling hills	2/ 100 x 100
12	1.1	low	wooded w/ thick kudzu	near road, kudzu makes access difficult	relatively flat	2/ 100 x 100*
14	**	low	heavily vegetated	off trail access	rolling hills	1/ 100 x 100*
15	**	low	open field, tall grass, and pine trees	access from road	relatively flat	1/ 100 x 100*
16	2.3	low	subdivision, open, grass landscaped	good access	flat	1/ 100 x 100
17	**	low	open field, grass landscaped	good access	flat	1/ 100 x 100
18	8.6	high	open field, landscaped w/ some trees	good access	flat	4/ 100 x 100
19	0.9	low	wooded, some underbrush	15 min walk down horse trail	flat, adjacent to Lake Craig	1/ 100 x 100
24	1.7	medium	dense wooded, underbrush	moderately difficult	rolling hills	2/ 100 x 100
26	**	low	dense wooded, underbrush	moderately difficult	relatively flat	1/ 100 x 100 *
27	16.5	medium	wooded, open marsh area	moderately difficult	flat to steep rolling hills	3/ 100 x 100
29	2.1	low	wooded w/ open field & golf course	good access	rolling hills	1/ 100 x 100
30	3.0	medium	wooded w/ heavy vegetation (kudzu)	near road, kudzu makes access difficult	rolling hills	4/ 100 x 100.
32	**	high	open field to wooded.	good access	flat	2/ 100 x 100 *
33	**	high	wooded w/ heavy vegetation (kudzu)	near road, kudzu makes access difficult	relatively flat	2/ 100 x 100*
34	**	low	NA	off road access	relatively flat	1/ 100 x 100 *
36	2.5	high	wooded w/ dense underbrush	dirt road access	moderately steep hills	2/ 100 x 100
37	2.5	low	mostly open fields w/ wooded areas	good access from dirt road	rolling hills	1/ 100 x 100
38a	0.9	low	wooded w/ mostly young trees	access from off a trail.	rolling hills	1/ 100 x 100
38b	0.7	low	wooded w/ underbrush	access from bike trail, somewhat difficult	rolling hills w/ steep sided ravin	1/ 100 x 100
39	5.2	medium	wooded w/ dense underbrush	good access	relatively flat	2/ 100 x 100 *
40	2.1	medium	wooded w/ dense underbrush	off trail access required	rolling hills	1/ 100 x 100
41a	2.4	medium	wooded w/ underbrush	good access, need right of entry	moderately steep	2/ 100 x 100
43	**	low	wooded	good access	flat to rolling hills	1/ 100 x 100 *
44	2.1	medium	wooded to open field	good access	flat	2/ 100 x 100
45	2.8	low	wooded	good access	rolling hills to relatively flat	1/ 100 x 100
46	**	medium	wooded w/ moderate underbrush	access by logging trail	rolling hills	1/ 100 x 100 *
48	**	low	Not able to locate site	need right-of-entry	rolling hills	1/ 100 x 100 *
50	3.1	high	open field	good access	relatively flat	2/ 100 x 100
56	1.9	high	wooded w/ dense underbrush	good access	relatively flat	2/ 100 x 100 *
57	2.4	low	wooded w/ heavy vegetation (kudzu)	near road, kudzu makes access difficult	sloping hills	2/ 100 x 100 *
60	2.3	medium	open field, wooded at property line	good access	flat	2/ 100 x 100
61	**	high	kudzu	need right-of-entry	Richland Creek Ravine	2/ 100 x 100 *
64	4.9	low	wooded w/ moderate underbrush	poor access due to Kudzu on trail	rolling hills	2/ 100 x 100
65	0.5	low	wooded w/ moderate underbrush	good access	rolling hills	1/ 100 x 100
67	2.4	medium	open cultivated field	good access	rolling hills	1/ 100 x 100*
68	2.4	high	open field w/ trees, overgrown	good access	rolling hills	2/ 100 x 100
69	**	high	residential	good access, need right of entry	rolling hills	2/ 100 x 100*

Table 3. Proposed Sampling Locations, Grid Size, and Site Data

Site I.D.	Total Area (ac.)	Priority	Vegetation	Access	Topography	Number of Grids / Size
70	**	high	residential	good access, need right of entry	rolling hills	2/ 100 x 100*
71	38.0	medium	open field, residential	good access	rolling hills to flat	4/ 100 x 100
72	**	medium	wooded w/ mod. to dense underbrush	good access	relatively flat to rolling hills	2/ 100 x 100*
74	14.0	high	heavily wooded w/ dense underbrush	fair access	moderately steep hill.	4/ 100 x 100
75	31.0	high	wooded w/ underbrush	good access	steep to relatively flat	6/ 100 x 100
78	11.6	medium	wooded, w/ moderate underbrush	good access	relatively flat	2/ 100 x 100
80	2.4	low	wooded except along power line	good access	sloping hill	1/ 100 x 100
85	5.4	medium	wooded	good access	relatively flat	1/ 100 x 100
86	12.0	low	wooded, heavy to moderate shrubs	good access	relatively flat	3/ 100 x 100
A2	1.5	medium	wooded w/ underbrush	good access	flat to rolling hills	1/ 100 x 100*
A3	642.8	medium	wooded w/underbrush	assess of dirt road	rolling hills	4/ 100 x 100*
A5	516.5	medium	wooded to open field	good access	flat to rolling hills	6/ 100 x 100*
A7	723.1	medium	mostly wooded	need right-of-entry	relatively flat to rolling hills	10/ 100 x 100*
A8	522.3	medium	mostly wooded w/ some open fields	off road access, need right of entry	rolling hills	7/ 100 x 100*
A9	344.4	low	open field	difficult access, need right of entry	rolling hills	6/ 100 x 100*
A10	401.7	low	wooded w/ underbrush	need right-of-entry	rolling hills	7/ 100 x 100*
A11	11.5	low	NA	difficult access, need right of entry	rolling hills	1/ 100 x 100*
A12	45.9	low	wooded to open field	dirt road access, need right of entry	relatively flat to rolling hills	2/ 100 x 100*
A14	34.4	low	NA	dirt road access, need right of entry	steep slopes	2/ 100 x 100*
A15	9.0	medium	wooded	dirt road access, need right of entry	relatively flat	2/ 100 x 100*
A16	13.8	high	NA	difficult access, need right of entry	rolling hills	2/ 100 x 100*
A18	11.5	low	landscaped yards w/ some woods	good access	relatively flat	1/ 100 x 100*
A20	95.5	low	landscaped property w/ woods	good access	relatively flat	2/ 100 x 100*
A21	11.5	low	landscaped yards and woods w/ dense under	good access	relatively flat	1/ 100 x 100*
A22	137.7	low	NA	difficult access, need right of entry	rolling hills	2/ 100 x 100*
A23	39.0	medium	open field, wooded at property boundary	good access	flat	2/ 100 x 100*
A24	459.1	medium	NA	difficult access, need right of entry	rolling hills	4/ 100 x 100*
A29	45.9	high	NA	difficult access, need right of entry	rolling hills	2/ 100 x 100*
A31	6.9	medium	wooded with dense underbrush	moderately difficult	rolling hills	2/ 100 x 100*
A32	68.9	medium	wooded w/ generally heavy underbrush	difficult access, need right of entry	variable	6/ 100 x 100*
A33	46.8	high	NA	good access, need right of entry	rolling hills to flat	8/ 100 x 100*
A34	11.5	medium	open landscaped, and golf course	good access, need right-of-entry	rolling hills	1/ 100 x 100*
A37	413.2	low	wooded w/ underbrush	off trail access only	steep to rolling hills	4/ 100 x 100*
A39	275.5	medium	wooded to heavily wooded w/ underbrush	off trail access	rolling to steep sided hills	2/ 100 x 100*
AREA1	172.2	high	NA	off trail access, needs right of entry	rolling to steep sided hills	5/ 100 x 100*

Source: ESE 1995

* Additional site reconnaissance may determine the need for additional grids.

** This site requires additional reconnaissance to determine total area.

NA The data was not obtained during field reconnaissance.

An estimated 183 grids will be required to complete this investigation.

Table 4. Standard EE/CA Removal Action Alternative Evaluation Criteria

EFFECTIVENESS
- Overall Protection of Environment
  - Protective of public health and community
  - Protective of workers during implementation
  - Protective of the environment
  - Complies with Applicable or Relevant and Appropriate Requirements (ARARs)
  - Ability to Achieve Removal Objectives
  - Level of treatment/containment expected
  - Residual effect concerns
  - Short term concerns during implementation

IMPLEMENTABILITY
- Technical Feasibility
  - Construction and operational considerations
  - Demonstrated performance/useful life
  - Adaptable to environmental conditions
  - Contributes to remedial performance
  - Can be implemented in required time period
- Availability
  - Equipment
  - Personnel and services
  - Outside laboratory testing capability

COST
- Capital Cost
  - Construction costs
  - Equipment and material costs
  - Land acquisition or lease costs
  - Buildings and services costs
  - Transport and disposal costs
  - Analytical costs
  - Contingency allowances
  - Treatment and operation costs
- Indirect Capital Costs
  - Engineering and design fees
  - Legal fees and permit costs
  - Startup costs
- Annual O&M Costs
  - Operational costs
  - Maintenance costs
  - Disposal of residue costs
  - Monitoring costs
  - Support costs

Source: EPA, 1993.

Figures

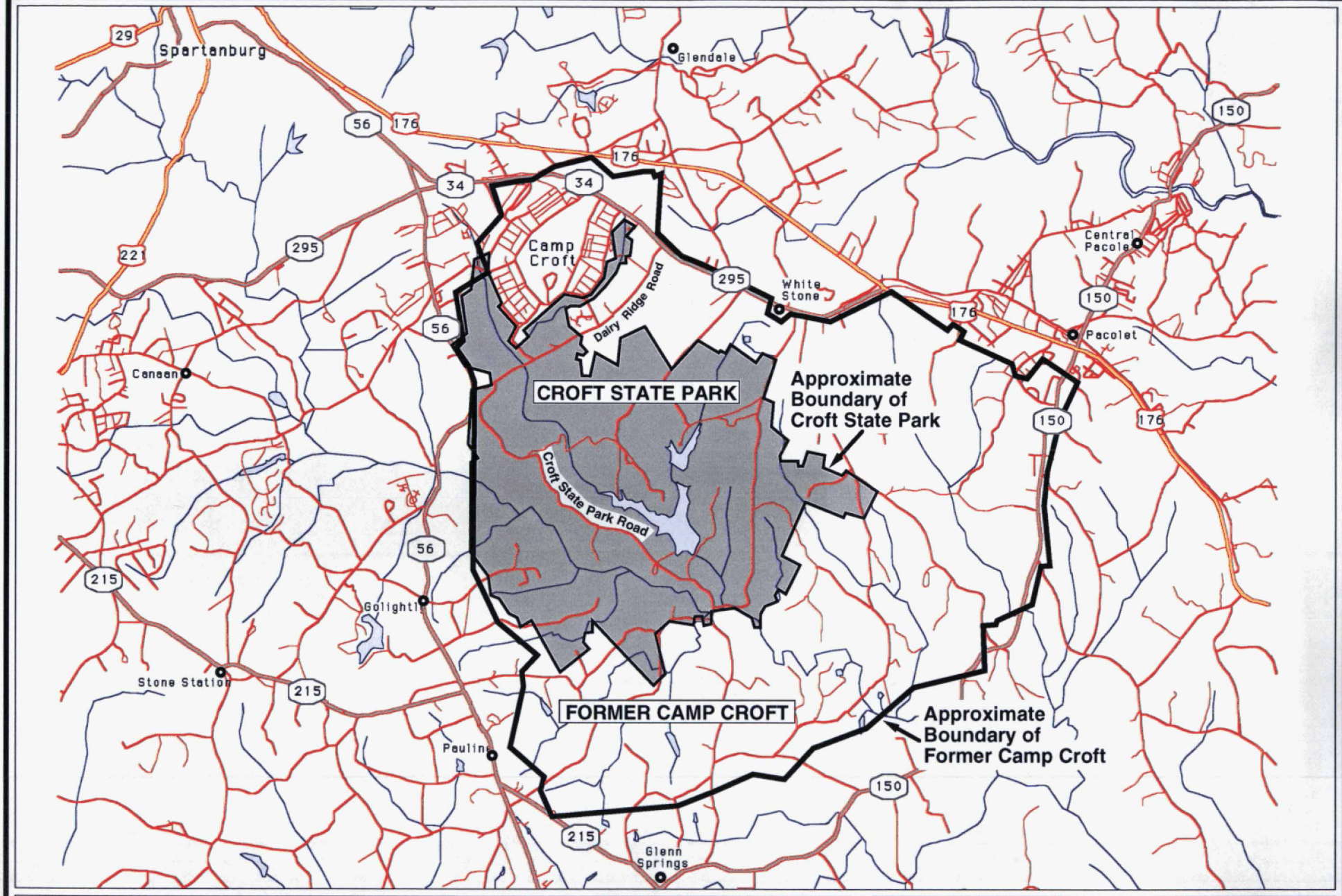


Figure 1
FORMER CCATF LOCATION MAP

SOURCE: ESE.

FORMER CAMP CROFT ARMY TRAINING FACILITY
SPARTANBURG, SC

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNSTVILLE

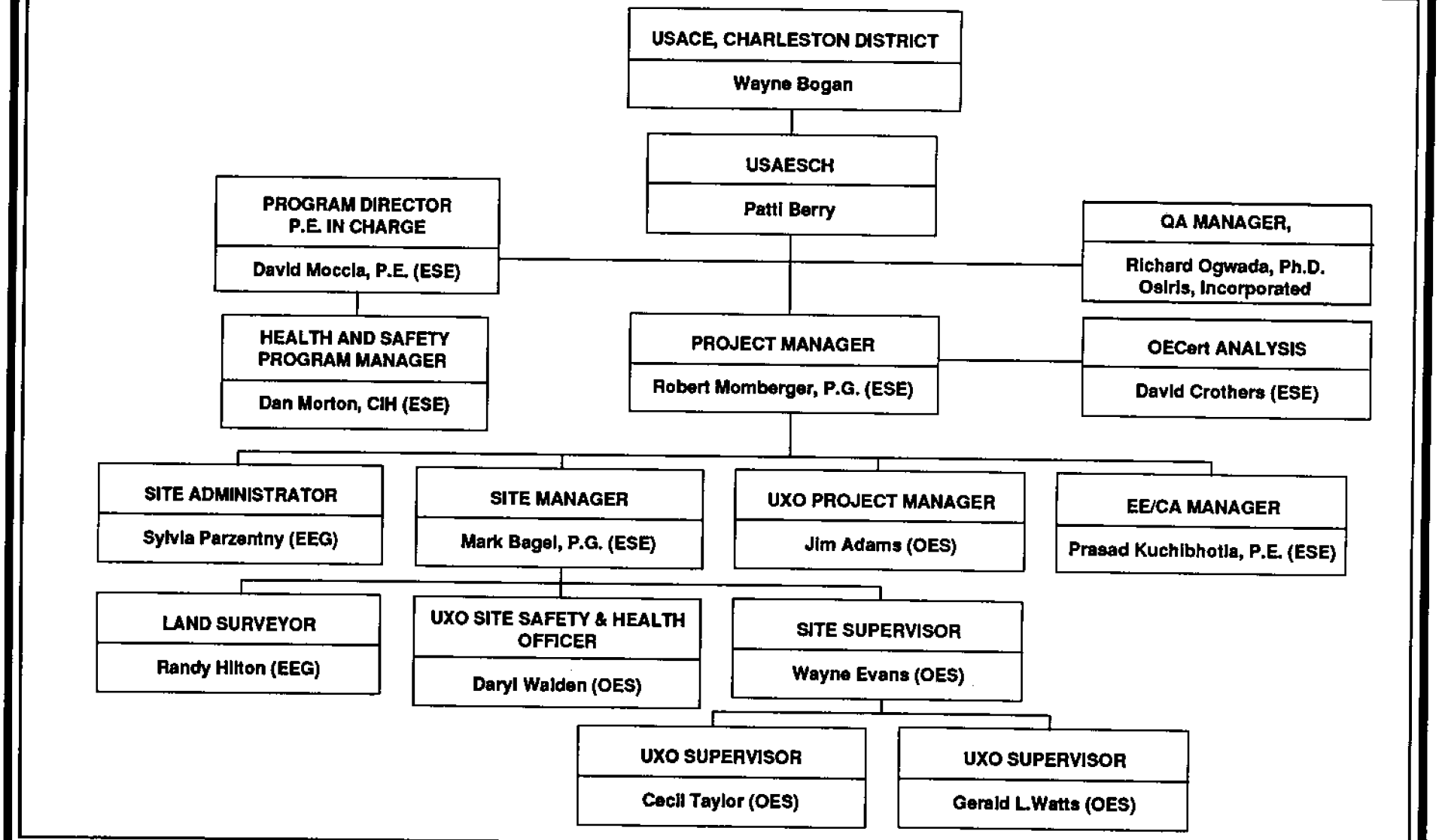


Figure 2
PROJECT ORGANIZATION CHART

SOURCE: ESE.

FORMER CAMP CROFT ARMY TRAINING FACILITY
SPARTANBURG, SC

U.S. ARMY ENGINEERING AND SUPPORT CENTER
HUNTSVILLE

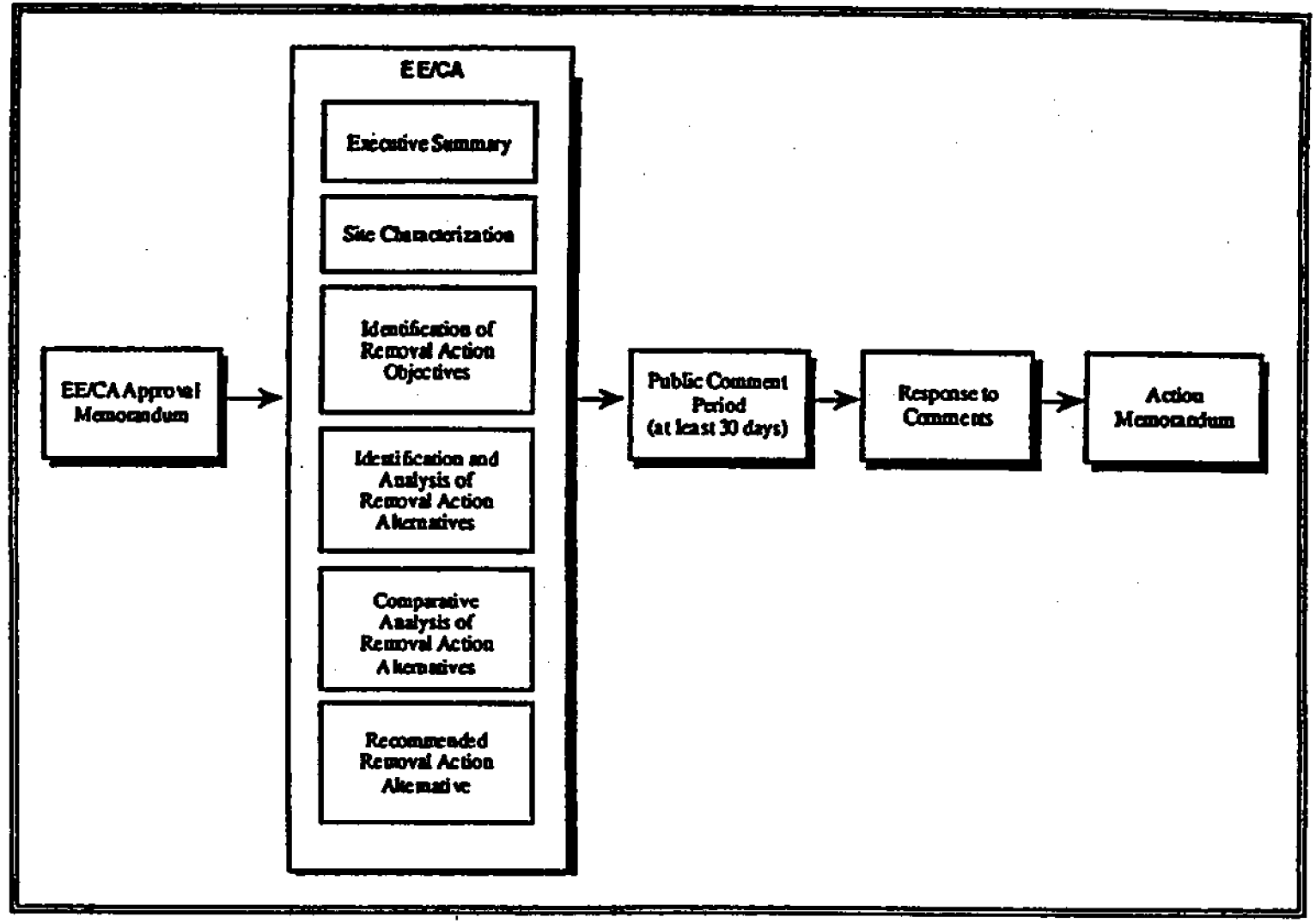


Figure 3
EE/CA DEVELOPMENT PROCESS

SOURCE: EPA, 1993.

FORMER CAMP CROFT ARMY TRAINING FACILITY
SPARTANBURG, SC

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE

TO BE PROVIDED

Figure 4

SASR POTENTIAL OE SAMPLING SITES

SOURCE: ESE 1995; USGS 1983

APPROXIMATE BOUNDARY OF FORMER CAMP CROFT AREA

BOUNDARY OF CROFT STATE PARK

POTENTIAL OE SITES (IDENTIFIED FROM AERIAL PHOTOGRAPHS)

POTENTIAL OE SITES (IDENTIFIED FROM INTERVIEWS)

GROUPING OF POTENTIAL OE SITES

NOTE: SITE 48 WAS NOT LOCATED PRIOR TO PREPARATION OF THIS FIGURE.

0 500 1000
METERS

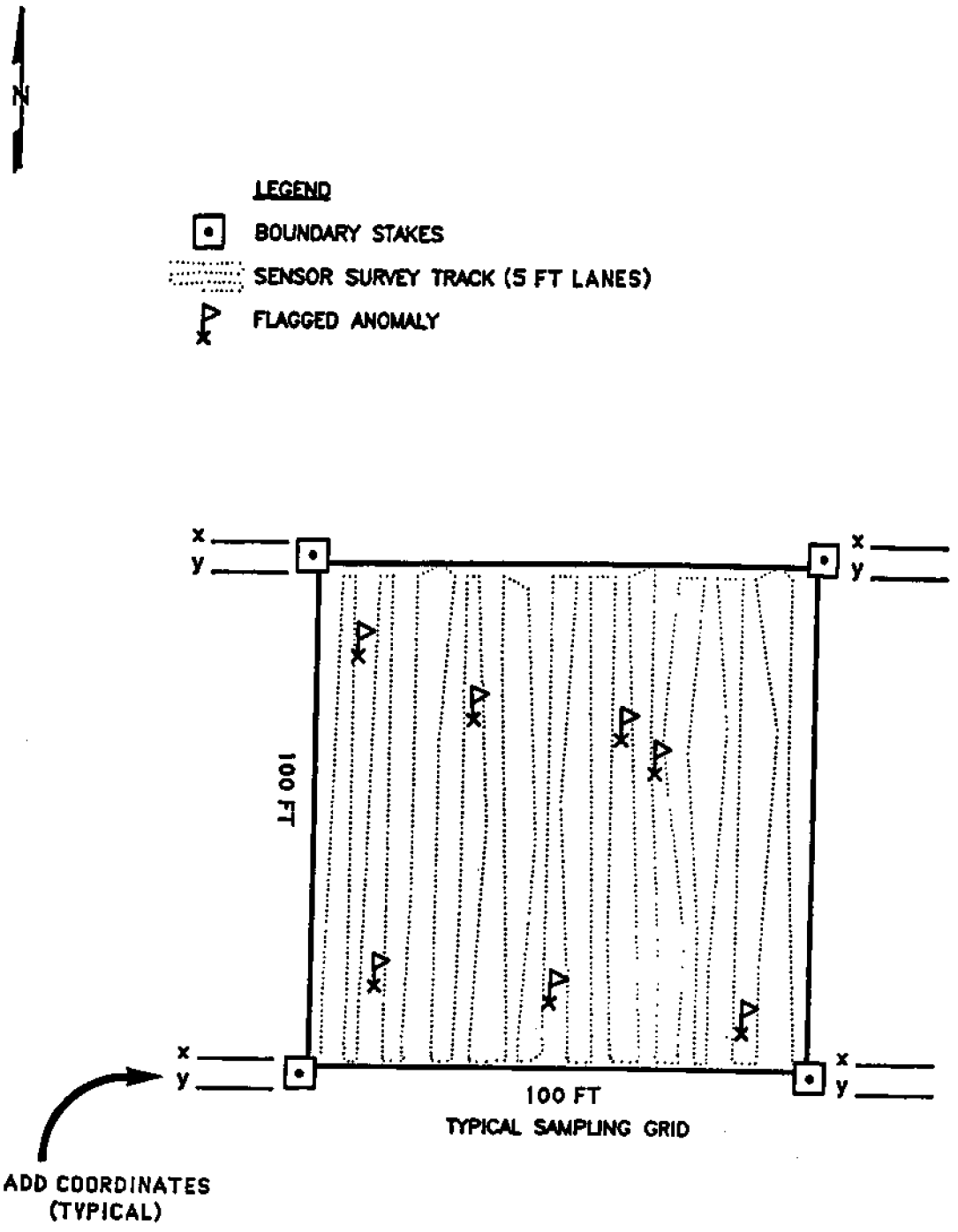
0 1500 3000
FEET

N

SCALE: 1" = 1500FT

FORMER CAMP CROFT ARMY TRAINING FACILITY
SPARTANBURG, SC

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE



Page ____ of ____

Figure 5
TYPICAL EE/CA SAMPLING SITE
GEOPHYSICAL SENSOR SURVEY LAYOUT
(5-FT CENTERS) MAGNETOMETER PROTOCOL

SOURCES: EODT, 1994; ESE.

FORMER CAMP CROFT ARMY TRAINING FACILITY
SPARTANBURG, SC

U.S. ARMY ENGINEERING AND SUPPORT CENTER
HUNTSVILLE

Appendix A

Scope of Work

APPENDIX A
ANNEX AA
STATEMENT OF WORK
ADDITIONAL WORK FOR
ENGINEERING EVALUATION/COST ANALYSIS
FORMER CAMP CROFT
SPARTANBURG, SOUTH CAROLINA
06 Aug 1996

1. OBJECTIVE

Perform additional work to complete the entire former Camp Croft Engineering Evaluation/Cost Analysis (EE/CA), in accordance with the National Contingency Plan (NCP) and the special requirements of this Scope of Work (SOW). The EE/CA for the entire former Camp Croft site will be used as the basis for the selection of the corrective action in order to reduce public safety risk associated with Ordnance and Explosives (OE). The A-E shall coordinate closely with the Contracting Officer and other contractors performing the removal of OE or other investigative work on site. The removal may be performed at the same time as this additional work.

2. BACKGROUND

The work required under this Scope of Work (SOW) falls under the Defense Environmental Restoration Program - Formerly Used Defense Sites. OE contamination exists on property formerly owned by the Department of the Army.

2.1 General. OE is a safety hazard and constitutes an imminent endangerment to the public. These actions will be performed in substantial compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP). For any actions on site, no Federal, State, or Local permits are required. The provisions of 29 CFR 1910.120 shall apply to all actions taken at this site.

2.2 This site is not a suspected Chemical Warfare Material (CWM) site. However, if the A-E encounters suspected CWM during work, the A-E shall immediately withdraw from the work area and

notify the Corps of Engineers on-site Safety Specialist or the CEHNC project manager for guidance. The Huntsville Center Safety Office will notify the Technical Escort Unit (TEU). The A-E shall, after coordination with the CEHNC Safety Specialist, move to another work site and continue work under this Scope of Work (SOW).

2.3 Site Description. Camp Croft was established as a World War II Army Infantry Replacement Training Center on 10 January 1941. The camp consisted of two general areas: a series of firing ranges; and a troop housing area with attached administrative headquarters. Camp Croft is located approximately five miles southeast of Spartanburg, South Carolina and encompassed approximately 19,045 acres. The following are areas of concern, as related to OE:

2.3.1 Training Range Impact Area. This area of present-day Croft State Park is suspected to be contaminated with OE that would have been generated during small arms ammunition and mortar training conducted by infantry troops. Ordnance waste located includes .30 caliber small arms, 60 mm and 81 mm mortars, 105 mm illumination projectiles, and 20 mm projectile evidence, hand grenades, and fuzes. There are approximately 16,929 acres that classified as the range impacts areas. There are two campgrounds located within the park area for an estimated 100 acres total. Hiking trails, roads, parking lots, and Craig Lake are also located in the impact area.

2.3.2 Gas Chambers and Gas Obstacle Course Area. The gas chambers and obstacle course were located on land east of Kohler parking lot. These structures have been removed and no chemical ordnance or other evidence of past chemical training were found. Gas chambers and obstacle course area are located on approximately 199 acres.

2.3.3 Cantonment Area. The cantonment area is presently used as Camp Croft residential area. The size of the cantonment area is approximately 167 acres. Some Camp Croft-era structures still remain at the present time.

2.3.4 Grenade Court. The Grenade court is approximately 175 acres in size. The site is being graded for construction. There are no evidence of OE located at this site.

3. TASK 1- PREPARE A WORK PLAN

The A-E shall prepare an abbreviated Work Plan to accomplish this Delivery Order for approval. The Work Plan must be approved by the Contracting Officer prior to the start of any field work.

4. TASK 2- PREPARE SUPPLEMENTAL ARCHIVE SEARCH REPORT (SASR)

The A-E shall provide a team of professionals to perform additional SASR for the former Camp Croft site. The team shall visit the site to collect additional information, interview knowledgeable local populace, and prepare the SASR for the site. The A-E shall coordinate with the CEHNC project manager to obtain local point of contacts that shall be interviewed. The A-E shall provide all logistical supports for a public meeting to be held at Spartanburg, SC. This shall include mailing the notification to all persons on the mailing list. All cost associated with this public meeting shall be paid by the A-E. The A-E shall provide a senior UXO supervisor to assist in this public meeting. The Government will conduct the public meeting. The A-E shall obtain approval from the Contracting Officer prior to performing this task.

5. TASK 3- PERFORM SITE RECONNAISSANCE OF ADDITIONAL SAMPLING AREAS

The A-E shall prepare a supplemental Safety Plan for approval prior to the start of this task. The A-E shall perform site reconnaissance of all of the proposed additional sampling areas. Conditions of the proposed sampling areas shall be recorded and photographed. The results of this task shall be included in the supplemental engineering report.

6. TASK 4- PUBLIC MEETINGS

6.1 The A-E shall attend meetings to be held at the site or CEHNC to discuss project status, progress, and plans for future activities. These meetings will involve personnel from the Government. The A-E shall provide a minimum of two professionals,

thoroughly familiar with the project, at the minimum of one meetings. The meetings should last not more than one day. The A-E shall be required to provide technical support and other support as directed by the Contracting Officer for the Public Involvement.

6.2 The A-E shall provide all logistical support for up to three public meetings to be held at the site. This shall include mailing the notification to all persons on the mailing list. All cost associated with this public meeting shall be paid by the A-E. The A-E shall provide a senior UXO supervisor to assist in this public meeting. The Government will conduct the public meeting. The A-E shall obtain approval from the Contracting Officer prior to performing this task.

6.3 The A-E shall provide all logistical support for up to two additional public meetings to be held at the site. This shall include a pre-brief to Government personnel at the A-E's office prior to the public meeting. Logistical support shall include mailing the notification to all persons on the mailing list. All costs associated with the public meeting shall be paid by the A-E. The A-E shall provide a Senior UXO Supervisor to assist in this public meeting. The Government will conduct the public meeting. The A-E shall obtain approval from the Contracting Officer prior to performing this task.

7. TASK 5- PROJECT MANAGEMENT

The A-E shall, during the life of this Delivery Order, manage this Delivery Order in accordance with the SOW, Appendix A. All project management associated with this Delivery Order, with the exception of direct technical oversight of work described in the preceding and following tasks, shall be accounted for in this task.

8. SCHEDULE

Task	Date
Draft Work Plan	7 Apr 95
Final Work Plan	19 Apr 95
Draft SASR	21 Jul 95
Final SASR	5 Sep 95

Draft Engineering Report	3 Oct 95
Final Engineering Report	16 Oct 95
Draft Work Plan for EE/CA	15 Jul 96
Receive Government Comments	1 Aug 96
Draft Final WP for EE/CA	1 Oct 96
Receive Government Comments	15 Oct 96
Final Work Plan for EE/CA	1 Nov 96
Pre-Draft EE/CA	3 Feb 97
Receive Government Comments	21 Feb 97
Draft EE/CA	7 Mar 97
Public Meeting	24 Mar 97
Final EE/CA	25 Apr 97
Draft Action Memorandum	7 Mar 97
Receive Government Comments	18 Apr 97
Final Action Memorandum	9 May 97

All work and services under this delivery order shall be completed by 30 Jun 97.

8.1 Review Comments. The A-E shall review all comments received through the CEHNC Project Manager and evaluate their appropriateness based upon their merit. The A-E shall incorporate all applicable comments and provide a written response to each comment as an attachment to the next submittal.

8.2 Identification of Responsible Personnel. Each submittal shall identify the specific members and title of the subcontractor and A-E's staff which had significant input into the report. All final submittal shall be sealed by the registered Professional Engineer-In-Charge.

8.3 Correspondence. The A-E shall keep a record of phone conversation and written correspondence affecting decisions relating to the performance of this delivery order. A summary of the phone conversation and copy of written correspondence shall be submitted to the Contracting Officer with the monthly progress report.

8.4 Monthly Progress Report. The A-E shall prepare and submit monthly progress reports describing the work performed since the previous report, work currently underway and work anticipated. The report shall state whether current work is on schedule. If the work is not on schedule, the A-E shall state

what actions are taken in order to get back on schedule. The report shall be submitted to the Contracting Officer not later than the 10th day of each calendar month.

8.5 Computer Files. All final text files generated by the A-E under this delivery order shall be furnished to the Contracting Officer in WordPerfect, IBM PC compatible format. All drawings shall be on reproducible (mylar) and design file compatible with CEHNC GIS System.

8.6 Public Affairs. The A-E shall not publicly disclose any data generated or reviewed under this contract. The A-E shall refer all requests for information concerning the site condition to CEHNC Project Manager. Reports and data generated under this delivery order are the property of the Department of Defense and distribution to any other sources by the A-E, unless authorized by the Contracting Officer, is prohibited.

8.7 Addressee.

	Copies
US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE ATTN: CEHNC-OE-DG (Ms. Patti Berry) 4820 University Square HUNTSVILLE, AL. 35816-1822	6
US ARMY ENGINEER DISTRICT, CHARLESTON ATTN: CESAC-EN-PR (Mr. Wayne Bogan) P.O. BOX 919 CHARLESTON, SC. 29402-0919	Draft WP, 4 Final WP, 10 Pre-Draft EE/CA, 4 Draft EE/CA, 10 Final EE/CA, 10
HEADQUARTERS, US ARMY CORPS OF ENGINEERS ATTN: CEMP-RF (Mr. Jim Coppola) Room 2214-C 20 Massachusetts Avenue Washington, D.C. 20314-1000	1
COMMANDER 547th EXPLOSIVE ORDNANCE DETACHMENT (EODCT) Ft. GILLEM FOREST PARK, GA. 30050-5000	1

PARK SUPERINTENDENT
CROFT STATE PARK
ATTN: Mr. Gerry Perry
450 CROFT STATE PARK ROAD
SPARTANBURG, SC. 29302

9. TASKS 6, 7, & 8 - PREPARE EE/CA FOR THE DEVELOPING AREAS, THE PARK AREAS, AND THE NON-DEVELOPING AREAS

The A-E shall prepare one EE/CA for the developing areas, the park areas, and the non-developing areas. As part of this task, the A-E shall prepare an additional WP and propose the OE sampling locations. The A-E shall supplement the existing work plan for this task order for the UXO related work. The work plan must include: UXO Operational Plan; Site-Specific Safety & Health Plan (SSHP); Equipment Plan; Environmental Protection Plan; Quality Control Plan; Work, Data, and Cost Management Plan; and Geophysical Investigation Plan. The actual OE sampling will be performed in accordance with "Task 9 - Site Characterization." The results of the sampling will be utilized for the preparation of the EE/CA. The A-E shall utilize a UXO risk assessment model provided by the Contracting Officer to perform the risk assessment. The A-E shall evaluate the risk that the site represents to human health and the environment. The risk evaluated shall be related to the site safety related OE and shall not consider chronic health effects which could result from chemical constituents of OE. The A-E shall collect the data items (for the applicable site type) to be used in the OE Cost/Risk Effectiveness Program (OE Cert). After the site investigation is complete and the baseline site risk is assessed, the A-E shall identify and analyze removal alternatives. Then, based on close consultation with the Contracting Officer, the A-E shall recommend a preferred removal alternative. The EE/CA report shall be prepared in accordance with the guidance contained in "Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA." The A-E shall obtain approval from the Contracting Officer prior to the start of this task. Schedules to complete this task will be as directed at the time this task is approved.

10. TASK 9 - SITE CHARACTERIZATION

The A-E shall characterize the sites for developing, park, and non-developing areas identified in the approved Work Plan by implementing the work described in the Work Plan and including but not necessarily limited to the following activities:

10.1 Geophysical Investigations. The A-E shall implement geophysical investigations as described in the approved Work Plan.

10.2 Intrusive Investigations. The A-E shall, utilizing qualified personnel, implement site UXO sweeps as described in the approved Work Plan in order to actually locate OE at these sites. The A-E shall identify in the Work Plan a percent of the total anomalies to be excavated for each particular site, up to a maximum number of excavations for each given site. This excavation is intended for site characterization and not complete OE removal.

10.2.1 UXO Destruction. The A-E will be responsible for the destruction of UXO encountered during site investigations and characterizations utilizing an approved UXO subcontractor and in accordance with all aspects of the project Work Plan.

10.3 Surveying. The A-E shall perform all location surveys and mapping required to establish boundaries of areas identified in the approved Work Plan and as required to support the project. During all field and intrusive activities, the survey crew shall be accompanied by a UXO Specialist who shall perform a UXO survey in each area prior to the surveyors starting work. Based on site conditions, it is possible that a UXO escort will not be required in all areas at all times after the initial site visit. However, such a decision will be made jointly by the on-site Safety Officer and CEHNC Safety Specialist who may rescind or modify it at any time. Grid corners shall be established using precision surveying methods. Each corner of each grid area shall be located by establishing the appropriate state plane gird system to the closest 1 foot and shall be both tabulated and shown on maps of the site. Other coordinate systems and accuracy specifications are not acceptable and shall not be used. The A-E shall mark and survey the corners of the designated grids with

stakes or other visible temporary markers. Individual locations of recovered UXOs only shall be tape measured or the x and y distance estimated to obtain a horizontal accuracy of plus or minus one foot from the established grid corners. If subsurface UXOs are encountered, their depth below ground surface shall also be measured. The location of ordnance scrap, ordnance fragments, shrapnel, small arms ammunition, and metallic debris shall be recorded only on a per-grid basis and not located by coordinates. The use of Total Station, GPS, or other precision survey method to locate individual UXOs, UXO scrap, or geophysical anomalies within a grid shall not be performed. A magnetometer shall be used to survey the location for the establishment of any monuments or markers.

10.3.1 Items and data to be submitted to CEHNC as part of this task are as follows:

10.3.1.1 A tabulated list of all control points and a list of all adjusted coordinates established and/or used for this survey.

10.3.1.2 Electronic copies of all survey data, maps, or boundary controls information developed during this action. These files shall include all CADD drawings in Microstation (Version 5.0) format, all raw field notes, or any GPS triangulations in ASCII format.

11. TASK 10 - EE/CA ACTION MEMORANDUM

After the EE/CA has been approved by the Contracting Officer, the A-E shall prepare an EE/CA Action Memorandum in accordance with the EPA Guidance Document, "Superfund Removal Procedures, Action Memorandum Guidance, OSWER Dir. 9360.3-01, December 1990."

12. HEALTH AND SAFETY PLAN

12.1 Safety and Health Program. The Occupational Safety and Health Administration (OSHA) requires all employers performing on-site activities to develop and maintain an ongoing written Safety and Health Program in compliance with OSHA Standard 29 CFR 1910.120(b)/29 CFR 1926.65(b). The program,

including updates, shall be made available on request.

12.2 Site Safety and Health Plan (SSHP). The SSHP required by 29 CFR 1910.120(b)/29 CFR 1926.65(b)(4), and as defined by this SOW, shall be prepared and submitted. On-site activities shall not commence until the plan has been reviewed and accepted. The SSHP shall describe the site-specific safety and health procedures, practices and equipment to be implemented and utilized in order to protect affected personnel from the potential hazards associated with the site-specific tasks to be performed. The level of detail provided in the SSHP shall be tailored to the type of work, complexity of operations to be accomplished and the hazards anticipated. The A-E shall address all elements contained in Appendix B of ER 385-1-92 in preparing the SSHP. Where the use of a specific topic is not applicable to the project, the A-E shall provide a negative declaration to establish that adequate consideration was given of the topic and give a brief justification for its omission. Information readily available in standards texts shall be repeated only to the extent necessary to meet the requirements of this SOW. The SSHP shall not duplicate general information contained in the Safety and Health Program that is not specifically related to this project.

Appendix B

Former Camp Croft Training Facility EE/CA Schedule

APPENDIX B

FORMER CAMP CROFT TRAINING FACILITY
EE/CA SCHEDULE*

Task	Date
Draft Final Work Plan for EE/CA	05 Nov 96
Receive Government Comments	22 Nov 96
Final Work Plan for EE/CA	09 Dec 96
EE/CA Sampling Mobilization	13 Jan 97
Pre-Draft EE/CA	25 Apr 97
Receive Government Comments	15 May 97
Draft EE/CA	29 May 97
Public Meeting	10 Jun 97
Draft Action Memorandum	12 Jun 97
Receive Government Comments	03 Jul 97
Final EE/CA	24 Jul 97
Final Action Memorandum	24 Jul 97
Delivery Order Completion	30 Aug 97

*Note: EE/CA document submittal dates will be dependent upon the actual approved number of sites that are sampled and field time duration.

Appendix C

Explosives Safety Precautions

TABLE OF CONTENTS

Revised February 16, 1996

U.S. Army Engineering and Support Center, Huntsville

SAFETY CONCEPTS AND BASIC CONSIDERATIONS FOR UNEXPLODED ORDNANCE (UXO) OPERATIONS

1. Introduction. There is no "safe" procedure for dealing with UXO, merely procedures which are considered least dangerous. However, maximum safety in any UXO operation can be achieved through adherence to applicable safety precautions, a planned approach and intensive supervision. Only those personnel absolutely essential to the operation shall be allowed in the restricted/exclusion area during UXO operations (DoD 6055.9-STD). Safety must become a firmly established habit when working with UXO. Safety is the leading edge of quality.

2. References. The following documents form a part of this document to the extent referenced.

ATFP 5400.7	Alcohol Tobacco and Firearms Explosives Laws and Regulations
27 CFR Part 55	Commerce in Explosives
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1926	Safety and Health Regulations for Construction
49 CFR 100-199	Transportation
DoD 6055.9-STD	DoD Ammunition and Explosives Safety Standards
DA Pam 385-64	Ammunition and Explosives Safety Standards
ETL 385-1-2	Generic Scope of Work for Ordnance Avoidance Activities
TM 9-1300-200	Ammunition General
TM 9-1300-214	Military Explosives
TM 9-1375-213-12	Operator's and Organization Maintenance Manual (Including Repair Parts and Special Tools List); Demolition Materials

3. Definitions

a. Unexploded Ordnance (UXO). An item of ordnance which has failed to function as designed, or has been abandoned or discarded, and is still capable of functioning and causing injury to personnel or damage to material.

b. UXO Procedures. UXO procedures include but are not limited to the following actions:

(1) Gaining access to (manual excavation) and identifying subsurface anomalies, and assessing condition of buried UXO.

(2) Identifying and assessing condition of surface UXO.

(3) Recovery and final disposal of all UXO.

c. UXO Related procedures: UXO related procedures include but are not limited to the following:

(1) Location and marking of subsurface anomalies.

(2) Location and marking of suspected surface UXO.

(3) Transportation and storage of recovered UXO.

(4) Utilizing Earth Moving Machinery (EMM) to excavate soil to no closer than approximately 12 inches of a subsurface anomaly.

d. UXO Qualified Personnel: UXO qualified personnel are US citizens who have graduated from the US Army Bomb Disposal School, Aberdeen, MD, or the US Naval Explosive Ordnance Disposal (EOD) School, Indian Head, MD. Graduates of the EOD assistant Course, Redstone Arsenal, AL, or Elign AFB, FL with more than three years combined active duty military EOD and contractor UXO experience shall also be UXO qualified.

4. General Safety Concerns.

a. UXO operations shall not be conducted until a complete plan for the operation involved is prepared and approved. Plans shall be based upon limiting exposure to a minimum number of personnel, for a minimum time, to the minimum amount of UXO, consistent with safe and efficient operations.

b. Only UXO qualified personnel shall be involved in UXO procedures. Non-UXO qualified personnel may be utilized to perform UXO related procedures when supervised by UXO qualified personnel. All personnel engaged in operations shall be thoroughly trained in explosive safety and be capable of recognizing hazardous explosive exposures.

c. The use of electroexplosive devices (EED) susceptible to electromagnetic radiation (EMR) devices in the radio frequency (RF) range, that is, radio, radar, and television transmitters, has become almost universal.

d. Some ordnance is particularly susceptible to EMR (RF) emission.. A knowledge of ordnance that is normally unsafe in the presence of EMR (RF) is important so preventive steps can be taken if the ordnance is encountered in a suspected EMR (RF) field.

(2) The presence of antennas, communication and RADAR devices should be NOTED on initial site visits and/or preliminary assessments.

(3) When potential EMR hazards exist, the site shall be electronically surveyed for EMR/RF emissions and the appropriate actions will be taken. Minimum safe distances from EMR/RF sources are listed in Tables 2-2, 2-3, and 2-4 of TM 9-1375-213-12.

f. Do not wear outer or undergarments made of materials which have high static generating characteristics when working on UXOs. Materials of 100 percent polyester, nylon, silk, or wool are highly static-producing. Any person handling a UXO suspected of containing EEDs will ground himself/herself prior to touching the UXO. Refer to DA Pam 385-64 for more information regarding non-static producing attire.

5. UXO Safety Precautions for Site Characterization.

a. Make every effort to identify the UXO. Visually examine the item for markings and other identifying features such as shape, size, and external fittings. However, do not move the item to inspect it. If an unknown UXO is encountered, the US Army Engineering and Support Center, Huntsville (USAESCH) representative will be notified.

b. Foreign UXO were returned to the United States for exploitation and disposal. When a records search indicates the possibility of foreign UXO being on a site, appropriate safety precautions and procedures will be incorporated into UXO operation plans.

c. Any time a suspected chemical munition is encountered, all personnel will withdraw up wind from the munition. A two person UXO team, located upwind, shall secure the munition until relieved by the Technical Escort Unit (TEU) or Explosive Ordnance Disposal (EOD) personnel.

d. Ordnance items which penetrate the earth to a depth where the force of the explosion is not enough to rupture the earth's surface forms an underground cavity called a camouflet. Camouflets will be filled with the end product of the explosion,

carbon monoxide gas. Camouflet detection and precautions must be considered if a records search indicates the site was used as an impact area.

e. Avoid inhalation of, and skin contact with, smoke, fumes, and vapors of explosives and related hazardous materials.

f. Consider UXO which has been exposed to fire and detonation as extremely hazardous. Chemical and physical changes may have occurred to the contents which render it much more sensitive than it was in its original state.

g. Do not rely on the color coding of UXO for positive identification of contents. Munitions having incomplete, or improper color coding have been encountered.

h. Avoid the area forward of the nose of a munition until it can be ascertained the item does not contain a shaped charge. The explosive jet can be fatal at great distances forward of the longitudinal axis of the item. Assume any shaped charge munitions to contain a piezoelectric (PZ) fuzing system until the fuzing system is positively identified. A PZ fuze is extremely sensitive, can function at the slightest physical change, and may remain hazardous for an indefinite period of time.

i. Examine a projectile for the presence or absence of an unfired tracer. Also examine the item for the presence or absence of a rotating band and it's condition.

j. Approach an unfired rocket motor from the side. Ignition will create a missile hazard and hot exhaust.

(1) Do not expose rocket motors to any EMR source.

(2) If an unfired rocket motor must be transported, it shall be positioned in the direction which offers the least exposure to personnel in the event of an accidental ignition.

k. Consider an emplaced landmine armed until proven otherwise. It may not be possible to tell, or it may be intentionally rigged to deceive.

(1) Many training mines contain firing indicator charges capable of inflicting serious injury.

(2) Exercise care with wooden mines that have been buried for a long time. Because of soil conditions, the wood deteriorates and the slightest inadvertent pressure/movement may initiate the fuze.

l. Assume a practice UXO contains a live charge until it can be determined otherwise. Expended pyrotechnic/practice devices may contain red/white phosphorus residue. Due to incomplete combustion, phosphorous may be present

and reignite spontaneously if subjected to friction or the crust is broken and the contents exposed to air."

m. Do not approach a smoking white phosphorus (WP) UXO. Burning WP may detonate the burster or dispersal explosive charge at any time.

n. If the positive identification of suspected explosive materials is required, procedures in Chapter 13, TM 9-1300-214, " Military Explosives" or other approved explosives analysis shall be used to identify the explosives.

6. Ordnance Avoidance for HTRW Activities.

a. Investigative activities on potential ordnance contaminated sites will be accomplished using approved ordnance avoidance procedures.

b. HTRW ordnance avoidance procedures are detailed in Engineering Technical Letter 385-1-2. This ETL is available on the Internet, or through the Quality and Technology team at USAESCH.

7. Restricted/Exclusion Area Operations.

a. On Ordnance and Explosives sites, the contractor's site safety personnel shall establish a restricted/exclusion area for each UXO team operating on the site. The purpose of the area is for the protection of the public and other personnel from the blast and fragmentation hazards of an accidental detonation. The area shall be establish based on the following minimum factors:

(1) Previous site use that caused the contamination: impact area, open burn/ open detonation, burial, etc..

(2) Project type: surface clearance, subsurface clearance, sifting operation, sampling, etc..

(3) Known ordnance contamination, distances to public exposure, terrain, etc..

b. When multiple UXO teams are operating on a site, the restricted/exclusion area and team separation distances shall never be less than 200 feet.

c. During the time frame that UXO operations are being accomplished, only personnel necessary for the UXO operation shall be within the restricted/exclusion area. When non-essential personnel enter the restricted/exclusion area, all UXO operations will cease.

(1) Plan for, provide, and know the measures to be taken in the event of an accident.

(2) Provide a designated emergency vehicle in the area in case of an accident or other emergency.

(3) Coordination with the appropriate airspace representative shall be conducted and the appropriate notification procedures arranged.

(4) When non-essential personnel must enter the restricted/exclusion area, the following must be accomplished: a) The individual must receive a safety briefing, b) be escorted by a UXO qualified individual; and c) All UXO operations must cease within the fragmentation radius of the largest item expected to be encountered within the area.

d. Before any movement of a UXO, the fuze condition must be ascertained. If the condition is questionable, consider the fuze to be armed. The fuze is considered the most hazardous component of a UXO, regardless of type or condition.

(1) In general, a projectile containing a Base Detonating (BD) fuze is to be considered armed if the projectile has been fired.

(2) Arming wires and pop out pins on unarmed fuzes should be secured by taping in place prior to movement.

(3) Do Not dismantle or strip any UXO.

(4) Do Not depress plungers, turn vanes, or rotate spindle, levers, setting rings, or other external fittings on UXO's. Such actions may arm, actuate, or function the UXO.

(5) Do Not subject mechanical time fuzes to any unnecessary movement.

(6) Do Not remove any fuzes from UXO's.

(7) Some ordnance items do not contain any positive safety features. Positively identify and review all safety precautions prior to handling any ordnance.

e. Personnel working within the Restricted area/Exclusion zone shall comply with the following:

(1) Do not conduct operations without an approved Site Specific Safety and Health Plan and an approved Work Plan.

(2) Do not smoke, except in authorized areas.

(3) Do not have fires for heating or cooking, except in authorized areas.

(4) Do not conduct explosive operations during electrical, sand, dust, or snow storms.

(5) Explosive operations will be conducted during daylight only.

(6) During magnetometer operations, UXO teams shall not wear safety shoes or other footwear which would cause the magnetometer to present a false indication.

f. Do not undertake the handling or disposal of liquid propellant fuels or oxidizers if not familiar with the characteristics of the material.

g. Civil War projectiles shall be treated as any other UXO.

h. If records search indicated WP munitions were fired or destroyed in the area, extra care shall be taken when uncovering a buried UXO, A buried WP munition may be damaged and when exposed to air, may start burning and detonate. An ample supply of water and mud shall be immediately available if excavation reveals a WP UXO. Appropriate protective equipment (leather gloves, face shield, and flame-retardant clothing) and first aid shall also be immediately available.

8. Storage.

a. During Ordnance and Explosives projects, storage of explosives and UXO fall into two categories.

(1) On-DoD Installations.

(2) Off-DoD Installations.

b. On-DoD Installation Storage.

(1) The provisions of DoD 6055.9-STD shall be followed. Generally, an installation should have an explosive storage area that meets requirements in DoD 6055.9-STD. Permitting and compliance requirements for existing facilities are an installation responsibility. Compatibility of explosives found in Chapter 3, DoD 6055.9 -STD shall be complied with. UXO awaiting disposal shall not be stored with other explosives.

(2) If an installation does not have an existing storage facility, the provisions of paragraph c. below shall apply.

c. Off-DoD Installation Storage.

(1) Generally, the contractor is responsible for construction of a temporary explosive storage area that meets all local, state, ATF requirements, and as much of DoD 6055.9-STD that is practical to implement.

(2) When establishing an explosive storage area, the following requirements must be met.

(a) The area shall, if possible, meet the inhabited building and public traffic route distances specified in DoD 6055.9-STD. If the distances are less than

required by DoD 6055.9-STD, then a proposed barricading and berm plan to protect the public from accidental detonation must be submitted and approved.

(b) Magazines must meet requirements of ATF Regulations, and each magazine must have an Net Explosive Weight established for the explosives to be stored.

(c) Each magazine must have lightning protection IAW Chapter 7, DoD 6055.9-STD.

(d) Magazines must meet intramagazine distances as defined in Chapter 9, DoD 6055.9-STD.

(e) A physical security survey shall be conducted to determine if fencing or guards are required. Generally, a fence around the magazines is needed, but the contractor is responsible to determine the degree of protection required to prevent the theft of explosives and UXO.

d. A fire plan for the storage area shall be prepared and coordination with the nearby fire department shall be conducted. Placarding of magazines shall be in accordance with local, state, and federal requirements.

9. Excavation Operations.

a. The usual method for uncovering buried UXO is to excavate by hand. Hand excavation is the most reliable method for uncovering UXO, but unless the UXO is very near the surface, hand excavation exposes more people to the hazard of detonation for a longer period of time than any other method. Hand excavation will be accomplished only by UXO qualified personnel.

b. Earth moving machinery (EMM) may be used to excavate buried UXO, if the UXO is estimated to be deeper than 12 inches. EMM shall not be used to excavate within 12 inches of an UXO. When excavation gets within approximately 12 inches of an UXO, hand excavation shall be used to uncover the UXO. EMM may be operated by non-UXO personnel, under the direct supervision of UXO personnel.

(1) If more than one EMM will be used on the same site, they will be separated by the same separation distances required for multiple teams on that site.

(2) During excavation operations, only those personnel absolutely necessary for the operation shall be within the restricted area/exclusion zone.

(3) Excavation and trenching shall comply with the provisions of 29 CFR 1926 subpart P.

10. Disposal Operations.

a. As a general rule, UXO will be detonated in place when the situation allows. All detonation-in-place operations shall be conducted by electrical means to assure

maximum control of the site, except in situations where static electricity or EMR hazards are present. Non-electrical means can be used when the situation dictates.

(1) Do not allow one person to work alone in disposal operations. At least one person shall be available near the disposal site to give warning and assist in rescue activities in the event of an accident.

(2) Loose initiating explosives include lead azide, mercury fulminate, lead styphnate, and tetracene. These explosives manifest extreme sensitivity to friction, heat, and impact. Extra precautions may be required when handling these types of explosives. Keep initiating explosives in a water-wet condition at all times until ready for final preparation for detonation, the sensitivity of these explosives is greatly increased when dry.

(3) Only condition "Code A" or "Code C" explosive items shall be used as donor explosives for disposal operations.

(4) Exercise extreme care in handling and preparing high explosives for detonation. They are subject to detonation by heat, shock, and friction.

(5) Do not pack bomb fuze wells with explosives unless it can be positively confirmed that the fuze well does not contain any fuze components.

(6) Photo flash bombs must be handled with the same care as black powder filled munitions.

(7) WP UXO shall not be detonated into the ground. The UXO shall be counter-charged on the bottom center line when possible.

b. The following safety rules will be adhered to at all times:

(1) Carry blasting caps in approved containers and keep them out of the direct rays of the sun, and located at least 25 feet from other explosives, until they are needed for priming.

(2) Do not handle, use, or remain near explosives during the approach or progress of an electrical storm. All persons should retire to a place of safety.

(3) Do not use explosives or accessory equipment that is obviously deteriorated or damaged. They may cause a premature detonation or fail completely.

(4) Always point the explosive end of a blasting cap, detonators, and explosive devices away from the body during handling.

(5) Use only standard blasting caps of at least the equivalent of a commercial No. 8 blasting cap.

(6) Use electric blasting caps of the same manufacture for each demolition shot involving more than one cap.

(7) Do not bury blasting caps. Use detonating cord to position blasting caps above the ground. Buried blasting caps are subject to unobserved pressures and movement which could lead to premature firing or misfires.

(8) Test electric blasting caps for continuity at least 25 feet from any other 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 be connected to the firing circuit.

c. When disposing of explosives by detonation, do not approach the disposal site for at least thirty minutes, after the expected detonation time, in the event of a misfire. When conducting non-electric procedures, the wait time shall be thirty minutes plus time fuse burn time.

d. A post-search of the detonation site shall be conducted to assure a complete disposal was accomplished.

e. If the situation dictates, protective measures to reduce shock, blast, and fragmentation shall be taken. Army Technical Manual (TM) 5-855-1, Fundamentals of Protective Design for Conventional Weapons, contains data on blast effects, ground shock, cratering, ejection, and fragmentation. The following distances shall be used unless protective measures are implemented.

(1) For non-fragmenting explosive materials, evacuation distance should be a minimum of 1250 feet.

(2) For fragmenting explosive materials, evacuation distance should be a minimum of 2500 feet. For bombs and projectiles with caliber 5-inch or greater, use a minimum evacuation distance of 4000 feet.

(3) Items with lugs, strong backs, tail plate sections, etc., should be oriented away from personnel locations as these items tend to travel further than normal fragmentation.

f. Consideration should be given to tamping the UXO to control fragments, if the situation warrants. Fragments shall be minimized not only to protect personnel but also property, such as buildings, trees, etc.

g. Open burning of explosives and smokeless powder or chemical decomposition of explosives shall not be accomplished without prior approval of the contracting officer.

(1) Do not inhale the smoke or fumes of burning pyrotechnic or incendiary materials. The fumes and dust from many of these materials are irritating and/or toxic if inhaled.

(2) Do not use water on incendiary fires. Water may induce a violent reaction or be completely ineffective, depending on the mixture.

(3) Anticipate a high order detonation when burning pyrotechnics or incendiary-loaded UXO. Safety measures for personnel and property must be based upon this possibility.

h. Inert Ordnance will not be disposed of or sold for scrap until the internal fillers have been exposed and unconfined. Heat generated during a reclamation operation can cause the inert filler, moisture, or air to expand and burst the sealed casings. Venting or exposure may be accomplished in any way necessary to preclude rupture due to confined pressure.

11. Transportation.

a. If UXO must be transported off-site for disposal , the provisions of 49 CFR 100-199, DA Pam 385-64, state and local laws shall be followed.

b. Armed fuzes will only be transported when absolutely necessary and when all other avenues of "in place" disposal have been exhausted. Transportation to an on-site disposal area for these items is preferred.

c. Do not transport WP munitions unless it is immersed in water, mud, or wet sand.

d. If loose pyrotechnic, tracer, flare, and similar mixtures are to be transported, they shall be placed in #10 mineral oil or equivalent to minimize fire and explosion hazards.

e. Incendiary loaded munitions should be placed on a bed of sand and covered with sand to help control the burn if a fire should start.

f. If an unfired rocket motor must be transported, it shall be positioned in such a manner as to offer the maximum protection to personnel in the event of an accident.

g. If base-ejection type projectiles must be transported to a disposal area or collection point, the base will be oriented to the rear of the vehicle and the projectile secured, in the event the ejection charge functions in route.

h. If an UXO, with exposed hazardous filler (HE, etc), has to be moved to a disposal area, the item shall be placed in an appropriate container with packing materials to prevent migration of the hazardous filler. Padding should also be

added to protect the exposed filler from heat, shock, and friction.

Appendix D

Site-Specific Safety and Health Plan

SITE SAFETY AND HEALTH PLAN
FOR
FORMER CAMP CROFT ARMY TRAINING FACILITY
SPARTANBURG, SOUTH CAROLINA

Prepared for:

U.S. ARMY ENGINEERING AND SUPPORT CENTER
HUNTSVILLE

December 1996

PREFACE

This Site Safety and Health Plan (SSHP) outlines and specifies the work practices and procedures needed to ensure protection of site personnel, the environment, and the local community during the conduct of the site activities at the former Camp Croft Army Training Facility (CCATF), Spartanburg, South Carolina. All site activities will be performed in accordance with this SSHP and applicable U.S. Army Engineering and Support Center, Huntsville (USAESCH), federal, state, and local regulations.

In generating this document; attention has been given to identifying site- and task-specific hazards and to developing hazard control techniques and procedures. The hazard control methods detailed in this SSHP were evaluated and selected to minimize the potential for accident or injury and to safeguard the environment and general public. This SSHP, however, should be considered a living document, and may be subject to change based on review and site implementation of currently identified or additional tasks. Any tasks and their associated documentation that may be added after final approval of this document must be approved by the personnel on the following signature page and the USAESCH Contracting Officer. These additions to the SSHP will be treated as amendments and will not, unless otherwise specified, supersede the approved Work Plan or SSHP.

This SSHP is intended to be used by Environmental Science and Engineering, Inc. (ESE), OES (a Division of ATI), and Ellis Environmental Group ((EEG). It attempts to address the corporate health and safety requirements of ESE and its subcontractors, as they relate to this project. In cases where there are differences in the safety requirements of these organizations, the more stringent requirements will apply.

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

ALS	Advanced Life Saving
ANSI	American National Standards Institute
CBC	complete blood count
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CPR	cardiopulmonary resuscitation
CSHP	Corporate Safety and Health Program
CWM	chemical warfare material
°C	degrees Celsius
DOD	U.S. Department of Defense
DOT	Department of Transportation
EOD	explosive ordnance disposal
ESE	Environmental Science & Engineering, Inc.
°F	degrees Fahrenheit
FM	Factory Mutual Engineering Corp.
ft	foot
gal	gallon
GFCI	ground fault circuit interrupter
HAZWOPER	Hazardous Waste Operations and Emergency Response
hr	hour
HR	heart rate
IHS	industrial hygiene service
mph	miles per hour
MSDS	material safety data sheet
NEC	National Electric Code
NESC	National Electrical Safety Code
NIOSH	National Institute of Occupational Safety and Health
OE	ordnance and explosive waste
OES	Ordnance/Explosives Environmental Services, A Division of ATI
OHP	occupational health program
OHS	occupational health services
OSHA	Occupational Safety and Health Administration
OT	oral temperature
oz	ounce
POL	petroleum, oil, and lubricant
PPE	personal protective equipment
SOP	standard operating procedure
SOW	scope (statement) of work

SSHO	site safety and health officer
SSHP	site safety and health plan
SZ	support zone
TLV	threshold limit value
TWA	time-weighted average
UL	Underwriters Laboratory
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USATEU	U.S. Army Technical Escort Unit
UV	ultraviolet
UXO	unexploded ordnance
WBGT	wet bulb, dry globe temperature
WP	work plan
WWII	World War II
WZ	Work Zone

SSHP APPROVAL

Project: **Camp Croft** Site: **Former Camp Croft Army Training Facility**

Project Number: **3-94-7007G** Site Location: **Spartanburg, South Carolina**

We have reviewed the attached SSHP for the referenced site. We recognize that when this form is completed, the attached SSHP is approved for field activities on the referenced site. Changes to this SSHP will be documented in writing.

Approved by: _____ Date: _____
D. Morton, CIH, ESE

Reviewed by: _____ Date: _____
Robert Momberger, P.G., Project Manager, ESE

SSHP ACKNOWLEDGEMENT

Project: **Camp Croft** Site: **Former Camp Croft Army Training Facility**

Project Number: **3-19-5165G** Site Location: **Spartanburg, South Carolina**

ESE Project Manager: **Robert Momberger, P.G.**
ESE Site Manager: **Mark Bagel**
Site Supervisor: **Wayne Evans, Jr.**
UXO Project Manager: **James H. Adams, Jr.**

ESE Site Health and Safety Officer: **to be determined**
UXO Site Safety and Health Officer: **Darrell Walden**

I acknowledge that I understand the requirements of this SSHP and agree to abide by the procedures and limitations specified. I also acknowledge that I have been given an opportunity to have my questions concerning the SSHP and its requirements answered prior to performing field activities. Health and safety training and medical surveillance requirements applicable to my field activities at this site are current and will not expire during onsite activities.

ESE PERSONNEL

SIGNATURE	EMPLOYEE NO.	DATE

SUBCONTRACTOR PERSONNEL

SIGNATURE	ORGANIZATION	DATE

1.0 INTRODUCTION

1.1 PURPOSE/OBJECTIVES

This Site Safety and Health Plan (SSHP) has been prepared by Environmental Science & Engineering, Inc. (ESE) and Ordnance/Explosives Environmental Services (OES), a Division of ATI, and is designed to anticipate, identify, evaluate, and control safety and health hazards which may be encountered during this engineering evaluation/cost analysis (EE/CA) study at the former Camp Croft Army Training Facility (CCATF), near Spartanburg, South Carolina. This SSHP also describes the response procedures that will be implemented if an emergency arises during the conduct of the site tasks outlined in this document and the Work Plan (WP). All project activities shall be performed in accordance with this SSHP and the references listed in Section 1.2. Where the word "shall" is used, the provisions of this plan are mandatory.

1.1.1 The levels of personal protection and the procedures specified in this plan are based on the best available information from reference documents and current site data. These recommendations represent the minimum health and safety requirements to be observed by all personnel engaged in this project. Unforeseeable site conditions or changes in the Scope of Work (SOW) may warrant a reassessment of protection levels and controls stated. All adjustments to the SSHP must have prior approval by the USAESCH and ESE.

1.1.2 All ESE, OES, and other subcontractor personnel involved in this project shall read this document carefully, understand and comply with it, and complete the SSHP acknowledgement form prior to the start of work. All onsite personnel shall follow the designated safety and health procedures, be alert to the hazards associated with working onsite, and exercise reasonable caution at all times.

1.1.3 Unexploded ordnance (UXO) and hazardous waste pose a serious safety and health problem that endangers human and animal life and environmental quality. The regulations and guidelines listed in Section 1.2 provide employers and employees with information on the potential for injury and illness resulting from hazardous waste operations.

1.2 REGULATIONS AND GUIDELINES

The safety and health of onsite personnel and the local community will be ensured by following all applicable requirements and regulations listed in the following publications:

1. Occupational Safety and Health Administration (OSHA) General Industry Standards, 29 Code of Federal Regulations (CFR) 1910;

2. OSHA Construction Standards, 29 CFR 1926;
3. USAESCH EM 385-1-1;
4. ESE Corporate Health and Safety Program (CHSP);
5. Army Regulation (AR) 385-40 (with USAESCH Supplement 1), Accident Reporting and Records;
6. U.S. Environmental Protection Agency (EPA) Hazardous Waste Management, 40 CFR 260-276, latest edition; and
7. Engineering Regulation (ER) 385-1-92, Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) and Ordnance and Explosive (OEW) Activities, 18 March 1994.
8. OES Corporate Safety and Health Program (CSHP).

1.3 REFERENCES

In addition to the publications and regulations previously listed, the following documents were used as reference material in the preparation of this document:

1. U.S. Department of Defense (DOD) 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives;
2. Occupational Safety and Health Guidance for Hazardous Waste Site Activities, U.S. Department of Health and Human Services, National Institute of Occupational Safety and Health (NIOSH), October 1985; and
3. Threshold Limit Values and Biological Exposure Indices for 1993-94, American Conference of Governmental Industrial Hygienists (ACGIH), 1993.

2.0 SAFETY AND HEALTH ORGANIZATION

2.1 GENERAL

All operations and personnel having exposure potential to site hazards are subject to the requirements of this SSHP. Work may not be performed in a manner that conflicts with the intent of, or the inherent safety, health, or environmental precautions expressed in this SSHP. After due warnings, personnel violating safety procedures will be dismissed from the site.

2.1.1 The safety and health requirements listed in this SSHP may change as site work progresses; however, no changes will be made without approval of USAESCH, ESE, and OES. Figure 2-1 shows the safety and health chain-of-command.

2.2 ESE HEALTH AND SAFETY PERSONNEL

ESE will provide on site management and administrative support during the conduct of field operations and will prepare or approve all USAESCH-required reports and documents. ESE will also have overall responsibility for the health and safety of site personnel operating under this SOW at former CCATF.

2.2.1 CERTIFIED INDUSTRIAL HYGIENIST (CIH)

The ESE CIH, Dan Morton, is responsible for development and oversight of the SSHP. He will coordinate closely with the OES Safety Manager and other subcontractors.

2.2.2 SITE SAFETY AND HEALTH OFFICER (SSHO)

The ESE SSHO for the former CCATF field effort is the site manager, and the OES Site SSHO will be responsible for implementing the SSHP and maintaining all required records.

2.3 OES SITE PERSONNEL

OES will be responsible for providing highly trained site personnel to identify, handle, and remediate UXO, OE, and other hazardous wastes. OES site personnel will have extensive experience in recognizing, evaluating, and handling UXO and chemical hazards.

2.3.1 OES Safety Manager/Quality Assurance Manager (SM/QAM)

OES will have a SM/QAM whose responsibilities will include:

1. Reporting directly to the OES Director on all OES safety and health and quality control matters.

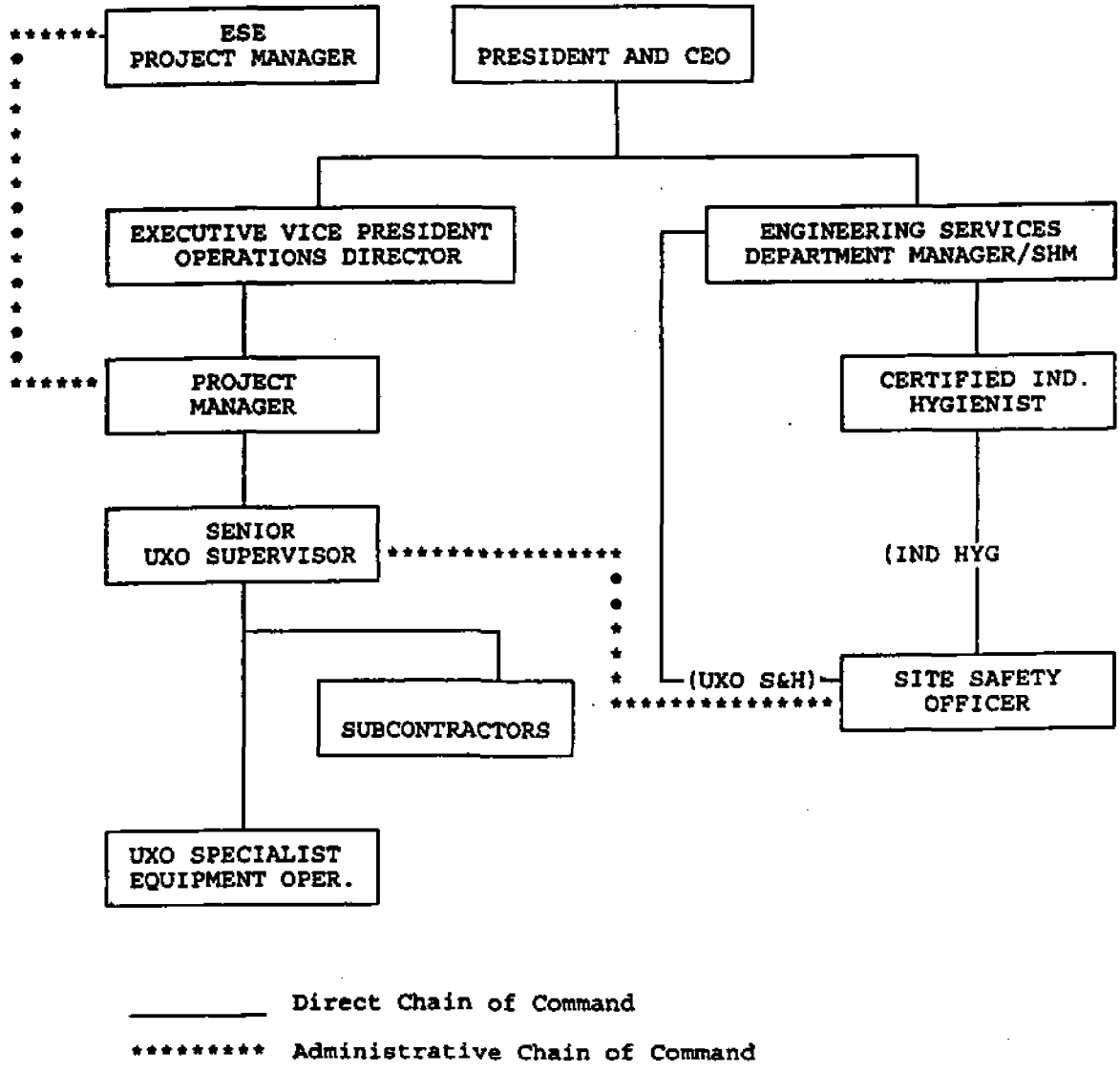


Figure 2-1
SAFETY AND HEALTH ORGANIZATIONAL MANAGEMENT CHART

SOURCE: EDOT; ESE.

FORMER CAMP CROFT ARMY TRAINING FACILITY
SPARTANBURG, SC

U.S. ARMY ENGINEERING AND SUPPORT CENTER
HUNTSVILLE

2. Providing assistance in preparing and conducting a final review of the SSHP, in coordination with ESE CIH.
3. Provides UXO safety and health consultation to the OES Site Safety and Health Officer/Quality Control Specialist (SSHO/QCS) to assure field implementation of the SSHP.
4. Coordinates with the ESE CIH to ensure site compliance with the SSHP and the OES CSHP;
5. Conducting training of OES site personnel.
6. Conducting onsite safety audits every 30 to 45 days.
7. Evaluating and authorizing any changes to the SSHP in conjunction with the ESE CIH.

2.3.2 OES SSHO/QCS

The responsibilities of the OES SSHO/QCS will be as follows:

1. Authorizing STOP WORK for safety and health reasons.
2. Completing personnel data sheets on all OES site personnel.
3. Assisting in developing the SSHP.
4. Implementing and enforcing the SSHP.
5. Conducting daily tailgate safety briefings.
6. Training employees in site-specific hazards and completing the ESE and OES documentation of training form.
7. Specifying proper levels of personal protective equipment (PPE) in accordance with (IAW) the specifications of this SSHP.
8. Consulting the OES SM/QAM and ESE Site Manager prior to downgrading levels of PPE.
9. Developing additional safety and health procedures, as required, in coordination with the OES Safety Manager.
10. Enforcing the OES Alcohol/Drug Abuse Policy.
11. Investigating accidents/incidents and near misses.
12. Conducting visitor orientation.
13. Conducting daily safety inspections, weekly safety and QC audits, and completing OES weekly safety audit checklist.
14. Coordinating with OES Safety Manager on monitoring and PPE requirements.
15. Conducting monitoring IAW this SSHP.
16. Ensuring field implementation of the OES CSHP.

2.4 RESPONSIBILITIES OF ALL SITE PERSONNEL

All ESE, OES, USAESCH, and subcontractor personnel who will be involved in onsite activities are responsible for the following:

1. Taking all reasonable precautions to prevent injury to site personnel and being alert to potentially harmful situations.
2. Performing only those tasks that can be done safely with proper training provided.
3. Notifying the OES SSHO/QCS of any special medical conditions (e.g., allergies, contact lenses, diabetes, etc.) which may be impacted by site operations.
4. Notifying the OES SSHO/QCS of any prescription and/or nonprescription medication which a worker may be taking that might cause drowsiness, anxiety, or other unfavorable side affects.
5. Preventing spillage and splash of materials to the greatest extent possible.
6. Practicing good housekeeping by keeping the work area neat, clean, and in order.
7. Immediately reporting all injuries, no matter how minor, to the OES SSHO/QCS.
8. Complying with the SSHP and all safety and health recommendations and precautions and properly using the PPE as determined by this SSHP and/or the OES SSHO/QCS.
9. Maintaining current training and medical documentation at the work site.

2.5 SEGREGATION OF SAFETY OFFICER RESPONSIBILITIES

ESE, as the USAESCH Contractor for this project, will have the responsibility for the safe and healthful conduct of all site operations. Therefore, the ESE Site Manager will have the ultimate responsibility for safety and health of all on site personnel, including subcontractors.

2.5.1 Due to the inherent nature of the hazards associated with UXO/OE, and the unique training and experience required for investigating, identifying, and handling UXO/OE, OES SSHO/QCS will have the responsibility for the daily implementation of the SSHP and operational safety and health.

2.5.2 In the event of an emergency, or whenever conditions at the site warrant such action, the OES SSHO/QCS will implement the Emergency Response Plan (ERP) found in Section 12.0 of this Site Manager. The ESE SSHO will be responsible for ensuring the

evacuation, emergency treatment, emergency transport of site personnel as necessary, and notification of emergency response units and the appropriate management staff.

2.6 SUBCONTRACTOR RESPONSIBILITIES

Any ESE and OES subcontractors will be responsible for providing medically approved and properly trained site personnel. The subcontractor will also be responsible for providing equipment that is safe for operations and free from any obvious hazards.

3.0 SITE AND TASK DESCRIPTIONS

3.1 SITE DESCRIPTION

3.1.1 PROJECT LOCATION

The former CCATF consisted of approximately 19,045 acres located about 5 miles southeast of Spartanburg, South Carolina. Figure 1 of the WP shows the boundaries and major features of the former CCATF.

3.1.2 SITE HISTORY

Camp Croft was established in January 1941 as an Army Training Facility. The camp consisted of two general areas: a series of training firing and impact ranges (approximately 16,929 acres) and a troop housing (cantonment) area, with attached administrative quarters (approximately 167 acres). The firing ranges at the former CCATF consisted of pistol, rifle, machine gun, mortar, anti-aircraft, and anti-tank ranges. UXO/OE of concern which may be encountered at the former CCATF include: .30- caliber (cal) and .50-cal small arms; 20 millimeter (mm); hand and rifle smoke, tear gas and incendiary grenades; 60-mm and 81-mm high explosive (H.E.), practice, smoke, tear gas, and illumination mortar rounds; and 2.36-inch H.E. anti-tank (HEAT), smoke, incendiary, and practice rockets. The former CCATF also contained a gas chamber/gas obstacle course area (approximately 199 acres) where realistic chemical warfare training was conducted.

3.1.2.1 In 1947, the War Assets Administration declared the entire acreage of the former CCATF as surplus. By 1950, the Army disposed of the land by selling it piecemeal to organizations and business interests. This included the conveyance of 7,088 acres of land to the South Carolina Commission of Forestry for the creation of Croft State Park. The remaining acreage has been converted to residential housing, churches, and industrial and commercial businesses. The gas chamber and gas obstacle course have been removed, and no ordnance or other evidence of past chemical training are to be found at the site.

3.1.3 PREVIOUS CCATF UXO/OE INVESTIGATIONS

3.1.3.1 1984 Site Survey of Camp Croft

In 1984, the USAESCH, Charleston District Environmental and Real Estate Divisions conducted a site survey of the former CCATF. This study concluded that "unexploded and dangerous bombs, shells, rockets, mines and charges either upon or below the surface" could be found at the former CCATF.

3.1.3.2 1990 Site Screening Investigation

In 1990, a report by the South Carolina Bureau of Solid and Hazardous Waste Management, Department of Health and Environmental Control documented a site screening of the domestic landfill located near the former CCATF. This landfill was first used in 1971; no records were available to indicate any use of this landfill by the DOD or the existence of any previous Army landfill at this site.

3.1.3.3 1991 Preliminary Assessment

In 1991, the USAESCH, Charleston District conducted a Preliminary Assessment of this site. This study determined that the site was eligible for further investigation under the Defense Environmental Restoration Program (DERP) for Formerly Used Defense Sites (FUDS). This study determined that the site contains several locations where drums were placed inside wells during the closure procedures conducted at the site. The report generated by this assessment did not indicate the presence of soil or groundwater contamination due to medical, ordnance, or chemical weapons.

3.1.3.4 1994 Ordnance and Explosive Waste Archives Search

In 1994, the USAESCH, Rock Island District conducted a site inspection and archives search of the former CCATF. The final report, dated April 1994, outlined the nature and degree of UXO/OE contamination to be found at the former CCATF. This report listed the ordnance (paragraph 3.1.2.1) which may be found at or below the surface of during this project. This report also stated that the gas chamber/gas obstacle course no longer exists and that no historical recorded evidence was located to document and confirm the presence of chemical ordnance since site closure. It did state, however, that based on the nature of the former the former CCATF's training mission, that the potential for chemical ordnance or chemical contamination of the soil in this area does exist. It is believed that chemical training of that period would have involved the use of CN, a tear agent, as the training chemical.

3.2 TASK DESCRIPTIONS

3.2.1 VISUAL CLEARANCE, SURVEYING, AND MAPPING

Surveying and mapping of each of 76 sample areas will be performed. All areas accessed by survey and mapping crews will be visually inspected and cleared by OES. A magnetometer check will be performed at all points where survey stakes, posts, markers, or monuments are to be installed. If suspect UXO is located during this sweep, the UXO Supervisor will report the encounter to the OES Site Supervisor, who will then inform the ESE Site Manager and take appropriate measures to safeguard the area.

3.2.2 VEGETATION AND TREE REMOVAL

Vegetation removal may be necessary to conduct the magnetometer surveys. Vegetation removal will be conducted using hand-held weed eaters equipped with nylon line or saw blades. A visual clearance of the areas to be cleared will be conducted prior to vegetation removal.

3.2.2.1 Tree Removal

Trees (3 inches in diameter and smaller) will be removed on a case-by-case basis and only as required to accomplish the tasks outlined in the SOW. If removal is required, the tree will be cut using chain saws. The tree will be sectioned, if necessary, to remove it from the immediate area, so it does not interfere with UXO/OE detection or survey activities. If trees larger than 3 inches in diameter are determined to impact the investigations, ESE will advise USAESCH and SCDPRT. No further site action will be taken without full coordination and approval of USAESCH and SCDPRT.

3.2.3 DETERMINATION OF UXO/OE CONTAMINATION

Based on data from the government-furnished Archives Search Report (ASR), ESE will select 183 sampling grids for surface/subsurface investigations. These locations will be scattered over the project site. The sampling locations will be 100 by 100 feet (ft). OES personnel will excavate the locations of suspect anomalies within the 76 locations to identify the anomalies and confirm the presence/absence of UXO/OE. Anomalies will be investigated to a depth of 4 ft. Investigation of anomalies at depths greater 4 feet must be approved by USAESCH. Excavation below 4 ft will be performed in accordance with 29 CFR 1926 and Section 25 of EM 385-1-1. If an investigated anomaly is suspected of being chemical warfare material (CWM) which potentially contains military toxic chemical agents, operations will cease immediately within 500 meters (m) of the site and the item will be secured by two UXO specialists who will position themselves 50 meters upwind so that they can view the site at all times. The USAESCH representative will be contacted immediately, who will in turn request military EOD support.

3.2.4 DISPOSAL OPERATIONS

OES shall dispose of any inert OE encountered in accordance with Appendices C (Explosive Safety Precautions) and E (UXO/OE Operational Plan) of the WP.

4.0 HAZARD IDENTIFICATION

4.1 PRELIMINARY EVALUATION

Qualified personnel have performed a preliminary evaluation of the tasks and sites. During development of this SSHP, a Certification of Task Hazard Assessment has been completed for each task (or group of similar tasks) to be conducted under this SSHP. This assessment has been conducted to comply with the revised OSHA PPE standard 29 CFR 1910.132(d)(2) (effective July 5, 1994) and to ensure that all tasks have been assessed to determine the PPE and controls needed to protect site personnel. However, evaluation of work site characteristics and hazards is an ongoing process which will continue throughout the project. If changes occur in the level or types of hazards present for a currently evaluated task, or if a new task is added to the WP, the OES SSHO/QCS will inform the ESE Site Manager of the change. If needed, a new Certification of Hazard Assessment form will be completed which outlines the new hazards, control methods, and PPE for the task.

4.2 CHEMICAL EXPOSURE RISK ASSESSMENT

In assessing the risk of chemical exposure, ESE and OES personnel examined the following: archival data and sampling results provided by ESE and USAESCH, current land usages, the physical properties of potential site contaminants, the potential exposure routes, and the operational tasks to be performed. Examination of these items indicate that the potential for exposure to chemical hazards will be essentially nonexistent during all planned site activities to which this SSHP applies. If site activities are modified, the potential for chemical exposure will have to be re-evaluated.

4.3 PHYSICAL HAZARDS IDENTIFICATION

Physical hazards expected to be encountered in conducting operations are cold stress, flammable and explosive materials, lifting, operation of hand and power tools, inclement weather, uneven/unstable surfaces, sharp objects (e.g., nails and broken glass), trips and falls, excessive noise, dense vegetation, biological hazards, and heavy equipment. Should the work extend beyond the anticipated completion date, heat stress may also be a factor.

4.3.1 Site personnel should look for potential safety hazards and immediately report the hazards to the OES SSHO/QCS or field team leader. Site personnel will be informed of the actions to be taken to control or remove the hazard.

4.3.2 The OES SSHO/QCS shall be responsible for thoroughly evaluating each day's field operations with respect to potential physical hazards. Any suspect or known physical hazards,

and the specific procedures to control them, shall be reviewed and documented during the daily tailgate safety briefing. General procedures for reducing or eliminating these hazards are discussed in Section 11.0 of this SSHP.

4.4 UXO HAZARDS

The hazards associated with UXO will be specifically addressed as part of the geophysical survey conducted by OES. If UXO is encountered during field activities, OES will notify the ESE Site Manager. Two UXO specialists will positively identify the item and condition. If possible, it will be moved out of the work area. If it cannot be moved, it will be visibly marked and barricaded. Work will not stop unless the item is a suspect CWM. If a known or suspected CWM is encountered, all work within 500 m of the location will cease, the area will be evacuated, and USAESCH notified. In the interim, two UXO specialists will maintain security on the item from an upwind location. The remainder of the field team will be posted on all access routes to ensure no unauthorized personnel enter the site. This posture will be maintained until relieved by proper military authority [i.e., EOD or U.S. Army Technical Escort Unit (USATEU)]. ESE and OES will render assistance as requested by USAESCH.

4.5 BIOLOGICAL HAZARDS

Biological hazards include stinging insects such as bees, wasps, and hornets; poisonous plants such as poison ivy, oak, and sumac; ticks; mosquitoes; and poisonous snakes. Employee awareness and the safe work practices outlined in Section 11.0 will reduce the risks associated with these hazards. Several of these hazards are seasonal in nature and will only pose a potential problem for workers should the job extend into the warm months.

4.6 HAZARD COMMUNICATION

To comply with the OSHA Hazard Communication Standard 29 CFR 1910.1200 and to ensure that site personnel are informed of the hazards associated with the materials with which they work, the following shall apply to all commercial products containing hazardous substances which are brought onsite:

1. A written Hazard Communication Program will be made available to site personnel.
2. Material safety data sheets (MSDSs) will be maintained for each product containing a hazardous substance which is used onsite.
3. All containers not supplied with adequate hazard labeling shall have a hazard communication label affixed to the container that communicates the health and physical hazards associated with working with the material.

4. Employees working with hazardous substances shall be trained in accordance with the requirements of 29 CFR 1910.1200.
5. An MSDS inventory of all hazardous substances used onsite will be maintained in Attachment A of this report.
6. Personnel, including subcontractors, affected by hazardous substances use shall be informed of the hazards.
7. When available, MSDSs for chemicals known or suspected to be onsite will be maintained in the field office. Workers will be advised of the location and contents of these MSDSs IAW the requirements of this SSHP.

4.7 TASK HAZARD ASSESSMENT

A task hazard assessment has been performed, and Certification of Task Hazard Assessment forms have been generated to provide a task-specific evaluation of the known or potential hazards associated with the conduct of an individual task. The SSHO will use these forms daily to inform site personnel of the hazards expected during the day's activities. The completed Certification of Task Hazard Assessment also outlines the engineering and administrative controls, operating procedures or programs, and PPE which will be required for the safe conduct of each task in the SOW.

4.7.1 The hazard assessments have been conducted using the best-available information related to the site and the nature of the task itself. If site conditions or tasks change, the OES SSHO/QCS will evaluate the new conditions or task and complete a new Certification of Task Hazard Assessment form. The OES SSHO/QCS will then forward the form to the OES Safety Manager and the ESE CIH for approval prior to resuming or initiating the task.

HAZARD ANALYSIS

Activity: Mobilization/Demobilization

Principal Steps:
Travel to/from site.
Attend Site Specific Orientation Training.
Read and Understand Site Safety and Health Plan.
Receive training on personal protective equipment required.
Receive supervised training on standard operating procedures and on any piece of equipment which will be operated (by individual employee).

Potential Hazards:
Motor vehicle accidents.
Tripping hazards.
Cuts and lacerations.
UXO/OE.
Noise hazards.
Physical exertion.
Temperature extremes.

Recommended Controls: Personnel will be briefed on safe driving techniques. As this is a training function, all personnel will be closely supervised as they are being checked out on equipment operation and on standard operating procedures. Hearing protection will be strictly enforced while operating weedeaters, chainsaws or other noisy equipment.

Personal Protective Equipment Requirements: Modified Level D PPE (while being checked out on standard operating procedures and equipment). PPE requirements will vary with job performed, and will be found on the specific hazard analysis for that activity.

Equipment to be used: This will vary as to the job function of the individual. The hazard analysis for each individual job activity will apply. Each employee will be checked out by a supervisor on any equipment he will be using on the site.

Inspection Requirements: All equipment will be inspected prior to use. If equipment is not in good condition or is not functioning properly, it will be removed from service for repair/ replacement.

Training Requirement: All UXO workers are required to be graduates of the Naval EOD school at Indian Head, MD. The activity of mobilization is primarily a training function in which employees are trained in the site hazards, the Site Safety and Health Plan, standard operating procedures, emergency procedures, and equipment they will be using on site.

Prepared By: _____ Date: _____

HAZARD ANALYSIS

Activity: Clearing and Grubbing

Principal Steps:
Fuel weedeater and chain saw.
Use weedeater and chain saw to clear vegetation from the site.
Remove cut vegetation from site.

Potential Hazards:
Handling flammable liquid during fueling.
Tripping hazards.
Use of power tools.
Flying pieces of debris.
Cuts and abrasions.
Noise

Recommended Controls:
Proper training in equipment use.
Maintaining equipment in good condition.
Wearing personal protective equipment.
Storage of gasoline in approved flammable liquid containers.
Perform fueling in area free of combustible debris/vegetation

Personal Protective Equipment Requirements:
Modified Level D PPE
Hard hat
Face shield
Leather gloves
coveralls (cotton)
Leather work boots
Hearing protection

Equipment to be Used:
Weedeater
Chain saw

Inspection Requirements: Equipment will be inspected daily prior to use. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/ replacement. All safety guards designed on equipment will remain in place. If any safety device on equipment is missing, that piece of equipment will be placed out of service until it can be repaired/replaced.

Training Requirements: Operators will be trained in the safe use of required equipment and in the required personal protective equipment.

Prepared By: _____ Date: _____

HAZARD ANALYSIS

Activity: Magnetometer Survey

Principal Steps: Using magnetometer to assure there are no anomalies where stakes are to be driven by the survey team to mark the site boundaries. If anomalies are indicated, magnetometer will be used to find another suitable location for the stake, free of anomalies. Operators will perform a magnetometer survey of each lane in the entire work area. Anomaly locations will be identified using flags, using care not to disturb the anomaly with the flag.

Potential Hazards: Tripping hazards.
UXO/OE hazards.
Cuts and abrasions from surface debris.

Recommended Controls: Operators will be trained in proper use of magnetometer.
Equipment will be maintained in good condition.
Operators will wear required PPE.

Personal Protective Equipment Requirements: Modified Level D PPE
Work clothes or coveralls (cotton)
Leather work gloves
Leather work boots

Equipment to be Used: Schoenstedt Magnetometer

Inspection Requirements: Magnetometer is to be inspected daily before use. It is to be calibrated in accordance with manufacturer's instructions. If equipment is not functioning properly or is not in useable condition, it is to be turned in for repair/replacement.

Training Requirements: Operators will be trained in proper use and function of magnetometer and in required personal protective equipment.

Prepared By: _____ Date: _____

HAZARD ANALYSIS

Activity: Digging Up Anomalies

Principal Steps:
Bring hand tools to location of anomaly marker.
Carefully dig the ground above and around the anomaly by hand until it is located, being careful not to jar the item.
Identify the item and condition of any UXO/OE located.
If anomaly is inert scrap, it will go with other metal scrap for disposition.
If anomaly is UXO/OE, disposal will be made on site in accordance with disposal procedures.

Potential Hazards:
Tripping hazards
Cuts and abrasions
UXO/OE hazards

Recommended Controls: UXO workers will be well trained in hazards inherent with UXO/OE operations and in safe operating procedures. All personnel will receive refresher training on types of UXO/OE expected to be found on the site. All tools used will be inspected prior to use and must be in good condition. All UXO personnel will wear cotton clothing to reduce the potential for generation of static electricity.

Personal Protective Equipment Requirements:
Modified Level D PPE
Work clothes or coveralls (cotton)
Leather work boots

Equipment to be used: Hand tools (shovels)

Inspection Requirements: All tools will be inspected prior to use. If equipment is not in good condition, it will be removed from service for repair/replacement. Only tools necessary to perform the job will be brought to the site. Tools will be used in the manner and purpose for which they were designed.

Training Requirements: All UXO workers are required to be graduates of the Naval EOD School at Indian Head, MD. All UXO workers will receive a site specific safety training which will include a refresher briefing on all UXO/OE expected to be found on this site. All workers receive supervised OJT from the Senior UXO Supervisor to assure they are familiar with safe operating procedures, emergency procedures, and PPE requirements at this site.

Prepared By:_____ Date: _____

HAZARD ANALYSIS

Activity: Demolition of UXO/OE

Principal Steps:
Make required notifications of demolition operations, per operating procedures.
Retrieve demolition explosives from day box.
Set up shot in accordance with demolition procedures.
Have sentry posted on potential access points.
Contact all sentries to assure no traffic is in the vicinity.
Demolition crew evacuates to shelter at least fragmentation distance from the shot.
Demolition occurs.
After receiving "All Clear" sign from supervisor, crew returns to inspect demolition site to assure demolition completed properly, do a magnetometer sweep of the pit, and remove fragmentation.
If a misfire occurs, crew observes wait time and follows misfire procedure.

Potential Hazards:
Static electricity
Electromagnetic Radiation
Fragmentation hazards
Blast hazards
Noise hazards

Recommended Controls: All UXO workers will be well trained in hazards inherent with UXO/OE operations and in safe operating procedures. All UXO workers will be required to wear cotton clothing (under- and outer-wear) to reduce generation of static electricity. Radios will not be used in the area once the pit is primed or during the priming process, unless the radios are at the firing point and the firing line is shunted. Demolition crew will observe fragmentation distances when seeking shelter from blast. Hearing protection will be strictly enforced during all demolition operations.

Personal Protective Equipment Requirements:
Modified Level D PPE
Work clothes or coveralls (cotton)
Leather work boots
Hearing protection
Two-way radio

Equipment to be used:
Demolition explosives
Electric detonators
Blasting circuits

Inspection Requirements: All equipment will be inspected prior to use. If equipment is not in good condition or is not functioning properly, it will be removed from service for repair/ replacement.

Training Requirement: All UXO workers are required to be graduates of the Naval EOD School at Indian Head, MD. All UXO workers will receive a site specific safety training which will include a refresher briefing on all UXO/OE expected to be found on this site. All workers receive supervised OJT from the Senior UXO Supervisor to assure they are familiar with safe operating procedures, emergency procedures, and PPE requirements at this site.

Prepared By: _____ Date: _____

HAZARD ANALYSIS

Activity: Clearing and Grubbing Using Weed Eater with Nylon Line

Principal Steps:
Fuel weedeater.
Use weedeater and chain saw to clear vegetation from the site.
Remove cut vegetation from site.

Potential Hazards:
Handling flammable liquid during fueling.
Tripping hazards.
Use of power tools.
Flying pieces of debris.
Cuts and abrasions.
Noise

Recommended Controls:
Proper training in equipment use.
Maintaining equipment in good condition.
Wearing personal protective equipment.
Storage of gasoline in approved flammable liquid containers.
Perform fueling in area free of combustible debris/vegetation

Personal Protective Equipment Requirements: Modified Level D PPE
Hard hat
Face shield
Leather gloves
Work clothes or coveralls (cotton)
Leather work boots
Hearing protection

Equipment to be Used: Weedeater

Inspection Requirements: Equipment will be inspected daily prior to use. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/ replacement. All safety guards designed on equipment will remain in place. If any safety device on equipment is missing, that piece of equipment will be placed out of service until it can be repaired/replaced.

Training Requirements: Operators will be trained in the safe use of required equipment and in the required personal protective equipment.

Prepared By: _____ Date: _____

5.0 TRAINING PLAN

5.1 GENERAL

All personnel assigned to or regularly entering the site will have the required training prior to participating in site activities. In accordance with 29 CFR 1910.120 and other OSHA regulations, applicable training shall include the following.

5.1.1 BASIC OSHA TRAINING

All general site workers must have the 40-hour offsite Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and 3 days of field experience under the direct supervision of a trained experienced supervisor. Onsite management personnel (team leaders, site manager, and OES SSHO/QCS) must have an additional 8 hours of specialized supervisory training. All workers must have an annual refresher (8 hours) if initial training is over 1 year old. All training will be documented.

5.1.2 FIRST-AID AND CARDIOPULMONARY RESUSCITATION (CPR) TRAINING

At least two employees per site will be certified in first aid and CPR. The training shall be equivalent to that provided by the American Red Cross.

5.1.3 SITE-SPECIFIC SAFETY AND HEALTH TRAINING

This training covers the information and mandates of the project SSHP. This training stresses preventive measures, but also addresses emergency response procedures and will cover the chemical and physical hazards of the site and site operations.

5.1.4 BLOODBORNE PATHOGEN TRAINING

The OES SSHO/QCS will primarily be responsible for rendering first aid in the event of injury or accident. However, other OES site personnel may be needed to assist in rendering first aid for severe injuries. Therefore, onsite OES personnel will receive training in controlling exposures to bloodborne pathogens. This training will consist of the following:

1. Review of the bloodborne pathogen standard.
2. Requirements of the exposure control plan.
3. Description of the risks of exposure and how bloodborne pathogens are transmitted.
4. Management and employee responsibilities.
5. Methods of protection against exposure and procedures for decontamination.
6. Post-exposure procedures.
7. Labeling and color coding of infectious waste.

5.1.5 HEARING CONSERVATION TRAINING

All site personnel exposed to noise levels exceeding 85 dBA 8-hour TWA will be provided with training which addresses the following topics:

1. Physical and psychological effects of high noise exposure.
2. Noise exposure limits.
3. Elements of the Hearing Conservation Program.
4. Selection, use, and limitations of hearing protection devices.

5.1.6 FIRE EXTINGUISHER TRAINING

All OES site personnel will be trained in the general principles of fire extinguisher selection, use, and the hazards associated with incipient stage fire fighting. This training will also include instructions on when NOT to fight a fire (i.e., when explosive materials are involved, when the fire is too large, etc.) This training will, when feasible, include hands-on practice with a live test fire.

5.2 TAILGATE SAFETY BRIEFINGS

Each day, before starting work onsite, all employees, including contractor, subcontractor, and government employees, will be given a safety briefing by the OES SSHO/QCS that identifies potential hazards and risks that may be encountered during that day's activities. Additional training in the use of safety equipment, emergency medical procedures, emergency assistance notification procedures, and accident prevention, as well as discussion of the WP will ensure that work accomplishments can be carried out in a safe and effective manner. At the conclusion of each day's work, a debriefing for all employees will be held, if needed.

5.2.1 Records of all tailgate safety briefings documenting date, attendance, and topics covered will be maintained on the ESE and OES documentation of training form as part of the project documents.

5.3 VISITOR TRAINING

Site visitors are defined as persons: (1) who are not employed at the project site, (2) who do not routinely enter restricted work areas, and (3) whose presence is of short duration (i.e., 1 to 2 days at one time or per month). Visitors are required to meet the requirements of Sections 5.3.1 and 5.3.2. These visitors may include client personnel; ESE and OES personnel; subcontractor personnel; commercial vendors; political representatives; and auditors or inspectors from local, district, or federal agencies.

5.3.1 GENERAL VISITOR REQUIREMENTS

The following requirements apply to visitors whose purpose is to observe site conditions or field activities:

1. The OES Site Supervisor and SSHO/QCS will be notified of the nature and duration of the visit before visitors are permitted to enter the work site.
2. The visitor's log will be completed including the individual's name, date, and the name of the company or agency represented.
3. The site visitor will be escorted by an OES representative, preferably the Site Supervisor or SSHO/QCS, at all times while in the area.

4. Visitors will comply with specific safety and health requirements, as applicable.

5.3.2 VISITOR TRAINING REQUIREMENTS

All visitors will receive site-specific training to ensure that potential hazards and risks are identified. This training will consist of a safety briefing by the OES SSHO/QCS that will include the following:

1. Location and description of potential hazards and risks.
2. Required PPE.
3. Areas of the site that are closed to visitors.
4. The site evacuation plan and emergency procedures.
5. Other topics, as deemed appropriate.

5.4 SUPPLEMENTAL TRAINING

Supplemental training (e.g., confined space, HAZCOM, and OSHA chemical-specific requirements), as determined by the OES SSHO/QCS, may be required for site-specific contaminants and/or changes in site conditions.

5.5 WEEKLY TRAINING

At the start of each work week (which is normally Monday), a site-specific safety topic will be selected and discussed in detail. All site personnel are required to attend the training, and the OES SSHO/QCS will document this training on the ESE and OES documentation of training form. The training will consist of site-specific hazards (e.g., known chemicals, ordnance, and cold stress) and will be given in conjunction with the tailgate safety briefing.

5.6 BUDDY SYSTEM TRAINING

Workers shall be instructed that all site work will be performed using the buddy system. Team members will keep in visual contact with each other at all times. Team members will be made aware of any slip, trip, and all lifting hazards, as well as any potential exposure to chemical substances, cold stress, and general hazards within their work area.

6.0 MEDICAL PLAN

6.1 OCCUPATIONAL HEALTH PROGRAM

6.1.1 ESE MEDICAL SURVEILLANCE PROGRAM

ESE provides its employees with an annual, in-depth physical examination, including blood chemistry with complete blood count and differential, urinalysis, medical history, required chest x-rays, audiogram, pulmonary function testing, and a physician's interpretation of an employee's ability to wear a respirator.

6.1.2 OES MEDICAL SURVEILLANCE PROGRAM

OES has a comprehensive Medical Surveillance Program in compliance with 29 CFR 1910 to prevent, diagnose, and treat occupational illnesses and injuries sustained onsite. All OES site personnel and subcontractors involved with site activities will be included in the Medical Surveillance Program.

6.1.2.1 The purpose of the Medical Surveillance Program is to: (1) assess the individual's health prior to working in a hazardous or physically stressful environment, (2) determine the individual's suitability for work assignments requiring the use of personal protective clothing and PPE, and (3) monitor for evidence of changes in the individual's medical indicators that could be related to the work. The assessment addresses any physical conditions the employee could have that would predispose him/her to illness or injury due to chemical exposure or the physical demands of using PPE.

6.1.2.2 The examining physician will be provided with information related to the employee's duties, potential exposures to chemical and physical hazards, and a description of the levels of PPE to be used by the employee. The physician will conduct a physical examination, as specified in this section, and then review the examination results to determine whether the employee is medically qualified to perform the proposed hazardous work. The physician will determine the need for any subsequent medical examinations (i.e., exit or supplemental).

6.1.2.3 A physician's statement, certifying that the employee is physiologically fit to work in hazardous waste operations, will be received and maintained on file at OES prior to commencement of work. The physician's statement will also include information related to limitations on the employee's work assignment, results of the examination/tests, and a statement that the employee has been informed of the results of the medical examination.

6.2 CERTIFICATION

ESE and OES employee participation in the Medical Surveillance Program will be a part of the employee's permanent medical record maintained in the respective employer's office. A list certified by the CIH, including the date of the last examination and physician's name, will be maintained

onsite. Other subcontractors will also submit documentation of Medical Surveillance Program participation for all site employees.

6.3 OCCUPATIONAL HEALTH SERVICES (OHS)

Complying with the requirements of 29 CFR 1910, ESE has designated the following physician to oversee the site-specific medical surveillance:

David L. Barnes, MD
Environmental Medicine Resources, Inc.
4360 Chamblee Dunwoody Rd.
Suite 202
Atlanta, GA 30341
(770) 455-0818

OES has its own medical surveillance physician:

Robert W. Pare't, MD
Occupational Health Services
123 West Tennessee Avenue, Suite 408
Oak Ridge, TN 37830
(615) 481-0991

6.3.1 MEDICAL SURVEILLANCE EXAMINATIONS

Job-related medical surveillance examinations are pre-assignment, annual, supplemental, and termination examinations. The content of these examinations is hazard specific and requires ESE and OES to provide the examining physicians with a complete inventory of chemical, biological, and physical exposure hazards as documented in Section 3.0, including relevant medical surveillance documents and pertinent information related to the following:

1. Treatment of occupational illness and injury,
2. Hearing conservation,
3. Vision conservation, and
4. Medical evaluation of respirator wearers.

6.3.2 BASELINE AND ANNUAL HEALTH ASSESSMENT REQUIREMENTS

The baseline and annual health assessment will include the following:

1. A complete medical and occupational history;
2. Physical examination;
3. Laboratory studies, including a complete blood count (CBC);
4. Urinalysis;
5. Chemistry panel (SMAC);
6. Pulmonary function testing (FEV and FVC);
7. Audiometry and visual screening;

8. Chest X-ray (PA) and/or electrocardiogram, when determined to be necessary by the physician; and
9. Drug testing (excludes ESE personnel).

6.3.3 TERMINATION EXAMINATION

Upon termination of employment, personnel who have worked continuously at a hazardous waste project site for more than 6 months will be given the opportunity to undergo a termination examination equivalent to the baseline health assessment. Specific examination tests will be determined by the physician.

6.3.4 SUPPLEMENTAL EXAMINATION

Any worker receiving a potentially harmful level of exposure to hazardous chemical/biological material or who exhibits possible exposure symptoms will undergo a supplemental examination. Any worker who develops a lost time illness or sustains a lost time injury will be re-examined. The physician will certify in writing that the employee is fit to return to work. If necessary, activity restrictions will also be specified in writing. Additional tests will be conducted if contaminants/potential exposures so dictate and will be determined by the examining physician.

6.3.5 IMMUNIZATIONS

Personnel working on this site will receive a tetanus immunization prior to beginning work on this site.

6.4 HEALTH CARE ADMINISTRATIVE SERVICES

In support of the Medical Surveillance Program, Dr. Pare't and Dr. Barnes will establish and maintain medical records. Dr. Pare't will maintain the medical records of OES personnel, and Dr. Barnes will maintain the records of ESE personnel. These records will be treated as private and confidential information and will be complete enough to provide data for use in health maintenance, treatment, and epidemiologic studies and in helping the government, ESE, and OES with program evaluation and improvement. The medical record will contain sufficient information to identify the patient, support the diagnosis, justify the treatment, and document an additional follow-up case or referral. The physician's written opinion for all medical examinations will be as specified in 29 CFR 1910.120, Subpart (f)(7).

6.5 INDUSTRIAL HYGIENE SERVICES (IHS)

ESE and OES will maintain an industrial hygiene surveillance program administered by the ESE CIH and OES Safety Manager, who perform the following services:

1. Implement the SSHP.
2. Develop a comprehensive health hazard inventory based on periodic work site evaluations of chemical, physical, and biological hazards and provide this information

to the contract physicians for use in establishing a hazard-specific Medical Surveillance Program.

3. Establish periodic hazard evaluation against hazard analysis and adjust accordingly.
4. Establish recordkeeping for all qualitative and quantitative exposure measurements and ensure a minimum annual review of these results by the designated physicians.
5. Provide support to the hearing and vision conservation programs.
6. Establish a respiratory protection program for chemical agent and other chemical/industrial hazards.
7. Provide technical expertise within the hazard communication program.

6.6 MEDICAL SUPPORT POLICIES

The onsite implementation of the Medical Surveillance Program will be governed by the following policies:

6.6.1 OES site personnel will be provided routine medical surveillance by Dr. Pare't, or another occupational physician, at no cost to the employee. The same will be provided to ESE personnel by Dr. Barnes.

6.6.2 The scope of the Medical Surveillance Program provided by ESE and OES shall include efforts to prevent, diagnose, or treat occupational illnesses and injuries. ESE and OES shall not provide definitive diagnosis or treatment for nonoccupational injuries or illnesses. The only exception is an emergency where immediate medical attention is necessary to prevent loss of life, to preclude permanent injury which would result if treatment were delayed, or to relieve suffering.

6.7 OPERATIONAL CONCEPTS

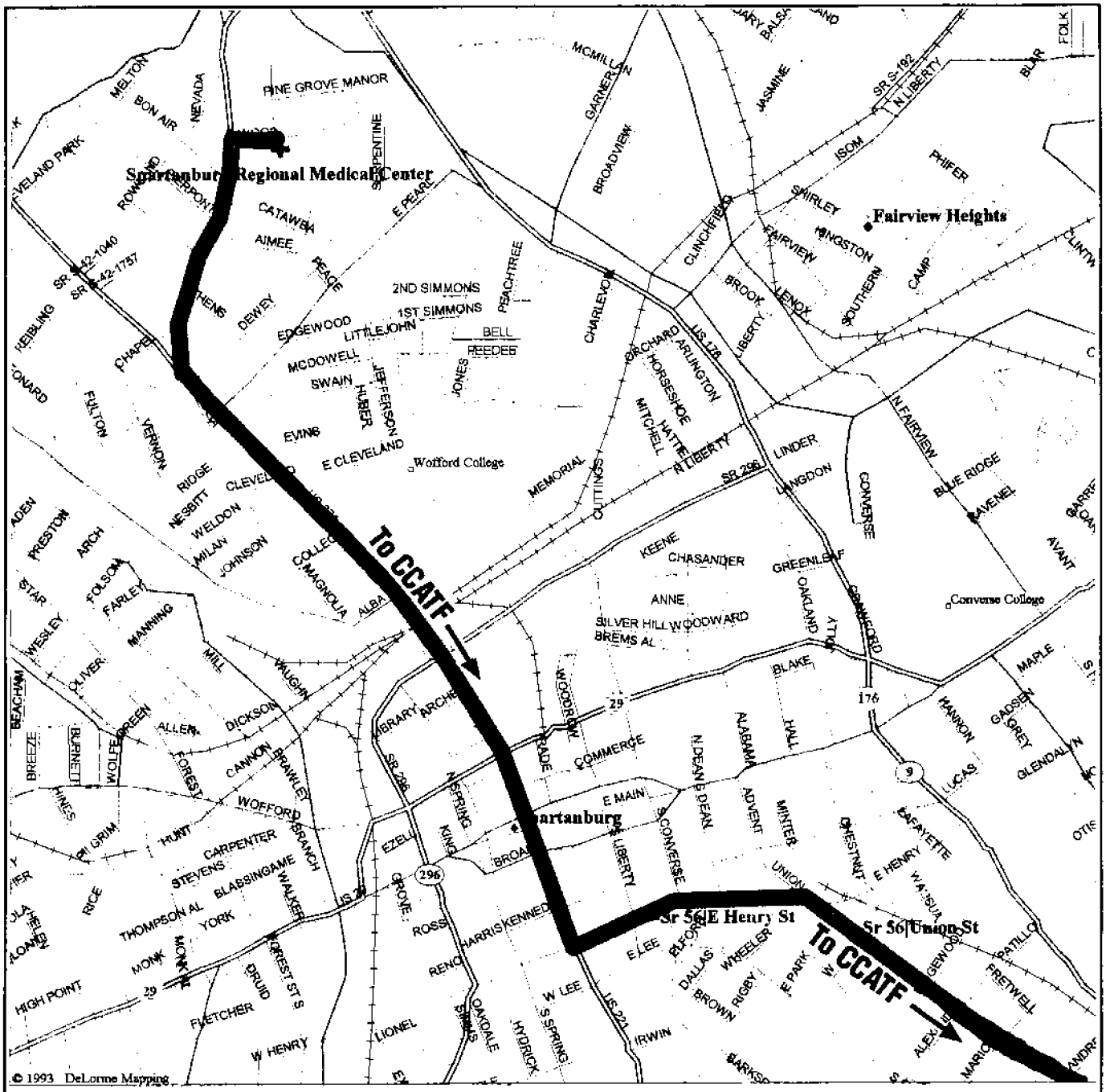
Onsite first aid/CPR support will be provided by two appropriately trained personnel. If specialized/elevated care is necessary, the injured person will be transported to the appropriate medical facility by an on-call Advanced Life Saving (ALS) service.

6.7.1 TREATING HOSPITALS

Primary treatment for illnesses or injuries which could occur onsite will be provided by the Spartanburg Regional Medical Center (Figure 6-1). This hospital is located in Spartanburg and is designated as a Level I trauma center. This level of service includes treatment all types of emergencies including severe trauma.

6.7.2 MEDICAL SUPPLIES

Medical supplies for the first aid treatment of minor injuries and burns will be maintained onsite by OES and will be inspected weekly by the OES SSHO/QCS.



Scale 1:15,625 (at center)

1000 Feet

500 Meters

N

Figure 6-1
HOSPITAL LOCATION MAP

SOURCE: DeLorme Mapping, 1993; ESE.

FORMER CAMP CROFT ARMY TRAINING FACILITY
SPARTANBURG, SC

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE

6.8 TRAINING

All required training is covered in Section 5.0 of this SSHP.

6.9 RECORDS

The ESE and OES field office in the Spartanburg area [to be determined (TBD)] will maintain records for the 40-hour or refresher training, physician's statement of medical clearance, and site monitoring.

7.0 SITE CONTROL AND LAYOUT

7.1 SITE ZONES

ESE and OES may establish work areas as required for the field effort. The boundaries of each work area, regardless of its configuration, will be clearly identified to prevent accidental intrusion by personnel not immediately involved with site operations. Each work site will have a Support Zone (SZ) that will be used as a staging area for personnel and equipment to support operations in the Work Zone (WZ). The SZ will include the site access control point, an area for visitors and a break area for site workers. The OES SSHO/QCS will delineate and increase or decrease these zones based on site conditions and activities. The zones will be marked on the site map, and the map will be posted at the entrance to each site. The establishment of access points and an entry corridor will be determined by OES personnel based on UXO clearances of certain areas.

7.1.1 SUPPORT ZONE

The SZ will be used as the staging area for site operations and for other support functions necessary or required to maintain smooth operations onsite. The SZ includes the change area, lunch and break areas, and supply storage areas. The SZ is designated as the tobacco product use, eating, and drinking area.

7.1.2 WORK ZONE

The WZ will be the area where actual site activities related to the investigation of UXO contamination will be conducted. It is anticipated that multiple WZs will be established during the conduct of this project. Each WZ will be clearly marked with flagging, and entry into these areas will be controlled by the OES SSHO/QCS. Non-UXO qualified personnel entering the WZ will be limited to cleared areas or escorted by UXO qualified personnel at all times. UXO operations will cease when non-UXO qualified personnel enter the WZ. Visitor entering the WZ must have current HAZWOPER training. No visitors will be allowed in the WZ during UXO handling or disposal operations.

7.2 SITE MAPS

Prior to initiation of site activities, the OES SSHO/QCS will generate a site map for each WZ which indicates the following information: site size and shape; the direction of the prevailing wind; entry/exit points; restricted areas; the designated assembly points; fire extinguishers and other safety equipment; and the location of ponds, streams, pits, tanks and other site hazards. The OES SSHO/QCS will use the site map during the tailgate safety briefings to inform site personnel of the locations of the previously listed items. To prevent excessive clutter, overlays can be used to portray the necessary information. Prior to initiating site activities, the OES SSHO/QCS will create a site map with all pertinent data, include it in the SSHP, post the map at the site, and use the map for initial safety briefings.

7.3 CENTER OF OPERATIONS

The Center of Operations for the site will be located within Croft State Park at a location to be determined. At this location, complete site maps and site personnel records will be kept. These maps will detail the location of entry points, WZs, SZs, staging areas, and survey areas.

7.4 UXO WORK AND EXPLOSIVES STORAGE AREAS

Areas potentially contaminated by UXO will be identified by evaluating the results of the geophysical surveys. In accordance with the SOW, OES personnel will excavate geophysical anomalies to identify the anomalies and confirm the presence of UXO. Anomalies will be investigated to a depth of 48 inches. Investigation of anomalies at depths greater 48 inches must be approved by USAESCH. Excavation below 48 inches will be performed in accordance with 29 CFR 1926 and Section 25 of EM 385-1-1.

OES shall dispose of any UXO encountered in accordance with Appendices C (Explosive Safety Precautions) and E (UXO/OE Operational Plan) of the WP. Disposal/venting operations will be conducted at sites/ranges established in the field after receiving USAESCH approval. Once designated, the disposal/venting sites will be secured by OES personnel whenever disposal activities are being conducted. All fuzed UXO will be detonated in-place unless USAESCH approval is given. If the OES site supervisor and SSHO/QCS agree that an individual unfuzed item is safe for transport, they will be allowed to use the appropriate means to transport the item to a disposal area, to consolidate a shot, and/or to move the item to a safer area.

Demolition explosives will be stored in two portable storage magazines. One magazine will be for storage of blasting caps. The other magazine will be for storage of other explosives for use in demolition operations. These explosives will be primarily binary explosives. There will also be small quantities of detonating cord and perforators. Both magazines will be class 1.1, however, quantities of stored explosives will be small. The net explosive weight of the main magazine will not exceed 50 pounds, and the net explosive weight of the blasting cap magazine will be under five pounds.

Per DoD 4145.26M, the magazines will be sited a distance of at least 670 feet from operating areas, support zone, inhabited buildings, and public traffic routes. Magazines will be placed a distance of 51 feet apart. The location of the storage magazines will be included with the site drawings for the Work Plan and the Site Safety and Health Plan. Both magazines will be grounded.

The magazines will be secured with locks as well as a perimeter fence which will also be secured with locks. Lightning protection will be installed in the magazine area in accordance with NFPA 78 Lightning Protection Code, NFPA 70 National Electrical Code, DOD 6055.9 DoD Ammunition and Explosives Safety Standards and a memorandum from Jeff Neese (Attachment C) regarding Lightning Protection for Non-DoD Explosive Storage Sites.

Emergency response organizations (i.e., police, fire department, etc.)
will be made aware of the location of the explosives storage magazines, and will be trained in the procedures involving emergencies in the vicinity of these magazines. Under no circumstances will the Fire Department approach within 670 feet from the magazines to fight a fire. Water may only be sprayed from a distance to try to prevent the spread of fire.

7.5 SITE SECURITY

Site security will be maintained during working hours by the OES SSHO, who will ensure that the only personnel entering a given WZ are those who are wearing the proper PPE and have been trained and medically cleared to enter the area. The OES SSHO/QCP will also ensure that all other safety and health precautions are in place prior to entry by site personnel.

7.6 BUDDY SYSTEM

The buddy system is an important element in controlling personnel exposure to site hazards. These procedures ensure that no site personnel are allowed to work without another qualified worker there to provide assistance if needed. At all times each buddy should be able to:

1. Observe his or her buddy for signs of chemical or extreme temperature exposure,
2. Periodically check the integrity of his or her buddy's protective clothing,
3. Observe the site area in which they are working for hazards,
4. Remain within verbal or visual contact with his or her buddy, and
5. Notify the personnel in the SZ if emergency assistance is needed.

The access control point to the WZ will be used as the location where the OES SSHO/QCP will enforce the buddy system.

7.7 SITE COMMUNICATIONS

Effective on- and offsite communication is an integral part of site control and will be established prior to initiating site activities. Offsite communication is required to ensure effective communication with offsite management and emergency response personnel. Onsite communication will be used to coordinate site operations, maintain site control, pass along safety information such as monitoring results and work/rest periods, and alert site personnel to emergency situations. All site personnel will be familiar with the different methods of off- and onsite communication. The methods of site communication that may be used on this project are:

1. Communication offsite:
    a. Two-way radio, and
    b. Cellular telephone.
2. Communication onsite:
    a. Two-way radio,
    b. Air horn, and
    c. Hand signals.

7.7.1 Site personnel will be familiar with the following hand and audible signals:

1.	Hand gripping throat:	"Breathing problem, can't breathe"
2.	Thumbs up:	"OK, I'm all right, I understand"
3.	Thumbs down:	"No, negative"
4.	Pointing to ear(s):	"Can't hear, don't understand"
5.	Waving hand(s) over head:	"Need assistance now"
6.	Pointing to eyes then pointing to a person/object:	"Watch person/object closely"
7.	Grab buddy's wrist:	"Evacuate site now, no questions"
8.	One long horn/siren blast:	"Evacuate site to assembly point"
9.	Two short horn/siren blasts:	"Condition under control, return to site"

7.8 STANDING ORDERS, STANDARD OPERATING PROCEDURES (SOPS), AND SAFE WORK PRACTICES (SWPs)

7.8.1 INTRODUCTION

This paragraph outlines the site standing orders that site personnel will obey at all times. The SWPs that address the health and safety precautions related to specific hazards which may be encountered during site operations are listed in Section 11.0 of this SSHP. This SSHP is written in accordance with ESE and OES SOPs and safe work practices.

7.8.2 SITE STANDING ORDERS

To maintain strong safety and health awareness onsite at all times, a list of standing orders has been developed which outlines the practices that must be followed in the SZ and WZ. These standing orders will be posted conspicuously at locations around the site and will be reviewed periodically during the tailgate safety briefings. These standing orders will be enforced by the OES SSHO/QCP, and personnel violating these orders may be subject to disciplinary action. The standing orders for the site are listed on Tables 7-1 and 7-2.

Table 7-1. General Standing Orders for the Site

1.	Running and horseplay are prohibited in all areas of the site.
2.	Tobacco product use, eating, drinking, application of cosmetics, or other hand to face activities are allowed in designated areas only.
3.	Ignition of flammable materials in any WZ is prohibited, unless directed by the SSHO.
4.	Buddy system procedures will be enforced during all site operations.
5.	The number of personnel in the SZ or WZ will be the minimum number necessary to perform work tasks in a safe and efficient manner.
6.	Site personnel will check in with the SSHO prior to leaving the site, and again upon returning to the site.
7.	Site visitors are to be escorted by UXO qualified OES personnel at all times.
8.	Site personnel will perform only those tasks they are qualified to perform.
9.	Site personnel will remain aware of site conditions at all times and will alert the SSHO to any changes that could pose additional hazards.
10.	Remember, "When in doubt. Don't." Ask questions first.

Table 7-2. Standing Orders for Personnel Entering the WZ

1.	No tobacco product use, eating, drinking, application of cosmetics, or other hand to face activities are allowed in this zone.
2.	No matches, lighters, or other spark sources are allowed in this zone.
3.	Check-in/out at the access control point upon entering or exiting this zone.
4.	Always have your buddy with you in this zone, and follow the buddy system procedures.
5.	No personnel allowed in this area without appropriate PPE as specified by the SSHP.
6.	Remain alert to site conditions and report any changes or unusual occurrences to the SSHO.
7.	Maintain visual or verbal contact between site personnel and the Command Post at all times.
8.	Remember--site safety and health is everyone's responsibility. Do your part.

8.0 MONITORING PLAN

Monitoring will be conducted during specified site activities to evaluate potential physical hazards. Hazard evaluations will assist in determining the effectiveness of control measures, need for upgrading or downgrading PPE requirements, and effectiveness of WZs and SOPs. Direct reading instruments will be used during site operations to detect and qualify the physical hazards. If a reading is achieved which exceeds the action levels specified in Table 8-1, the OES SSHO/QCP will take steps to correct the situation.

8.1 MONITORING RESPONSIBILITIES

Monitoring will be conducted by the OES SSHO/QCP and other site personnel trained in the proper calibration and operation of monitoring equipment. All monitoring equipment will be provided by USAESCH or leased and operated by OES. Any readings at or above the action levels, as specified in Table 8-1, will be reported to the ESE Site Manager and OES Safety Manager. Monitoring equipment to be used during operations will include the following, as needed.

1. Sound level meter is used as a screening device to measure sound power being emitted by a source. This instrument helps identify operations where hearing protection and noise dosimetry monitoring may be needed.
2. Noise dosimeter is used to calculate the 8-hour TWA noise exposure.
3. Wet bulb, dry globe temperature (WBGT) monitor is used to establish work/rest regiments for site personnel working in temperatures over 70 degrees Fahrenheit (°F). This will only be necessary if work extends into the warm months.

8.2 MONITORING SCHEDULE

Exposure monitoring will focus on the potential exposure to noise generated during mobilization/demobilization and brush clearing activities. Real-time monitoring, using direct reading instruments, will be conducted at a frequency respective to operations with high noise levels. Table 8-1 identifies the type of monitoring equipment to be used, the frequency at which the monitoring will be conducted, assignment of monitoring responsibility, monitoring method to be employed, action level, and resultant action to be taken.

8.3 CALIBRATION AND MAINTENANCE

All monitoring instrumentation used onsite will be calibrated and/or response checked IAW the manufacturer's specifications, before and after use each day. If an instrument fails to calibrate or respond correctly, it will be removed from service until it can be repaired, IAW manufacturer's specifications. Instruments used in the WZ will be cleaned with wet wipes after each day of use to remove dust or debris.

Table 8-1. Site Monitoring Schedule/Action Level

Contaminant or Hazard	Monitoring Equipment	Monitoring Responsibility	Monitoring Frequency/Location	Action Level	Action to be Taken
Heat Stress	Direct Reading WBGT Monitor	OES SSHO	Continuously whenever ambient temperatures exceed 70°F	See Table 11-4 to determine the WBGT temperatures where modification of work/rest regiments will begin.	See Table 11-4 for modifications to work/rest regiments
Noise	Sound Level Meter	OES SSHO	Initially when tools or equipment is operated and periodically thereafter, according to the recommendations of the ESE CIH or OES Safety Manager.	Sound levels greater than 85 dBA	Conduct noise dosimetry reading to determine the 8-hour TWA, and advise ESE CIH and OES Safety Manager.
	Noise Dosimeter	OES SSHO	Whenever noise levels in the hearing zone exceed 85 dBA, per the sound level meter.	Greater than 85 dBA for an 8-hour TWA.	Dosimeter readings are to be reported to the ESE CIH and OES Safety Manager to ensure hearing protection is adequate for the level of noise experienced.

9.0 PPE PROGRAM

9.1 INTRODUCTION

All personnel performing operations onsite shall be required to use the appropriate level of protection, as specified in the Certification of Task Hazard Assessment forms found in Section 4.0, of this SSHP. This SSHP makes provisions for use of Level D and Modified Level D, IAW the hazards associated with a given task or operation. All PPE requirements for site operations, activities, or zones are based on available site characterization and historical data. The PPE levels will need to be reassessed if any of the following occur:

1. Appearance of previously unidentified chemicals or conditions,
2. Introduction of a new task or expansion of a previously evaluated task,
3. Ambient weather conditions change which impact the use of assigned PPE,
4. A new task is introduced to the SOW or a previously assigned and evaluated task is expanded in scope, or
5. Upon discovery and confirmation of CWM UXO or storage containers.

9.1.1 For work tasks which are assigned after the approval of this SSHP, the OES SSHO/QCP will assess the hazards, assign the appropriate PPE level, complete a Certification of Task Hazard Assessment form and forward the form to the ESE CIH and OES Safety Manager. Upon approval by the CIH, Safety Manager and USAESCH, the new form will be incorporated into the SSHP. Any changes in PPE levels involving downgrading of PPE levels will be allowed only after review by the ESE CIH and OES Safety Manager.

9.2 SPECIAL CONSIDERATIONS

The following special considerations shall be observed in the selection and use of PPE for the following levels:

1. Hard hats are required only when working around heavy equipment or when a head impact hazard exists;
2. Steel toe/shank boots are not required during surface/subsurface location of UXO unless a serious toe hazard exists, whereupon a fiber safety toe will be used;
3. Safety glasses will be required only when an eye hazard exists and will be selected to provide site personnel with the best protection from physical hazards, such as flying objects, and ultraviolet (UV) radiation protection; and
4. The revised OSHA standards for PPE, 29 CFR 1910.132-138 will be incorporated into all phases of PPE selection, training and use.

9.3 LEVEL D PPE

The following PPE will be worn during general site zone activities:

1. Work clothes or coveralls (cotton);
2. Work gloves;

3. Boots: steel toe and shank or work boots (as required);
4. Hard hat (as required);
5. Safety glasses (optional); and
6. Two-way radio, one per team.

9.4 MODIFIED LEVEL D PPE

The following PPE will be worn when using power equipment for brush clearing:

1. Same as Level D, but with the following additions;
2. Hard hat with face shield (wire mesh preferred);
3. Leather work gloves;
4. Kevlar chaps;
5. Toe guards or steel toed boots; and
6. Ear plugs/muffs, as appropriate.

10.0 HYGIENE AND SANITATION

10.1 PERSONNEL HYGIENE

Hygiene facilities will be established onsite to ensure that personnel maintain good personal hygiene. These facilities shall include a personnel washing area, toilet facilities, and a lunch/break trailer for all site personnel. The personnel hygiene facilities will conform to the requirements specified in 29 CFR 1910.120.

10.1.1 Personnel are required to wash hands, face, and other exposed skin areas prior to leaving the site for breaks or lunch. Towels, washcloths, liquid soap, or handiwipes will be provided for personnel.

10.2 ROUTINE EQUIPMENT DECONTAMINATION

Tools and equipment used in the WZ will be kept free of soil and other debris and will be cleaned at the end of each day to ensure that equipment is maintained in a safe operating condition.

10.3 PPE AND DECONTAMINATION PROCEDURES

Site personnel using forms of PPE (e.g., gloves and safety glasses) will keep the equipment clean and in good working condition.

10.4 SANITATION

Site sanitation will be established and maintained IAW 29 CFR 1910.120(n) and EM 385-1-1, Section 2.

10.4.1 POTABLE WATER SUPPLY

An adequate supply of potable (drinkable) water shall be provided onsite at all times, and will be supplied IAW the following provisions:

1. Containers used for potable water shall be capable of being tightly closed, equipped with a tap and maintained in a clean sanitary condition;
2. A container used for distribution of drinking water shall be clearly labeled as to its contents and not used for any other purpose;
3. Water shall not be dipped from the container and use of a common cup will not be allowed; and
4. Where single service cups are provided, separate sanitary containers will be provided for the storage of the unused cups and for the disposal of the used cups.

10.4.2 NONPOTABLE WATER

As there are no water sources at this site, all water brought to the site for drinking, washing, etc. will be potable water. There should not be any nonpotable water available at this site.

10.4.3 TOILET FACILITIES

As this hazardous waste site is not provided with a sanitary sewer system, temporary toilet facilities will be located at the site. Chemical toilets will be used to fulfill this requirement and will be serviced every week. Each temporary toilet will provide protection from the weather and falling objects, be naturally lighted, have ventilation, be lockable from the inside, and will be serviced weekly. To ensure sanitary and adequate facilities, ESE will provide toilet facilities IAW the requirements of EM 385-1-1, which stipulates a minimum one toilet for each 15 site personnel.

10.4.4 WASHING FACILITIES

Hand and face washing facilities will be set up in the SZ and will be used by all personnel exiting the WZ prior to eating, drinking, tobacco use, or other hand to face activities. Hot and cold running water are not available at the site. Water, soap and drying towels will be provided, as well as handiwipes.

10.4.5 SITE HOUSEKEEPING

All work areas will be maintained in a clean/neat fashion, free of loose debris and scrap. Any materials/equipment not being used will be removed and stored or disposed of accordingly. All work areas will be supplied with a trash receptacle with lid, the contents of which will be emptied daily.

11.0 GENERAL SITE SAFETY PROCEDURES

11.1 GENERAL

Hazards due to normal site activities can be reduced by using common sense and following safe practices. The following practices are not allowed:

1. Running and horseplay.
2. Smoking, eating, or chewing tobacco while in the WZ or any potentially contaminated area.
3. Igniting flammable materials in the WZ. Equipment will be bonded, grounded, and explosion resistant, as appropriate.
4. Performing tasks in the restricted area individually (working alone). Personnel will be required to work using the buddy system at all times.

11.1.1 Personnel must keep the following guidelines in mind when conducting field activities:

1. Hazard assessment is a continuous process; personnel must be aware of the surroundings and constantly aware of the chemical and physical hazards that are or may be potentially present.
2. Team members will be familiar with the physical characteristics of each site, including site access and the location of communication devices and safety equipment.
3. The location of overhead power lines and underground utilities must be established.

11.2 HEAVY EQUIPMENT OPERATION

Heavy equipment used onsite will be operated under strict adherence to the applicable OSHA regulations found in 29 CFR 1910; 29 CFR 1926; the requirements of EM 385-1-1, Section 16; and the following guidelines;

1. The operation of heavy equipment will be limited to authorized personnel specifically trained in its operation;
2. The operator will visually inspect heavy equipment daily prior to operation and report any abnormalities/deficiencies to the OES SSHO/QCS;
3. The operator will use the safety devices provided with the equipment, including seat belts, and backup warning indicators and horns will be operable at all times;
4. While heavy equipment is in operation, all personnel not directly required in the area will keep a safe distance from the equipment;
5. The operator's cab will be kept free of all nonessential items, and all loose items will be secured;
6. Personnel will avoid moving into the path of operating equipment and areas blinded from the operator's vision;
7. When heavy equipment must negotiate in tight quarters, or if operators of earth-moving equipment cannot see the bucket, a secondary person will be stationed to guide the operator;

8. Additional riders will not be allowed on equipment unless it is specifically designed for that purpose (i.e., there is an additional seat with a seat belt); and
9. Personnel operating heavy equipment will use hearing protection.

11.3 POWER AND HAND TOOL OPERATION

11.3.1 POWER TOOLS

Power tools have great capability for inflicting serious injury if they are not used and maintained properly. To control the hazards associated with power tool operation, the requirements outlined in EM 385-1-1, Section 13 and the following safe work practices shall be observed when using power tools:

1. Operation will be conducted by authorized personnel familiar with the tool, its operation, and safety precautions;
2. Power tools will be inspected prior to use, and defective equipment will be removed from service until repaired;
3. Power tools designed to accommodate guards will have such guards properly in place prior to use;
4. Loose fitting clothing or long hair will not be permitted around moving parts;
5. Hands, feet, etc., will be kept away from all moving parts;
6. The power will be disconnected prior to maintenance and/or adjustments to equipment;
7. An adequate operating area will be provided, allowing sufficient clearance and access for operation;
8. Good housekeeping practices will be followed at all times.

11.3.2 HAND TOOLS

Use of improper or defective tools can contribute significantly to onsite accidents. Therefore, the requirements outlined in EM 385-1-1, Section 13 and the following safe work practices shall be observed when using hand tools:

1. Inspect hand tools for defects prior to each use;
2. Remove defective hand tools from service and repair or properly discard them;
3. Select and use tools in the manner for which they were designed;
4. Be sure of safe footing and grip before using any tool;
5. Do not use tools that have split handles, mushroom heads, worn jaws, or other defects;
6. Wear gloves whenever they increase gripping ability or if cut, laceration, or puncture hazards may exist during the use of hand tools;
7. Wear safety glasses or a face shield if use of tools presents an eye/face hazard;
8. Do not use makeshift tools or other improper tools;
9. Use non-sparking tools where there are explosive vapors, gases, or residue; and

11.4 EXCAVATIONS

General safety precautions are listed in EM 385-1-1, Section 25, Subpart P of 29 CFR 1926, and the OES CSHP. The following guidelines are intended to reflect minimum requirements to be followed on this site.

1. Prior to initiation of any excavation or trenching activity, the location of underground installations will be determined.
2. When the excavation/trench achieves a depth of greater than 4 ft, a competent person will determine the type of soil being excavated and designate the slope which will be used. This is not anticipated as 4 ft. is the designated depth for removal of anomalies. Anything deeper will require special permission, and this SSHP will be amended to accommodate this situation, should it surface.
3. The excavation(s) will be inspected daily by a competent individual prior to commencement of work activities.
4. Evidence of cave-ins, slides, sloughing, or surface cracks will be cause for work to cease until necessary precautions are taken to safeguard workers.
5. Spoils and other materials will be placed 2 ft or more from the edge of the excavation.
6. Excavations 4 ft or more in depth will have a means of egress at a frequency such that lateral travel to the egress point does not exceed 25 ft.

11.5 MATERIAL LIFTING

11.5.1 GENERAL REQUIREMENTS

Many types of objects are handled in normal daily operations. Care should be taken in lifting and handling heavy or bulky items because they are the cause of many joint and back injuries. The following fundamentals address the proper lifting of materials to avoid joint and back injuries:

1. The size, shape, and weight of the object to be lifted must be considered. Site personnel will not lift more than they can handle comfortably. Individual workers should not normally lift loads in excess of 40 pounds.
2. A firm grip on the object is essential; therefore, the hands and object shall be free of oil, grease, and water which might prevent a firm grip.
3. The hands and fingers shall be kept away from any points that cause them to be pinched or crushed, especially when setting the object down.
4. The item shall be inspected for metal slivers, jagged edges, burrs, rough or slippery surfaces, and pinch points, and gloves shall be used, if necessary, to protect the hands.
5. The feet shall be placed far enough apart for good balance and stability.
6. Personnel will ensure that solid footing is available prior to lifting the object.
7. When lifting, personnel shall get as close to the load as possible and bend the legs at the knees, making sure that the back is kept as straight as possible.
8. To lift the object, the legs are straightened from their bending position.
9. Personnel shall not carry a load that cannot be seen over or around.

10. When placing an object down, the stance and position are identical to that for lifting, with the back kept straight, the legs bent at the knees, and the object lowered.
11. If needed, OES will provide back support devices to aid in preventing back injury during lifting activities.
12. If an object to be lifted is too heavy for one person to handle, ask a co-worker for assistance or if a piece of materials handling equipment is available that will do the job, use it.

11.5.2 TWO-PERSON LIFTING

When two or more people are required to handle an object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each person, if possible, shall face the direction in which the object is being carried.

11.6 ELECTRICAL HAZARDS

1. Temporary power lines, switch boxes, receptacle boxes, metal cabinets, and enclosures around equipment will be marked to indicate the maximum operating voltage.
2. Patched, oil-soaked, worn, or frayed electric cords or cables will not be used.
3. Extension cords or cables will not be fastened with staples, hung from nails, or suspended by wire.
4. All electrical circuits will be grounded in accordance with the NEC and NESC unless otherwise noted in the reference manuals.

11.7 LADDERS

Accidents and injuries associated with ladders are frequent and usually severe in nature. Therefore, the following SOPs, along with any of the specialized requirements listed in 29 CFR 1926.1053(b) and EM 385-1-1, Section 21D will be followed whenever ladders are used onsite. The OES SSHO/QCS will be responsible for identifying and communicating any additional requirements related to ladder use during a given task. Requirements for ladder use include:

1. IAW 29 CFR 1926.1060, personnel using ladders shall receive training by the OES SSHO/QCS in the safe inspection, erection, use, and maintenance of the ladders to be used onsite;
2. Manufactured ladders will be constructed of heavy-duty grade material and will be American National Standards Institute (ANSI) approved;
3. Ladders will be inspected prior to each use by the OES SSHO/QCS to ensure safe working condition, and defective ladders will be removed from service;
4. The area around the top and bottom of a ladder will be kept clear of obstructions and debris;
5. Ladders will not be spliced together to make a longer ladder;

6. The base of straight ladders will be set back from the vertical surface a distance of approximately one-fourth the working height of the ladder;
7. Stepladders will be fully opened to permit the spreader to lock and will not be closed and leaned against an object for access;
8. Metal ladders will not be used for electrical work or in areas where they could contact energized wiring;
9. Ladders will be maintained free of grease, oil, or other slipping hazards.

11.8 FIRE HAZARDS

11.8.1 CAUSES OF FIRES AND EXPLOSIONS

Although fires and explosions may arise spontaneously, they are more commonly the result of carelessness during the conduct of site activities, such as during refueling of heavy or hand held equipment. Some potential causes of explosions and fires include:

1. Mixing of incompatible chemicals, which cause reactions that spontaneously ignite due to the production of flammable vapors and heat;
2. Ignition of explosive or flammable chemical gases or vapors by external ignition sources;
3. Ignition of materials due to oxygen enrichment;
4. Agitation of shock or friction-sensitive compounds; and
5. Sudden release of materials under pressure.

11.8.2 FIRE PREVENTION

Explosions and fires not only pose the obvious hazards of intense heat, open flames, smoke inhalation, and flying objects, but may also cause the release of toxic chemicals into the environment. Such releases can threaten personnel onsite and members of the general public living or working nearby. Site personnel involved with potentially flammable material or operations will follow the following guidelines and EM 385-1-1, Section 9, to prevent fires and explosions:

1. Prior to initiation of site activities involving explosive/flammable materials, all potential ignition sources will be removed or extinguished.
2. Nonsparking and explosion-proof equipment will be used whenever the potential for ignition of flammable/explosive gases/vapors/liquids/solids exists.
3. Smoking will be prohibited at, or in the vicinity of, operations which may present a fire hazard, and the area will be conspicuously posted with signs stating "No Smoking or Open Flame Within 50 Feet". Smoking will only be permitted in designated areas within the Support Zone.
4. Flammable and/or combustible liquids must be handled only in approved, properly labeled metal safety cans equipped with flash arresters and self-closing lids.
5. Transfer of flammable liquids from one metal container to another will be done only when the containers are electrically interconnected (bonded).

6. Motors of equipment being fueled will be shut off during the fueling. Fueling will only occur in open, well-ventilated areas in order to prevent the occurrence of a flammable atmosphere.
7. Metal drums used for storing flammable/combustible liquids will be equipped with self-closing safety faucets, vent bung fittings, grounding cables and drip pans, and will be stored outside buildings in an area approved by the OES SSHO/QCS.

11.8.3 FIRE PROTECTION

The following safe work practices will be used to protect the site and site personnel against the hazards of fires:

1. Flammable/combustible liquid storage areas will have at least one 4A:20:B:C: fire extinguisher located within 25 to 75 ft.
2. All earth moving equipment (e.g., back hoes, bulldozers, and drill rigs) and equipment will be equipped with a fire extinguisher of not less than 1A:10B:C units or higher.
3. All vehicles used in the transport of explosives will be equipped with two fire extinguishers of not less than 10:B units or higher, with one fire extinguisher mounted/placed inside the cab of the vehicle and one mounted outside by the driver's side door, if possible.
4. Temporary offices will be equipped with a fire extinguisher of not less than 1A:10B:C units or higher.
5. At least one portable fire extinguisher having a rating of not less than 4A:10B:C units will be located at each work site.

11.9 ILLUMINATION

To ensure adequate lighting, personnel will only work during daylight hours, and no field activities will be scheduled during the period of 30 minutes before dusk to 30 minutes after dawn. If, however, work must be performed at times other than those previously listed, the illumination levels in Table 11-1 will be used as the minimum lighting allowed during the conduct of site related activities.

11.10 BIOLOGICAL HAZARDS

Biological hazards which are usually found onsite include insects, such as ticks, mosquitoes, spiders, and centipedes; poisonous snakes; and hazardous plants. Employee awareness and the SOPs outlined in the following paragraphs should reduce the risks associated with these hazards.

11.10.1 HAZARDOUS PLANTS

During the conduct of site activities, the number and variety of hazardous plants that may be encountered is large and extensive. However, the plants which present the greatest degree of risk to site personnel (i.e., potential for contact vs. affect produced) are those which produce skin reactions and skin and tissue injury.

Table 11-1. Minimum Illumination Levels

Foot-candles	Area of Operation
5	General site areas.
3	Excavation and waste areas, field maintenance, active storage and fueling areas.
5	Tunnels, shaft and underground work areas. Inside facilities, such as warehouses, hallways, and exitways.
10	General shops (i.e. storerooms, dressing and eating areas, and maintenance areas).
30	First aid stations, infirmaries, and offices.

11.10.1.1 Plants Causing Skin and Tissue Injury

Contact with splinters, thorns, and sharp leaf edges is of special concern to site personnel, as is the contact with the pointed surfaces found on branches, limbs, and small trunks left by site clearing and grubbing crews. This concern stems from the fact that punctures, cuts, and minor scrapes caused by accidental contact may result in noninfectious skin lesions, and the introduction of fungi or bacteria through the skin or eye. Personnel receiving any of the injuries listed previously, even minor scrapes, should report immediately to the OES SSHO/QCS for initial and continued observation and care of the injury.

11.10.1.2 Plants Causing Skin Reactions

The poisonous plants of greatest concern are poison ivy, poison sumac, and poison oak. These plants generally present a seasonal hazard which would only be applicable if work on this project extended into the warm months. Poison ivy thrives in all types of light and usually grows in the form of a trailing vine. However, it can also grow as a bush and can attain heights of 10 ft or more. Poison ivy has shiny, pointed leaves that grow in clusters of three. Poison sumac is a tall shrub or slender tree that usually grows along swampy areas or ponds in wooded areas. Each poison sumac leaf stalk has 7 to 13 leaflets which have smooth edges. Poison oak is mostly found in the southeast and west. Poison oak resembles poison ivy, with one important difference: poison oak leaves are more rounded rather than jagged like poison ivy and the underside of poison oak leaves are covered with hair.

11.10.1.2.1 The skin reaction associated with contacting these plants is caused by the body's allergic reaction to toxins contained in oils produced by the plant. Contamination can be achieved through contact with the leaves, branches, stems or berries, or contact with contaminated items such as tools and clothing. The allergic reaction associated with exposure to these plants will generally cause the following signs and symptoms:

1. Blistering at the site of contact, usually occurring within 12 to 48 hours after contact;
2. Reddening, swelling, itching and burning at the site of contact;
3. Pain, if the reaction is severe; and
4. Conjunctivitis, asthma, and other allergic reactions if the person is extremely sensitive to the poisonous plant toxin.

11.10.1.2.2 If the rash is scratched, secondary infections can occur. The rash usually disappears in 1 to 2 weeks in cases of mild exposure and up to 3 weeks when exposure is severe. Preventive measures which can prove effective for most site personnel are:

1. Avoid contact with any poisonous plants onsite, and keep a steady watch to identify, report, and mark poisonous plants found onsite;
2. Wash hands, face, or other exposed areas at the beginning of each break period and at the end of each work day;
3. Avoid contact with, and wash on a daily basis, contaminated tools, equipment, and clothing;

4. Try barrier creams, detoxification/wash solutions and orally administered desensitization to find the best preventive solution.

11.10.2 SNAKES

When site activities are conducted in warm weather on sites that are located in wooded, grassy, or rocky environments, the potential for contact with poisonous snakes becomes a real danger. Normally, if a person is approaching a snake, the noise created by the person is usually sufficient to frighten the snake off. However, during the warm months, extreme caution must be exercised when conducting site operations around areas where snakes might be found (i.e. rocks, bushes, logs, or in holes, crevices, and abandoned pipes). If poisonous snakes are identified onsite, OES will issue protective clothing, such as snake leggings, to site personnel. The rules to follow if someone is bitten by a snake are:

1. Do not cut "Xs" over the bite area because this will intensify the effect of the venom.
2. Do not apply suction to the wound since this has a minimal effective in removing venom.
3. Do not apply a tourniquet since this will concentrate the venom and increase the amount of tissue damage in the immediate area.
4. If possible to do so without risking another snake bite victim, kill the snake, bag it, and transport it with the victim or try to get a good look at it so it can be identified for proper selection of anti-venom. Pursuit of snakes will be limited to those snakes which are visible to team members. Once the snake has disappeared into rocks, bushes, etc., pursuit will stop.
5. Do not allow the victim to run for help since running increases the heart rate and will increase the spread of the venom throughout the body.
6. Keep the victim calm and immobile.
7. Have the victim hold the affected extremity lower than the body while waiting for medical assistance.
8. Transport the victim to medical attention immediately.

11.10.3 TICK BITES

11.10.3.1 General Information

The Centers for Disease Control (CDC) has noted the increase of Lyme disease and Rocky Mountain Spotted Fever (RMSF), which are caused by bites from infected ticks that live in and near wooded areas, tall grass, and brush. Ticks are small, ranging from the size of a comma up to about one-quarter inch. They are sometimes difficult to see, and, when embedded in the skin, they may look like a freckle. The tick season extends from spring through summer, so this section will only be applicable should work extend into the warm months.

11.10.3.1.1 Lyme disease has occurred in 43 states, with the heaviest concentrations in the northeast (Connecticut, Massachusetts, New Jersey, New York, Pennsylvania), the upper midwest (Minnesota

and Wisconsin), and along the northern California coast. It is caused by deer ticks and lone star ticks that have become infected with spirochetes. Female deer ticks are about one-quarter inch in size and are black and brick red in color. Male deer ticks are smaller and completely black. Lone star ticks are larger and chestnut brown in color.

11.10.3.1.2 RMSF has occurred in 36 states, with the heaviest concentrations in Oklahoma, North Carolina, South Carolina, and Virginia. It is caused by Rocky Mountain wood ticks and dog ticks which have become infected with rickettsia. Both are black in color.

11.10.3.1.3 The first symptoms of either disease are flu-like chills, fever, headache, dizziness, fatigue, stiff neck, and bone pain. If immediately treated by a physician, most individuals recover fully in a short time period. If not treated, more serious symptoms can occur.

11.10.3.1.4 If a team member believes he/she has been bitten by a tick, or if any of the signs and symptoms previously noted appear, the team member should contact the OES SSHO/QCS, who will authorize a visit to a physician for an examination and possible treatment.

11.10.3.2 Protective Measures

Standard field gear (i.e., work boots, socks, and light-colored coveralls) provide good protection against tick bites, particularly if the joints are taped. However, even when wearing field gear, the following precautions should be taken when working in areas that might be tick infested:

1. When in the field, check often for ticks, particularly on lower legs and areas covered with hair.
2. Spray outer clothing, particularly pant legs and socks, **BUT NOT YOUR SKIN**, with an insect repellant that contains permethrin or permanone;
3. When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible;
4. If you find a tick, remove it by pulling on it gently with tweezers;
5. If the tick resists, cover the tick with salad oil for about 15 minutes to asphyxiate it, then remove it with tweezers;
6. Do not use matches, a lit cigarette, nail polish or any other type of chemical to coax the tick out;
7. Remove all parts of the tick's body, and disinfect the area with alcohol or a similar antiseptic after removal; and
8. For several days to several weeks after removal of the tick, look for the signs of the onset of Lyme disease, such as a rash that looks like a bulls-eye or an expanding red circle surrounding a light area, frequently seen with a small welt in the center; and
9. Also look for the signs of the onset of RMSF, such as an inflammation which is visible in the form of a rash comprising many red spots under the skin, which appears 3 to 10 days after the tick bite.

11.10.4 BEES, HORNETS, AND WASPS

Contact with stinging insects like bees, hornets, and wasps may result in site personnel experiencing adverse health affects that range from being mildly uncomfortable to life threatening. Therefore, stinging insects present a serious hazard to site personnel, and extreme caution must be exercised whenever site and weather conditions increase the risk of encountering stinging insects. This is a seasonal problem, and will only be applicable should work extend into the warm months. Some of the factors related to stinging insects that increase the degree of risk associated with accidental contact are as follows:

1. The nests for these insects are frequently found in the type of remote wooded, grassy areas where many waste sites are located;
2. The nests can be situated in trees, rocks, bushes, or in the ground and are usually difficult to see;
3. Accidental contact with these insects is highly probable, especially during warm weather conditions when the insects are most active;
4. If a site worker accidentally disturbs a nest, the worker may be inflicted with multiple stings, causing extreme pain and swelling which can leave the worker incapacitated and in need of medical attention; and
5. Some people are hypersensitive to the toxins injected by a sting and, when stung, experience a violent and immediate allergic reaction resulting in a life-threatening condition known as anaphylactic shock.

Anaphylactic shock manifests itself rapidly and is characterized by extreme swelling of the body, eyes, face, mouth and respiratory passages. The hypersensitivity needed to cause anaphylactic shock can in some people, accumulate over time and exposure. Therefore, even if someone has been stung previously and has not experienced an allergic reaction, there is no guarantee that he/she will not have an allergic reaction after being stung again.

11.10.4.1 Because of the high probability of contact with stinging insects, all site personnel will comply with the following safe work practices:

1. If a worker knows that he/she is hypersensitive to bee, wasp, or hornet stings, he/she must inform the OES SSHO/QCS of this condition prior to participation in site activities.
2. All site personnel will be watchful for the presence of stinging insects and their nests and will advise the OES SSHO/QCS if a stinging insect nest is located or suspected in the area.
3. Any nests located onsite will be flagged, and site personnel will be notified of its presence.
4. If stung, site personnel will immediately report to the OES SSHO/QCS to obtain treatment and to allow the SSHO/QCS to observe them for signs of allergic reaction.

5. Site personnel with a known hypersensitivity to stinging insects will keep required emergency medication on or near their person at all times.

11.10.5 BITING INSECTS

Many types of biting insects such as mosquitos, flies and fleas may be encountered onsite. The use of insect repellents will be encouraged by the OES SSHO/QCS if deemed necessary. The biting insects of greatest concern are spiders, especially the black widow and the brown recluse, because of the significant adverse heath effects their bites can cause.

11.10.5.1 The black widow is a coal-black bulbous spider 3/4 to 1 1/2 inches in length, with a bright red hour-glass on the under side of the abdomen. The black widow is usually found in dark, moist locations, especially under rocks and rotting logs and may even be found in outdoor toilets where they inhabit the underside of the seat. Victims of a black widow bite may exhibit the following signs or symptoms:

1. Sensation of pinprick or minor burning at the time of the bite;
2. Appearance of small punctures (but sometimes none are visible); and
3. After 15 to 60 minutes, intense pain is felt at the site of the bite, which spreads quickly and is followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils, and generalized swelling of the face and extremities.

11.10.5.2 The brown recluse is brownish to tan in color, rather flat, and 1/2 to 5/8 inches long with a dark brown violin shape on the underside. It may be found in trees or in dark locations. Victims of a brown recluse bite may exhibit the following signs or symptoms:

1. Blistering at the site of the bite, followed by a local burning at the site 30 to 60 minutes after the bite;
2. Formation of a large, red, swollen, pustulating lesion with a bull's-eye appearance;
3. Systemic affects such as a generalized rash, joint pain, chills, fever, nausea, and vomiting; and
4. Possibly severe pain after 8 hours, with the onset of tissue necrosis.

11.10.5.3 There is no effective first aid treatment for either of these bites. Except for very young, very old, or weak victims, these spider bites are not considered to be life threatening. However, medical treatment must be sought to reduce the extent of damage caused by the injected toxins.

11.10.5.4 If either of these spiders are suspected or known to be onsite, the OES SSHO/QCS will brief the site personnel as to the identification and avoidance of the spiders. As with stinging insects, site personnel should report to the OES SSHO/QCS if they locate either of these spiders onsite or notice any type of bite while involved in site activities.

11.10.6 HANTAVIRUS

Hantavirus is a disease spread primarily from infected rodent droppings. To prevent worker exposure to this disease, enclosed workplaces (to include storage magazines) shall be constructed and maintained, so far as reasonably practical, to prevent the entrance or harborage of rodents. An effective extermination program shall be instituted where the presence of such vermin is detected. Any rodent droppings observed will be immediately cleaned up and the area wiped with a disinfectant.

11.11 UXO/OE

UXO/OE may be present and located during site activities. If UXO is located onsite, its location will be marked, and the onsite government representative will be notified of the presence of the UXO. All UXO-qualified personnel will follow the SWPs listed in Section 3.0 of the WP, and all non-UXO-qualified personnel will comply with the following SWPs:.

1. Non-UXO qualified personnel will receive site-specific UXO recognition training prior to participation in site activities;
2. No soil-penetrating activities will be allowed without the area first being cleared by UXO-qualified personnel;
3. Non-UXO qualified personnel will be escorted onsite by UXO qualified personnel, until such time as the area is cleared;
4. Once an area has been cleared and flagged, non-UXO qualified personnel may perform duties in the area unescorted but shall not leave the cleared area unescorted;
5. No excavation or soil-penetrating activities will be conducted in an area unless previously cleared by UXO/OE-qualified personnel; and
6. Non-UXO qualified personnel will not touch or disturb any object which could potentially be UXO/OE related and will immediately notify the nearest UXO-qualified person of the presence of the object.

11.11.1 TRANSPORTATION OF UXO/OE

All motor vehicles used in the transport of UXO/OE will be maintained and all operators will be trained in accordance with the OES Motor Vehicle Safety Program. At least two properly rated fire extinguishers are required to be mounted on the vehicle for flammable cargoes to include UXO/OE. Explosive placards will be mounted on all four sides of the transporting vehicle. The load shall be distributed, choked, tied down, or secured to prevent movement while in transit. All UXO/OE materials being prepared for transport will be handled in accordance with USAESCH's *Safety Concepts and Basic Considerations for Unexploded Explosive Ordnance (UXO)* (Appendix C of WP).

11.11.1.1 Operators of vehicles transporting personnel, explosives, flammable, or toxic substances shall stop at railroad crossings or drawbridges and shall not proceed until the course is clear. A stop shall not be required at a streetcar crossing within a business or residential district; at a railroad grade crossing or drawbridge protected by a watchperson, traffic officer, or by a traffic signal indicating approaching vehicles may proceed.

11.11.1.2 No explosives, flammable materials (except normal fuel supply), or toxic substances shall be transported in vehicles carrying personnel.

11.11.1.3 If base-ejection type projectiles must be transported to a disposal area or collection point, the base shall be oriented to the rear of the vehicle and the projectile secured, in the event the ejection charges function during transport.

11.11.1.4 If OE, with exposed hazardous filer (HE, etc.) must be moved to a disposal area, the item shall be placed in a heavy duty conductive plastic bag to prevent migration of the hazardous filler. Padding shall also be added to protect the exposed fill from heat, shock, and friction. An ideal padding material is vermiculite, kitty litter, or sand.

11.11.1.5 Motor vehicles and material handling equipment used for transporting ammunition or explosives must meet the following requirements:

1. Exhaust systems shall be kept in good mechanical repair at all times.
2. Lighting systems shall be electric.
3. As a minimum, two Class 2A:10B:C-rated, portable fire extinguishers shall be mounted on the vehicle outside of the cab, on the driver's side.
4. Wheels of carriers must be choked and brakes set during loading and unloading.
5. No explosives or ammunition shall be loaded into or unloaded from motor vehicles while their motors are running.

11.11.1.6 Motor vehicles and material handling equipment used to transport explosives shall be inspected prior to use to determine that:

1. Fire extinguishers are filled and in good working order.
2. Electrical wiring is in good condition and properly attached.
3. Fuel tank and piping are secure and not leaking.
4. Brakes, steering, and other equipment are in good condition.
5. The exhaust system is not exposed to accumulations of grease, oil, gasoline, or other fuels, and has ample clearance from fuel lines and other combustible materials.

No more than two persons shall ride in a truck transporting explosives or ammunition, and no person shall be allowed to ride in the trailer/bed. Vehicles shall not be refueled when carrying explosives. Vehicles must be 100 ft from magazine or trailers containing explosives before refueling. All vehicles used for transportation explosive materials will be cleaned of visible explosive contamination before releasing the vehicles for other duties.

11.11.2 CWM

If CWM or suspected CWM is encountered, all work within 500 meters of the location will cease, the area will be evacuated, and USAESCH will be notified. Two UXO specialists will maintain security on the item from an upwind location. The remainder of the field team will be posted on all access routes to ensure no unauthorized personnel enter the site. This posture will be maintained until

relieved by proper military authority (i.e., EOD Unit of U.S. Army Technical Escort Unit. ESE and OES will render assistance as requested by USAESCH.

11.12 COLD STRESS

The affects experienced by site personnel when working in cold environments depend on many environmental and personal factors, such as ambient air temperature, wind speed, duration of exposure, type of protective clothing and equipment worn, type of work conducted, level of physical effort, and health status of the worker. In cold environments, overexposure can cause significant stress on the body, which can lead to serious and permanent injury. Cold may affect just the exposed body surfaces and extremities, or the deeper body tissues and the body core. The following paragraphs contain information about the most common cold stress disorders and their signs, symptoms, affects, and control techniques.

11.12.1 COLD STRESS DISORDERS

11.12.1.1 Immersion Foot or Trench Foot

These two cold injuries occur as a result of exposure to cool or cold weather and persistent dampness or immersion in water. Immersion foot usually results from prolonged exposure when air temperatures are above freezing, whereas trench foot normally occurs from shorter exposure at temperatures near freezing. The symptoms for each disorder are similar and include tingling, itching, swelling, pain in some cases or numbness in others, lack of sweating, and blisters.

11.12.1.2 Frostbite

Frostbite occurs when water contained in the body tissues freezes. This usually occurs when temperatures are below freezing, but excessive wind can result in frostbite even at ambient temperatures that are above freezing. Frostbite can occur from several types of cold exposure, such as: exposure of bare skin to cold and wind, exposure to extremely cold ambient temperatures, or skin contact with objects whose temperatures are below freezing. The extremities are usually affected first since they experience reduced blood flow and heat loss. The tissue damage caused by frostbite can be superficial; near the surface of the skin; or extend to deeper body tissues, which can cause severe tissue damage. The skin may first have a prickly or tingling sensation and later become numb with cold, and the appearance may range from superficial redness of the skin to white, hard, frozen-looking tissues.

11.12.1.3 Hypothermia

Hypothermia results when the body loses heat faster than it can produce it. When this occurs, the blood vessels in the skin and extremities constrict, reducing the flow of warm blood to those areas, thereby reducing the rate of heat loss. This reduction in blood flow usually affects the peripheral extremities first. Ears, fingers, and toes begin to experience chilling, pain, and then numbness due to loss of blood flow and heat. Shivering begins as the body's core temperature begins to drop, and the body uses the shivering to compensate and create metabolic heat. Shivering is often the first sign of hypothermia. The pain and numbness in the extremities is an indication that the heat loss is increasing, and, when shivering becomes uncontrollable, the heat loss in the body core has become

extreme. Further heat loss produces speech difficulty, forgetfulness, loss of manual dexterity, collapse, and finally death.

11.12.2 TREATMENT OF COLD STRESS DISORDERS

The intent of all cold stress treatment is to bring the deep body core temperature back to its normal temperature of about 98.6°F. Work performed in cold environments should be discontinued for any worker who exhibits the signs or symptoms associated with hypothermia or frostbite. Workers exhibiting those symptoms should be brought to a warm area and allowed to rest and warm up. If a worker's clothing becomes wet, which reduces its insulation effect, it should be removed and replaced by dry clothing, or allowed to dry before resuming work. A warm, nonalcohol, decaffeinated drink (not coffee) or soup may be given. Rewarming should be gradual. For frostbite, the victim should be sheltered from the wind and cold and given warm drinks. If the frostbite is superficial, the frozen part should be covered with extra clothing or blankets or warmed against the body. **Do not use direct heat, and do not pour hot water over or rub the affected area.** Warming should be gentle and gradual. Failure to do this could lead to bleeding in the tissues and increase the possibility of infection. If the frostbite is deep (i.e., the affected area is frozen and hard to the touch) immediate medical attention should be obtained. The safe thawing of deep frostbite is beyond the expertise and facilities found onsite.

11.12.3 PREVENTION OF COLD STRESS DISORDERS

11.12.3.1 Preventive Measures Taken By Site Personnel

During work in cold environments, the OES SSHO/QCS will use the tailgate safety briefing to inform site personnel of the measures to be used to prevent and control cold stress. The OES SSHO/QCS will also use meteorological data and Table 11-2 to inform site personnel of the combined temperature/wind chill effect to be expected during the day's activities. Prevention methods which site personnel will use include the following:

1. Wear adequate, appropriately layered clothing, including a water repellant outer layer if precipitation is forecasted. Layered clothing should include an innermost layer, such as cotton to trap heat and absorb perspiration; an insulating layer; a layer of work weight clothing; and an outer protective layer designed to be wind/water proof, such as or Gortex®.
2. Wear a hat, gloves, and socks that are insulated to retain body heat.
3. Remove outer layers of clothing during breaks in heated shelters to prevent excessive sweating;
4. In windy, cold conditions, cover all exposed skin;
5. Eat well-balanced meals and maintain adequate intake of non-alcoholic, decaffeinated fluids;
6. Seek shelter in a warm protected area when signs and symptoms of cold stress become evident; and

Table 11-2. Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°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
Wind speeds greater than 40 mph have little additional effect	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER Danger from freezing of exposed flesh within 1 minute				GREAT DANGER Flesh may freeze within 30 seconds			
	Trench foot and immersion foot may occur at any point on this chart.											

7. Protect clothing from getting wet, this includes keeping clothing from getting wet with sweat, so remove outer layers if work activities cause excessive sweating.
8. Be aware of the higher likelihood for static electricity generation during colder weather due to dropping temperature and humidity levels. When handling potentially static sensitive explosive materials, synthetic materials such as nyloncan increase static electricity. The recommended material for clothing is cotton.

11.12.3.2 Preventative Measures Taken By ESE And EOD Subcontractor

ESE and OES will assist in preventing cold stress by providing sheltered, warm areas where site personnel can rest and regain body heat during breaks. ESE and OES will also provide the following to assist site personnel in abating cold stress:

1. Warm fluids, such as soup or decaffeinated tea and cocoa; and
2. A minimum of one 15-minute break in a heated shelter every 2 hours.

NOTE: To date, there are no federally mandated regulations related to work/rest schedules. The 15-minute break every 2 hours is a recommended routine but may not be adequate for all cold environments. The American Conference of Governmental Industrial Hygienists (ACGIH) has published a work/rest schedule, which is provided in Table 11-3 of this section. However, this table only applies to, and should be implemented for, temperatures below 0°F. Therefore, for temperatures above 0°F, workers will be encouraged to seek shelter and rest in a warm area whenever they exhibit signs or symptoms of cold stress, as discussed previously.

11.13 HEAT STRESS

Heat stress is one of the most common (and potentially serious) illnesses that can affect hazardous waste site workers. This is a seasonal hazard which will only be applicable should work extend into the warm months. The most common cause of heat stress during site activities is the effect that PPE has on the body's natural cooling mechanism. Impermeable PPE interferes with perspiration evaporation and causes the body to retain metabolic and environmentally induced heat. Individuals will vary in their susceptibility and degree of response to the stress induced by increased body heat. Factors which may predispose a worker to heat stress include lack of physical fitness, lack of acclimatization to hot environments, degree of hydration, level of obesity, current health status (e.g., having an infection, chronic disease, or diarrhea), alcohol or drug use, and the worker's age and sex. For the remainder of this section, reference to liquids will indicate water or an electrolyte replacement solution, not tea, coffee, or soft drinks.

11.13.1 HEAT STRESS DISORDERS

11.13.1.1 Heat Rash

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

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

Table 11-3. TLV Work/Rest Schedule for 4-Hour Work Shift*

Air Temp.	No Wind		5 mph Wind		10 mph Wind		15 mph Win		20 mph Wind	
°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
-4° to -8°	Normal	1	Normal	1	Normal	1	Normal	1	Normal	1
-9° to -13°	Normal	1	Normal	1	Normal	1	Normal	1	75 min.	2
-14° to -18°	Normal	1	Normal	1	Normal	1	75 min.	2	55 min.	3
-15° to -19°	Normal	1	Normal	1	75 min.	2	55 min.	3	40 min.	4
-20° to -24°	Normal	1	75 min.	2	55 min.	3	40 min.	4	30 min.	5
-25° to -29°	75 min.	2	55 min.	3	40 min.	4	30 min.	5	Nonemergency work should cease	
-30° to -34°	55 min.	3	40 min.	4	30 min.	5	Nonemergency work should cease			
-35° to -39°	40 min.	4	30 min.	5	Nonemergency work should cease					
-40° to -44°	30 min.	5	Nonemergency work should cease							
-45 & Below	Non-emergency work should cease									

Note: Schedule applies to any 4-hour work period with moderate to heavy work activity, with warm-up cycle in a warm location and with an extended break in a warm location (e.g., lunch) at the end of the 4 hours. For light to moderate work: apply the schedule one step lower.

The following is suggested as a guide for estimating wind velocity if other, more accurate means are not available: 5 mph - light flag moves; 10 mph - light flag fully extended; 15 mph - raises newspaper sheet; 20 mph - blowing and drifting snow.

This table applies only to acclimatized workers with appropriate dry clothing for winter work.

*Adapted from the 1993-1994 Threshold Limit Values and Biological Exposure Indices, ACGIH, Cincinnati, OH.

Source: ESE.

Treatment: Decrease amount of time in protective gear and provide powder such as corn starch or baby powder to help absorb moisture and decrease chafing. Maintain good personal hygiene standards and change into dry clothes if needed.

11.13.1.2 Heat Cramps

Heat cramps are caused by a perspiration rate that is not balanced by adequate fluid and electrolyte intake. The occurrence of heat-related cramps are often an indication that excessive water and electrolyte loss has occurred, which can further develop into heat exhaustion or heat stroke.

Symptoms: Acute, painful spasms of voluntary muscles such as the back, abdomen, and extremities.

Treatment: Remove victim to a cool area and loosen restrictive clothing. Stretch and massage affected muscles to increase blood flow to the area. Have patient drink one to two cups of liquid immediately, and every 20 minutes thereafter. Consult a physician if condition does not improve. If available, an electrolyte replacement solution should be taken along with water. Consumption of soft drinks will not be adequate and may aggravate the condition.

11.13.1.3 Heat Exhaustion

Heat exhaustion is a state of definite weakness or exhaustion caused by excessive fluid loss from the body. This condition leads to inadequate blood supply and cardiac insufficiency. Heat exhaustion is less dangerous than heat stroke but nonetheless must be treated. If allowed to go untreated, heat exhaustion can quickly develop into heat stroke.

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

Treatment: Remove the individual to a cool, air-conditioned place, loosen clothing, elevate feet and allow individual to rest. Consult physician, especially in severe cases. Have patient drink one to two cups of liquids immediately, and every 20 minutes thereafter. Total liquid consumption should be about 1 to 2 gallons per day. If the signs and symptoms of heat exhaustion do not subside, or become more severe, immediate medical attention will be required.

11.13.1.4 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of the heat-regulating mechanisms of the body. The failure of the individual's temperature control mechanism causes the perspiration system to stop working correctly. When this occurs, the body core temperature rises

rapidly to a point (105+°F) where brain damage and death will result if the person is not cooled quickly.

Symptoms: The victim's skin is hot and may or may not be red and dry because the individual may still be wet from perspiration while wearing protective clothing earlier; nausea; dizziness; confusion; extremely high body temperatures; rapid respiratory and pulse rate; delirium; convulsions; unconsciousness; or coma.

Treatment: Cool the victim immediately. If the body temperature is not brought down quickly, permanent brain damage or death may result. Cool the victim by either sponging or immersing the victim in cool water to reduce the core temperature to a safe level (< 102°F). If conscious, give the victim cool liquids to drink. Observe the victim and obtain immediate medical help. Do not give the victim caffeine or alcoholic beverages.

11.13.2 PREVENTIVE HEAT STRESS MEASURES

11.13.2.1 Minimal Preventive Measures

To avoid heat-related illnesses, proper preventive measures will be implemented whenever environmental conditions dictate the need. The preventive measures listed in this paragraph represent the minimal steps to be taken and will include the following procedures:

1. The OES SSHO/QCS will examine each site worker prior to the start of daily operations to determine the individual's susceptibility to heat stress. The OES SSHO/QCS will closely monitor workers exhibiting factors which make them susceptible to heat stress.
2. Site workers will be trained to recognize and treat heat-related illnesses. This training will include the signs, symptoms, and treatment of heat stress disorders as outlined in paragraph 11.13.1 of this section.
3. Workers will be encouraged to drink a minimum of 16 ounces (oz) of liquids prior to start of work in the morning, after lunch, and prior to leaving the site at the conclusion of the day's activities. Disposable 4- to 12-oz cups and liquids will be provided onsite. Acceptable liquids will include water and an electrolyte replacement solution, with the intake of each being equally divided. Liquids containing caffeine are to be avoided.
4. When ambient conditions and site work load requirements dictate, as determined by the OES SSHO/QCS, workers will be required to drink a minimum of 16 to 32 oz of liquids during each rest cycle.
5. A shelter or shaded area will be provided where workers may be protected from direct sunlight during rest periods.
6. Monitoring of ambient or physiological heat stress indices will be conducted to allow prevention and/or early detection of heat-induced stress. Monitoring will be conducted IAW paragraph 11.13.3 of this section.

7. Site workers will be given time to acclimatize to working in hot environments. Acclimatization usually takes 2 to 6 days and allows the worker's body to become adjusted to working in hot environments. This process involves a gradual increase of the workload over the 2- to 6-day period. The recommended acclimatization schedule suggests starting workers at 50 percent of the anticipated work load and increasing each day by 10 percent. For fit or trained individuals, the acclimatization period may be shortened to 2 or 3 days.

11.13.2.2 Additional Preventive Measures

When possible and/or feasible, the following measures will also be implemented to prevent or reduce the effects of heat-induced stress:

1. Designated rest areas should be air conditioned and the temperature maintained between 72 and 76°F.
2. Cooling devices will be provided to aid in body heat exchange. Cooling devices may include cooling jackets, vests, or suits and field showers or hose-down areas. Depending on the severity of the heat exposure, some form of artificial cooling may be required to ensure protection of the workers.
3. Workers will be encouraged to achieve and maintain an optimum level of physical fitness. Increased physical fitness will allow workers to better tolerate and respond to hot environments and heavy work loads. In comparison to an unfit person, a fit person will have less physiological strain, a lower heart rate and body temperature, and a more efficient sweating mechanism.

11.13.3 PHYSIOLOGICAL HEAT STRESS MONITORING

When site personnel are engaged in site activities involving the use of semi-permeable or impermeable clothing in ambient temperatures greater than 70°F, physiological monitoring will be conducted. The goal of all heat stress monitoring is to ensure that the worker's body temperature does not exceed 100.4°F. The following physiological monitoring methods are to be implemented based on the severity of the heat and work load. As a minimum, the OES SSHO/QCS will monitor the worker's heart rate as an indication of potential heat stress. However, if monitoring with the heart rate method indicates the need for closer, more direct monitoring, the oral temperature method will be implemented. The OES SSHO/QCS will determine the need for monitoring body water loss, based on observation of the sweat loss experienced by site personnel during their work cycle. The frequency of physiological monitoring will be determined using the information presented in Table 11-4.

11.13.3.1 Heart Rate Monitoring

The worker's baseline heart rate should be recorded prior to starting site activities by measuring the radial (wrist) pulse rate for 30 seconds. After each work cycle, the heart rate should be measured by taking the pulse rate as early as possible into the resting period. Taking the radial pulse rate is the preferred method. However, the carotid (neck) pulse rate may be taken if a worker has difficulty

finding the radial pulse. The pulse rate at the beginning of the rest period should not exceed 110 beats per minute (bpm). If the pulse rate is higher than 110 bpm, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate exceeds 110 bpm at the beginning of the next rest period, the work cycle should be further shortened by 33 percent. This procedure is continued until the pulse rate at the beginning of the rest cycle is maintained below 110 bpm.

11.13.3.2 Oral Temperature (OT) Monitoring

If deemed necessary by the SSHO/QCP, and the conditions warrant, OT monitoring will be conducted. The worker's OT will be taken and recorded prior to starting site activities using a clinical thermometer placed under the tongue. The OT must be taken prior to consumption of cool liquids and will be done at the end of each work period or at a frequency determined by Table 11-4. Whenever the OT exceeds 99.6°F, the work cycle must be shortened by one third, without changing the length of the rest period. If a worker's OT has exceeded 99.6°F, the OT should be tested again at the end of the rest cycle, and the worker should not be allowed to return to work until the OT drops below 99.6°F. If a worker's OT exceeds 100.4°F, the worker will not be allowed to work in impermeable or semipermeable PPE for the remainder of that work day.

11.13.3.3 Body Weight Loss

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

1. Subtract the ending weight (W_{ending}) from the daily starting weight (W_{start}) to obtain the weight lost (W_{lost}) during a given work period [i.e.: (W_{start}) - (W_{ending}) = (W_{lost})].
2. Multiply the starting weight by 1.5 percent to obtain permissible weight loss (W_{perm}) [i.e.: (W_{start}) x 0.015 = (W_{perm})].
3. Compare (W_{lost}) to the (W_{perm}). If (W_{lost}) is less than or equal to (W_{perm}), then hydration has been adequate, but if (W_{lost}) is greater than (W_{perm}), then hydration should be increased during the next work period.

11.13.3.4 WBGT Monitoring

For site conditions where personnel are working in Level D PPE and the ambient temperature is greater than 75°F, the SSHO/QCP will conduct WBGT monitoring to assist in controlling the potential for site workers experiencing heat-related adverse health affects. The SSHO/QCP will use a

Table 11-4. Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers [a, d]

ADJUSTED TEMPERATURE[b]	NORMAL WORK ENSEMBLE[c]	IMPERMEABLE ENSEMBLE
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-28.1°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (214.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.5°-214.3°C)	After each 150 minutes of work	After each 120 minutes of work

[a]For work levels of 250 kilocalories/hour.
[b]Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 x percent sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow (e.g., 100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows). Use decimal expression of percent sunshine)
[c]A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.
[d]Source: NIOSH/OSHA/USCG/EPA. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. DHHS (NIOSH) 85-115. Cincinnati, OH.

real-time direct reading WBGT monitor and, after estimating the work load, use the values expressed in Table 11-5 to determine the work/rest schedule to be implemented. The values outlined in Table 11-5 are designed such that nearly all acclimatized, fully clothed workers with adequate salt and water intake will be able to function without the body temperature exceeding 100.4°F. If conditions and/or work loads warrant, the SSHO/QCP may also implement the OT and water weight loss monitoring outlined in paragraphs 11.13.3.2 and 11.13.3.3.

11.13.4 HEAT STRESS DOCUMENTATION

The SSHO/QCP will be responsible for recording all heat-stress-related information. This will include training sessions, WBGT, and physiological monitoring data. Training sessions will be documented using the OES Training Roster. Pulse rate monitoring data will be recorded on the Heat Stress Monitoring Log (Figure 11-1), with the WBGT, OT, and/or water loss calculations being recorded in the Site Safety Log and/or Site Monitoring Log.

Table 11-5. Permissible WBGT Heat Exposure Threshold Limit Values

Work - Rest Regimen	WORK LOAD		
	Light*	Moderate	Heavy
Continuous work	86 (30.0)	80 (26.7)	77 (25.0)
75% Work - 25% Rest, each hour	87 (30.6)	82 (28.0)	78 (25.5)
50% Work - 50% Rest, each hour	89 (31.4)	85 (29.4)	82 (27.9)
25% Work - 75% Rest, each hour	90 (32.2)	88 (31.1)	86 (30.0)

*Consult the ACGIH TLV booklet for definitions of light, moderate and heavy work loads. Values are given in °F and (°C) WBGT, and are intended for workers wearing single layer summer type clothing. Use of semi or totally impermeable clothing require monitoring IAW the Physiological Heat Stress Monitoring found in paragraph 11.12.3 of this section. As workload increases, the heat stress impact on an unacclimatized worker is exacerbated. For unacclimatized workers performing a moderate level of work, the permissible heat exposure TLV should be reduced by approximately 2.5°C.
°Source: ACGIH. 1993-1994 Threshold Limit Values and Biological Exposure Indices. Cincinnati, OH.

Figure 11-1 HEAT STRESS MONITORING LOG

Date: _____ Site Name: _____ Conditions: _____

SSHO: _____ Location: _____ _____

Name	Organization	Start Time	Pulse Rate	Time	Pulse Rate	Time	Pulse Rate	Time	Pulse Rate	Time	Pulse Rate

Remarks and Observations:

P/FUDS/CROFT3/WP-D-FIG.1
07/11/96

12.0 EMERGENCY RESPONSE PLAN AND EQUIPMENT

12.1 GENERAL

Emergency situations can be minimized through proper implementation of the SSHP. If an emergency situation develops, the OES SSHO/QCP will act as the on-scene Incident Commander, and the initial response will be to handle it in a calm, deliberate manner so that the situation is controlled and the safety and health of the site workers and surrounding community are not jeopardized.

12.2 EMERGENCY PROCEDURES

Evacuation, assembly, site control, hospital route map (Figure 6-1), and emergency numbers will be posted in the office/break area. Hospital route maps shall also be maintained in the designated emergency vehicle, as well as all other site vehicles, and all personnel will be aware of the location of the closest telephone and/or radio communications. The list of the emergency phone numbers in Table 12-1 should be readily available to all employees on the job site; all phone numbers can be reached via cellular phone. The emergency plan shall be tested prior to commencing site operations to ensure its adequacy. This test shall include a person with simulated injury who is transported to the supporting medical facility.

12.2.1 The emergency equipment (Table 12-2) will be maintained in proper working order and checked daily for completeness during the site work.

12.2.2 In addition to the equipment (Table 12-2), a cellular telephone will be located in a support vehicle and verified to be in working order prior to start of work.

12.2.3 An air horn will be carried by the work team and one kept at the office/break trailer. One long blast on the air horn will be the signal to evacuate the site immediately. Personnel in the WZ will evacuate to the assembly point specified during the tailgate safety briefing. If the assembly point used by WZ personnel is different than that used by SZ personnel, the OES SSHO/QCP will use radio communication to coordinate accounting of all site personnel.

Once all personnel are accounted for, the OES SSHO/QCP will outline the actions to be taken as determined by the situation. Two short blasts is the **ALL CLEAR** signal.

12.2.4 During an emergency, the following actions will be taken, with some actions conducted concurrently. No one will attempt emergency response/rescue until the situation has been assessed and the appropriate response outlined by the OES SSHO/QCP. Rescue/response may include the following:

1. Enforcing the Buddy System: Allow no one to enter a contaminated area or hazardous area without a partner. At all times, personnel in the WZ should be in line-of-sight or communications contact with the supervisor or designated appointee.

Table 12-1. Emergency Telephone Numbers

Emergency Telephone Numbers		
Police	Spartanburg Police Dept.	(803) 596-2035
Sheriff	Spartanburg Co. Sheriff	(803) 596-2540
Fire	Spartanburg Fire Dept.	(803) 596-2083
	Camp Croft Vol. Fire Dept.	(803) 582-7638
Ambulance	Spartanburg Reg. Med. Ctr.	(803) 560-6175
Poison Control Center		(800) 282-3171
Hospital	Spartanburg Reg. Med. Ctr.	(803) 560-6107
EPA	24 Hours	(205) 655-2222
Point of Contact		
Patti Berry	USAESCH, Project Manager	(205) 895-1525
Wayne Bogan	CESAC Geographical Region Project Manager	(803) 727-4366
ESE Contacts		
Robert Momberger	Project Manager	(352) 333-3628
Dan Morton	Health & Safety	(813) 287-2755
Dave Moccia	Program Director	(352) 333-3601
Barry Peterman	Office Manager	(352) 333-3623
OES Contacts		
Jim Adams	Project Manager	(205) 830-4847
Cheryl Riordan	Safety Manager	(205) 830-4847

Table 12-2. Emergency Equipment

EQUIPMENT	NUMBER	LOCATION	OPERATION
First-Aid/Burn Kit	1 each location	Support Vehicles/SZ	All
Portable Eye Wash Kit	1	Support Vehicles/SZ	All
CPR Pocket Mask	1	Support Vehicles/SZ	All
15 Minute Gravity-Feed Eye Wash	1	Support Vehicles/SZ	All
Air Horn	2 (1 each location)	SZ/WZ	All
Fire Extinguisher	1 each location	Support Vehicles/WZ	All

2. Survey Casualties:
   a. Locate all victims and assess their condition.
   b. Determine resources needed for stabilization and transport.
3. Assessment: Assess existing and potential hazards to site personnel and the offsite population. Determine:
   a. Whether and how to respond,
   b. The need for evacuation of site personnel and offsite population, and
   c. The resources needed for evacuation and response.
4. Request Aid: Contact the required offsite/onsite personnel or facilities, such as the ambulance, fire department, police, etc. (Table 12-1).
5. Allocate Resources: Allocate onsite personnel and equipment to rescue and initiate incident response operations.
6. Control: Assist in bringing the hazardous situation under complete or temporary control and use measures to prevent the spread of the emergency (e.g., cover hole with tarp/plastic or wood, control fire, and secure site).
7. Extricate: Remove or assist victims from the area.
8. 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 and tanks).
9. Transport: Transport injured personnel to medical facility.
10. Casualty Logging: Record who, time, destination, and condition at transport.
11. Casualty Tracking: Record disposition, condition, and location.

12.2.5 Communications with response services will be conducted by the OES SSHO/QCP, followed by notification of the ESE Site Manager and the USAESCH Safety and Occupational Health Office.

12.3 ACCIDENT/INCIDENT REPORTING

In the event of an accident and/or incident, the ESE Site Manager will be immediately notified. Within 2 working days of any reportable accident, the ESE Site Manager, with the assistance the OES SSHO/QCP, will complete and submit an accident report on ENG Form 3394, in accordance with AR 385-40 and USAESCH supplements to that regulation.

12.4 HOSPITAL ROUTE

The main route from the former CCATF to Spartanburg, where the Spartanburg Regional Medical Center is located, is State Route 56 to U.S. Route 221. Route 56 runs along the western edge of the site. Follow Route 56 west [left onto Union Street, Route 56 becomes East Henry Street, then make a right onto Church Street (Junction with Route 221)]. Approximately 1.2 miles after the turn, the main road diverges into State Route 56 West (Church Street) and U.S. Route 221 North (North Magnolia). Wofford College will be located on your right. Follow U.S. 221 North by keeping to the right as you

pass Wofford College. Approximately 1/4 mile from the split with State Route 56, make a right turn (east) off of U.S. Route 221 onto East Wood Street. Spartanburg Medical Center is immediately on the right.

12.5 FIRES AND EXPLOSIONS

12.5.1 FIRE EXTINGUISHERS

A dry-chemical-type 4A:20B:C fire extinguisher will be available at each individual work site. Dry chemical fire extinguishers will be provided at any other site location where flammable materials may present a fire risk [e.g., petroleum, oil, and lubricant (POL) storage area]. Additionally, a fire extinguisher rated at least 1A:10B:C will be located with each piece of heavy equipment and in each site vehicle.

12.5.2 SMALL FIRES

A small fire is defined as a fire that can be extinguished with a 4A:20B:C type fire extinguisher. In the event of a small fire, site personnel will take the following actions:

1. Evacuate all unnecessary personnel from the area, preferably to an upwind location;
2. Attempt to extinguish fire using portable fire extinguishers or by smothering from an upwind location;
3. Request emergency response assistance (i.e., ambulance, fire, and police), as needed, for any injuries or exposures to hazardous chemicals; and
4. Do not attempt to extinguish a fire involving explosives.

12.5.3 LARGE FIRES

In the event of a large fire or small fire which cannot be extinguished, the following actions will be taken:

1. Evacuate all unnecessary personnel from the site, preferably to an upwind location.
2. Notify the fire department or other emergency response service (i.e., police, fire, ambulance, and hospital), as needed.
3. Order the appropriate level of protective clothing to be worn by personnel fighting the fire. Try to fight the fire from an upwind location.
4. Do not attempt to extinguish a fire involving explosives.

12.5.4 EXPLOSION

In the event of an explosion, all nonessential personnel will evacuate the site, required support equipment and personnel will be requested, and the USAESCH Contracting Officer or designated representative will be notified.

12.6 FIRST-AID KITS

The size and number of kits, which include first-aid and eye wash supplies, a CPR mask, and a burn blanket, will be sufficient to accommodate the maximum number of people (including government

personnel and visitors) onsite at any given time. The kits will be located at each work site and the location will be made known to all personnel. An additional kit will be kept by the designated first-aid/CPR attendant or by the OES SSHO/QCS. Kit locations will be provided with adequate water and other supplies necessary to clean burns, wounds, or lesions.

12.7 FIRST-AID PROCEDURES

The following first aid procedures will be followed when onsite first aid personnel must render assistance for individuals injured onsite:

1. For minor injuries, use routine first aid procedures;
2. For major injuries, call an ambulance immediately and administer the appropriate first aid while awaiting arrival of the ambulance;
3. Use Red Cross approved measures for treatment;
4. Wash/rinse affected area thoroughly with copious amounts of soap and water, then provide appropriate medical attention if required;
5. If chemicals have been splashed into the eyes, rinse eyes for at least 15 minutes;
6. If illness/injury involves the inhalation of hazardous materials, move victim to fresh air, and if necessary, decontaminate and transport to hospital;
7. For any injury/illness involving exposure to hazardous chemicals, decontaminate the victim and transport to the hospital for professional medical attention; and
8. The OES SSHO/QCS will provide personnel data sheets to appropriate medical personnel as requested.

12.8 INCLEMENT WEATHER

In the event of inclement weather, electrical storms, or extremely cold weather ($>32°F$), it may be necessary to cease operations and evacuate the site. The OES SSHO/QCS will be responsible for contacting the U.S. Weather Service on a daily basis and advising the senior UXO supervisor and the site personnel of the forecast. If necessary, the weather service will be contacted on a more frequent basis.

12.8.1 In the event of adverse weather, the ESE SSHO/QCS will determine if work can continue without sacrificing the health and safety of site personnel. Some of the items to be considered prior to determining if work should continue are the following:

1. Heavy rainfall,
2. Potential for heat stress,
3. Potential for cold stress,
4. Tornadoes,
5. Limited visibility,
6. Electrical storms,
7. Potential for accidents, and
8. The malfunctioning of monitoring equipment.

12.8.2 Severe weather with thunderstorms and associated lightning and tornadoes is a common feature of the region. Therefore, meteorological conditions will be closely watched. Thunderstorms and tornadoes often occur late in the afternoon on hot days but can occur at any time of the day in any season of the year. Tornadoes are usually preceded by severe thunderstorms with frequent lightning, heavy rains, and strong winds.

12.8.3 A severe thunderstorm or tornado watch announcement on the radio or television indicates that a severe thunderstorm or tornado is possible. Work will continue at the work site during severe thunderstorm or tornado watches. A severe thunderstorm or tornado warning signifies that a severe thunderstorm or a tornado has been sighted or detected by radar and may be approaching. All onsite work will cease during a thunderstorm, severe thunderstorm warning, or tornado warning.

12.8.4 Personnel onsite during a tornado will take the following steps:

1. Evacuate office trailers or vehicles;
2. If outdoors, lie flat in a nearby ditch;
3. Stay away from power poles, electrical appliances, and metal objects; and
4. Do not try to outrun a tornado.

12.9 SPILL RESPONSE

Site operations will not involve handling large containers of hazardous materials which could be easily spilled. However, small containers [5 gallons (gal) or less] of gasoline or diesel fuel may be used and stored onsite. If material from these containers is spilled, OES personnel will follow these steps:

1. Evacuate the immediate area and extinguish ignition sources.
2. The OES SSHO/QCS will evaluate the situation to ensure it is safe for personnel to begin cleanup operations.
3. Using nonsparking tools, OES personnel will collect the contaminated soil and place it in a plastic bag, which will then be placed in a 55-gal. Department of Transportation (DOT)-approved drum.
4. The OES SSHO/QCS will notify ESE Site Manager that the spill occurred. These Site Manager will notify the USAESCH representative and provide guidance on disposal of the drummed contaminants.

13.0 LOGS, REPORTS, AUDITS, INSPECTIONS, AND RECORDKEEPING

13.1 LOGS

The following logs and records will be completed, retained, and submitted to the ESE SSHO/QCS. Copies of sample forms (similar to the forms used onsite) are provided in Attachment B.

1. Safety log,
2. Training log, and
3. Visitor logs.

13.1.1 SAFETY LOG

The OES SSHO/QCS will maintain a safety log of all safety-related activities. The OES SSHO/QCS is responsible for ensuring that safety and health activities for the day, as well as tailgate safety briefing minutes, are part of the log. When safety and health deficiencies are noted during daily inspections, the measures, timetable, and individual responsible for correcting the deficiencies will be noted in the safety log.

13.1.2 TRAINING LOG

The OES SSHO/QCS is responsible for ensuring that all training conducted relative to job site activities is documented appropriately in the training log and the documentation form completed.

13.1.3 VISITOR LOG

A visitor log will be maintained at the entrance to all work sites to record visitations to the job site.

13.2 REPORTS

The following reports will be submitted as required by applicable USAESCH and OSHA regulations:

1. Eng Form 3394, in accordance with AR 385-40 and USAESCH supplements to that regulation. A copy of the form is included in Attachment B.
2. Medical Monitoring Records of employee(s) obtained after site investigations begin.
3. If a reportable injury/illness/accident occurs at the job site, the appropriate form will be completed and forwarded within 48 hr to ESE, OES, and USAESCH. If a near miss occurs, the accident form will be completed.

13.3 RECORDKEEPING

All recordkeeping will be in accordance with applicable OSHA and USAESCH standards and regulations.

ATTACHMENT A
MATERIAL SAFETY DATA SHEETS

MSDS1614

aterial Safety Data Sheet

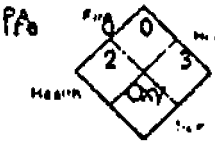
MATERIAL — 1942
UN N° — 6484-52-2
CAS N° — GCD-0086-848
CIL N° —

Emergency Tel. No

Halifax, N.S. (902) 469-9690
Montreal, Que. (514) 861-1211
Toronto, Ont. (416) 226-6117
Winnipeg, Man. (204) 943-8827
Edmonton, Alb. (403) 424-1754
Vancouver, B.C. (604) 685-5036

HAZARD RATING NFPA
non-fire
fire

4 - EXTREME
3 - HIGH
2 - MODERATE
1 - SLIGHT
0 - INSIGNIFICANT
* - CHRONIC HEALTH HAZARD: SEE SECTION 6



ection I. Identification of Product

ADE NAME & SYNONYMS	CHEMICAL NAME & SYNONYMS
Norway Saltpeter	Ammonium Nitrate
EMICAL AND PHYSICAL STATE Nitrate, solid	MOLECULAR FORMULA NH_4NO_3

ECTION II Physical Properties

PEARANCE AND ODOUR

Free-flowing, odourless, hygroscopic, white, deliquescent crystals or granules

ILING POINT (°C)	MELTING POINT (°C) - FREEZING POINT (°C)
210°C @ 1.47 kPa decomp @ 230°C @ 101.3 kPa	169°C
APOUR PRESSURE (MM HG)	SPECIFIC GRAVITY (WATER = 1 AT 4°C)
Not applicable	1.725 at 25°C
LK DENSITY	VAPOUR DENSITY (AIR = 1)
Not available	Not applicable
OLUBILITY IN WATER	OTHER SOLVENTS
2 g/ml of water	Methyl Alcohol, Ethyl Alcohol

ection III Fire and Explosion Hazard Data

ASH POINT (°C) METHOD	AUTOIGNITION TEMPERATURE (°C)
Non-flammable	—

AMMABLE LIMITS (% BY VOL IN AIR) LOWER — UPPER —

OULD ANY MATERIAL SATURATED WITH THIS PRODUCT E SUBJECT TO SPONTANEOUS COMBUSTION? ☐ YES ☒ NO MATERIALS:

IRE EXTINGUISHING DATA

Water

PECIAL FIREFIGHTING ROCEDURES: Controllable fires should be sprayed with water with adequate ventilation to dissipate heat of reaction & toxic gases. Approach should always be made from upwind side. Attempts to smother a fire involving the material are ineffectual as it is its own 'oxygen source'.

NUSUAL FIRE AND XPLOSION HAZARDS: If the fire is out of control, the area should be evacuated in case of detonation. Material will detonate if heated while confined or contaminated. A self-contained breathing apparatus should be worn in a fire. Thermal decomposition may cause the release of toxic oxides of nitrogen.

Section IV Reactivity Data

STABILITY			CONDITIONS TO AVOID
	UNSTABLE	XX	Heating in closed containers, contamination of material
	STABLE		

NCOMPATIBILITY (MATERIALS TO AVOID): Contact with oxidizable materials &/or metal powders at moderately high temp. will ause self-ignition. Incompatible with copper, fuels (e.g., lubricants, machine oils), fluorocarbon lubricants, acids, rosive liquids, Chlorates, Sulphur, charcoal, coke and sawdust.

AZARDOUS DECOMPOSITION PRODUCTS: Toxic gases & vapours (oxides of nitrogen) will be released by thermal decompositic (about > 300°C). At higher temperatures, decomposition may be explosive.

AZARDOUS OLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	XX	

SHOLD LIMIT VALUE (TLV-TWA)	LC_{50}	AMMONIUM NITRATE .... P. 2
Not available	Not available	

CTS OF EXPOSURE WHEN: -INHALED	Allergen, possible faintness & lowered blood pressure. Also see 'Ingested'.
-IN CONTACT WITH EYES	Irritation
-IN CONTACT WITH SKIN	Irritation
-INGESTED	Dizziness, cramps, vomiting, possible methemoglobinemia, weakness, depression, headache
GENCY AND AID PROCEDURES -INHALATION	Remove to fresh air. If not breathing, give artificial respiration. Keep warm & at rest. Obtain medical attention.
-EYES	Flush eyes with running water for at least 20 minutes, holding eyelids open. Obtain medical attention.
-SKIN	Remove contaminated clothing. Flush affected area with running water for 20 minutes. If irritation persists, obtain medical attention.
-INGESTION	If conscious, give large amounts of water or milk to induce vomiting. Obtain medical attention.

tion VI — Special Protection Information

ILATION REQUIREMENTS	Local ventilation preferred		
IRATORY PROTECTION	Air purifying respirator approved by NIOSH/MSHA equipped with dust, mist, fume cartridges, if necessary		
ECTIVE GLOVES	Impermeable gloves	EYE PROTECTION	Safety glasses
R PROTECTIVE EQUIPMENT	Protective clothing as required		

tion VII — Special Requirements

AUTION IN HANDLING STORING	Protect containers against physical damage. Store in cool dry well-ventilated building, preferably noncombustible equipped with automatic sprinkler protection. Floor drains & recesses should be plugged or eliminated to prevent entrapment of flowing molten nitrate during fire. Separate from incompatibles (Sec IV) acids, corrosive liquids, organic materials, Chlorates, Sulphur, powdered metals, charcoal, coke, sawdust
R AUTIONS	

tion VIII — Spill or Leak Procedures

TO BE TAKEN IN EVENT OF OR RELEASE IN ALL CASES Y APPLICABLE GOVERNMENT ORITY IF SPILL IS SIGNIFICANT	Stop & contain leak or spill. If in solid form or solution, absorb in earth or sand and shovel into containers for disposal. If contamination has not occurred, collect for reclaim.
ONMENTAL EFFECTS	Contaminated water is toxic to children & cattle. Toxic to fish at low concentrations (4.2 mg/l); aesthetic critical concentration (0.5 mg/l); fish toxicity critical concentrations (300 mg/l); used as fertilizer on land.
RALIZING CHEMICALS	Remove slowly into a large container of water. Add Soda Ash slightly by stirring. After 24 hours, decant or siphon into another container. Neutralize with 6M-HCl.
E DISPOSAL	Consult federal, provincial & local regulations on chemical waste disposal. May be possible to neutralize, flush & disperse with large quantities of water. May also be possible to dispose of in a secure sanitary landfill site.

tion IX — References

1. SAX, N.I., Dangerous Properties of Industrial Materials, 5th Ed., Van Nostrand Reinhold, 1979.
2. Toxic and Hazardous Industrial Chemicals Safety Manual, The International Tech. Info. Inst., Japan, 1979.

LAVOPTIK COMPANY, INC.
APPROVED BY U.S. DEPARTMENT OF LABOR
"ESSENTIALLY SIMILAR" TO FORM OSHA-20

MATERIAL SAFETY DATA SHEET

SECTION I

FEB 2 6 1987

PRODUCT NAME LAVOPTIK Eye Wash | SIZE 6 and 32 ounce

CHEMICAL NAME Eye Wash

FORMULA gms per 100ml Sodium Chloride 0.49, Sodium Biphosphate 0.40, Sodium Phosphate 0.45, Benzalkonium Chloride .005, Water to 100ml

MANUFACTURER LAVOPTIK COMPANY, INC.

ADDRESS 661 WESTERN AVENUE NORTH ST. PAUL, MN. 55103

FOR INFORMATION ON HEALTH HAZARDS CALL (612) 489-1351

FOR OTHER INFORMATION CALL (612) 489-1351 | INFORMATION EFFECTIVE AS OF 10/1/86

SECTION II HAZARDOUS INGREDIENTS OF MIXTURES

PRINCIPAL HAZARDOUS COMPONENT(S)	%	TLV (Units)
None		

SECTION III PHYSICAL DATA

BOILING POINT (°F) Same as Water | SPECIFIC GRAVITY (H_2O=1) 1

VAPOR PRESSURE (mm Hg) N/A | PERCENT VOLATILE BY VOLUME (%) 98.655%

VAPOR DENSITY (AIR=1) N/A | EVAPORATION RATE (=1) Same as Water

SOLUBILITY IN WATER 100%

APPEARANCE AND ODOR Clear, no odor

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method Used) Not Applicable | FLAMMABLE LIMITS | Lel | Uel

EXTINGUISHING MEDIA

SPECIAL FIRE-FIGHTING PROCEDURES

UNUSUAL FIRE AND EXPLOSION HAZARDS

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

Not Applicable

EFFECTS OF OVEREXPOSURE

EMERGENCY AND FIRST-AID PROCEDURES

SECTION VI REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
N/A	UNSTABLE	
	STABLE	

INCOMPATIBILITY
(Materials to avoid)

HAZARDOUS
DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur	Will Not Occur	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN
IN CASE MATERIAL IS
RELEASED OR SPILLED

Safe for humans to handle

WASTE DISPOSAL METHOD

Any Sewer

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION
(Specify Type)

Not Applicable

VENTILATION		
	LOCAL EXHAUST	SPECIAL
	MECHANICAL (general)	OTHER

PROTECTIVE GLOVES	EYE PROTECTION

OTHER
PROTECTIVE
EQUIPMENT

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE
TAKEN IN HANDLING
AND STORING

Protect from freezing

OTHER PRECAUTIONS

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
1145 CATALYN STREET
SCHENECTADY, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 467

AUTOMOTIVE
GASOLINE, LEAD-FREE

Date October 1981

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: AUTOMOTIVE GASOLINE, LEAD-FREE
DESCRIPTION: A volatile blend of hydrocarbons for automotive fuel
OTHER DESIGNATIONS: Petrol, CAS #00F 006 619, ASTM D439
MANUFACTURER: Available from several suppliers.

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Gasoline A hydrocarbon blend that can include normal and branched chain alkanes, cycloalkanes, alkenes, aromatics and other additives.** (Lead max 0.013 g/L, phosphorus max 0.0013 g/L, sulfur max 0.10 wt%. May contain benzene, <5%; see ASTM D3606). *ACGIH 1981 TLV (Intended Changes List). See also Am. Ind. Hyg. A. 39 110-117 (1978) **The composition of fuel is varied with altitude and seasonal requirements for a locality. The blend must meet antiknock requirements. (Antiknock Index min 85, ASTM D439.)	100	8-hr TWA 300 ppm or 900 mg/m^3* Man Eye: 500 ppm/1H Moderate irritation Inhalation: TCLo 900 ppm/1H TFX:CNS

SECTION III. PHYSICAL DATA

Distillation at 1 atm, Initial, deg C >39
50% distilled - 77-121
End point ----- <240
Vapor density (Air=1) ---------- 3.0-4.0
Solubility in water ---------- Insoluble

Specific gravity, 60/60 F - 0.72-0.76
Melting point, deg C ------ -90.5-95.4
Evaporation rate -------- N/A

Appearance and Odor: A clear, mobile liquid with a characteristic odor which can be recognized at about 10 ppm in air. (Gasoline may be colored with dye.)

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air % by volume	LOWER	UPPER
-45 F	536-853 F		1.4	7.6

Extinguishing Media: Dry chemical, carbon dioxide, alcohol foam. Use of water may be ineffective to extinguish fire, but use water spray for cooling fire-exposed drums and tanks to prevent pressure rupture. It is a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow along surfaces, reach distant ignition sources and flash back. Can react violently with oxidizing agents.
Firefighters should wear self-contained breathing apparatus and full protective clothing.

SECTION V. REACTIVITY DATA

This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.
This is an OSHA Class IA flammable liquid. A mixture of gasoline vapors and air can be explosive. It is incompatible with oxidizing agents.
Thermal-oxidative degradation can yield carbon monoxide and partially oxidized hydrocarbons.

NO. 467

SECTION VI. HEALTH HAZARD INFORMATION

TLV 300 ppm (See Sect. II)

Inhalation causes intense burning of the mucous membranes, throat and respiratory tract; overexposure to vapors can lead to bronchopneumonia. Inhalation of high conc. can cause fatal pulmonary edema. Repeated or prolonged skin exposure causes dermatitis. Can cause blistering of skin due to its defatting properties. Exposure to eyes can cause hyperemia of the conjunctiva.

Ingestion or excessive vapors can cause inebriation, drowsiness, blurred vision, vertigo, confusion, vomiting and cyanosis (2000 ppm produces mild anesthesia in 30 min, higher conc. are intoxicating in less time.) Aspiration after ingestion causes bronchitis, pneumonia, or edema which can be fatal.

FIRST AID:

Eye Contact: Flush thoroughly with running water for 15 min. including under eyelids.

Skin Contact: Remove contaminated clothing. Wash affected area with soap and water.

Inhalation: Remove to fresh air. Restore breathing and administer oxygen if needed.

Ingestion: Do not induce vomiting. Aspiration hazard. Contact physician.

Seek prompt medical assistance for further treatment, observation and support.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel of leaks or spills. Remove sources of heat or ignition. Provide adequate ventilation. Clean-up personnel require protection against liquid contact and vapor inhalation. If a leak or spill has not ignited, use water spray to disperse vapors and to protect men attempting to stop the leakage. Contain spill. Do not allow to enter sewer or surface water. Add absorbent solid to small spills or residues and pick up for disposal.

DISPOSAL: Burn scrap material in an approved incinerator. Burn contaminated liquid by spraying into an incinerator. Follow Federal, State, and Local regulations.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Use general and local exhaust ventilation (explosion-proof) to keep vapors below the TLV requirements in the workplace. Respirators should be available for nonroutine or emergency use above the TLV.

Avoid eye contact by use of chemical safety goggles and/or full faceshield where splashing is possible. Wear protective clothing appropriate for the work situation to minimize skin contact such as rubber gloves and boots. Clothing to be changed daily and laundered.

Eyewash fountains, showers and washing facilities should be readily accessible

Provide suitable training to those handling and working with this material.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a cool, dry, well-ventilated area away from sources of heat, ignition and strong oxidizing agents. Protect containers from physical damage. Avoid direct sunlight. Storage must meet requirements of OSHA Class IA liquid.

Outdoor or detached storage preferred. No smoking in areas of use. Prevent static electric sparks and use explosion-proof electrical services. (Must meet code.)

Avoid skin and eye contact. Avoid inhalation of vapors. Wear clean work clothing daily.

Indoor use of this material requires exhaust ventilation to remove vapors.

ICC Flammable Liquid, Red Label. LABEL: Flammable Liquid DOT I.D. No. UN 1203.

DOT Classification: FLAMMABLE LIQUID

DATA SOURCE(S) CODE: 2,4-9,11,37

APPROVALS: MIS J.M. Mueller

CRD

Industrial Hygiene and Safety

MEDICAL REVIEW: 14 November 1981

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
1145 CATALYN STREET
SCHENECTADY, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 469

FUEL OIL NO. 2

Date October 1981

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: FUEL OIL NO. 2
DESCRIPTION: Mixture of petroleum hydrocarbons; a distillate oil of low sulfur content.
OTHER DESIGNATIONS: ASTM D396, GE Material D27B1A, CAS #068 476 302
MANUFACTURER: Available from many suppliers, including:
AMOCO Oil Co.
200 East Randolph Drive
Chicago, Illinois 60601

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Fuel Oil No. 2		
Complex mixture of paraffinic, olefinic, naphthenic, and aromatic hydrocarbons		8-hr TWA 5 mg/m^3 (mineral oil mist)*
Sulfur content	<0.5	
Benzene**	<100 ppm	

*Current OSHA standard and ACGIH (1981) TLV

**A low benzene level reduces carcinogenic risk. Fuel oils are exempted under the benzene standard (29 CFR 1910.1028)

SECTION III. PHYSICAL DATA

Boiling point range, deg F, -------- Ca 340-675
Solubility in water ---------- negligible
Viscosity at 38 C, cSt ---------- 2.0-3.6
Specific gravity (H_2O=1) -- <0.876
Pour point, deg C ------ below -6

Appearance and Odor: Clear, bright liquid with a mild petroleum odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
100F min (TCC)	257 C (495F)	% by volume	0.6	7.5

Extinguishing Media: Dry chemical, carbon dioxide, foam, water spray. Use a water spray to cool fire exposed containers. Use a smothering technique for extinguishing fire of this combustible liquid. Do not use a forced water stream directly on oil fire as this will only scatter the fire. Material is an OSHA Class II combustible liquid. Firefighters should wear self-contained breathing apparatus and full protective clothing.

SECTION V. REACTIVITY DATA

This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.
Incompatible with strong oxidizing agents; heating greatly increases fire hazard.
THermal-oxidative degradation may yield various hydrocarbons and hydrocarbon derivatives (partial oxidation products), CO_2 and CO and SO_2.

NO. 469

SECTION VI. HEALTH HAZARD INFORMATION

TLV 5 mg/m^3 oil (mist) (See Sect II)

Inhalation of excessive concentrations of vapor or mist can be irritating to the respiratory passages and can cause the following symptoms: headache, dizziness, nausea, vomiting, and loss of coordination. Prolonged or repeated skin contact may cause irritation of the hair follicles and block the sebaceous glands. This produces a rash of acne pimples and spots, usually on the arms and legs. (Good personal hygiene will prevent this).

Chemical pneumonitis may result when ingestion occurs and oil is aspirated in the lungs.

FIRST AID:

Eye Contact: Flush thoroughly with running water for 15 min. including under eyelids.

Skin Contact: Remove contaminated clothing. Wipe excess oil off with a dry cloth. Wash affected area well with soap and water.

Inhalation: Remove to fresh air. Restore and/or support breathing as required.

Ingestion: Do not induce vomiting.

Seek medical assistance for further treatment, observation and support.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel of leaks or spills. Remove sources of heat or ignition.

Provide adequate ventilation. Clean-up personnel to use protection against liquid contact and vapor or mist inhalation. Contain spill by diking. Small spills can be contained by using absorbants, such as rags, straw, polyurethane foam, activated carbon, and sand. Clean up spills promptly to reduce fire or vapor hazards.

DISPOSAL: May be disposed of by a licensed waste disposal company, or by controlled incineration or burial in an approved landfill.

Follow Federal, State and Local regulations. Report large oil spills.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide adequate ventilation where operating conditions (heating or spraying) may create excessive vapors or mists. Use explosion proof equipment. Provide approved respiratory apparatus for nonroutine or emergency use. Use an approved filter & vapor respirator when vapor/mist concentrations are high. Wear protective rubber gloves and chemical safety glasses where contact with liquid or high mist conc. may occur. Additional suitable protective clothing may be required depending on working conditions. An eye-wash fountain and washing facilities to be readily available near handling and use areas.

Launder soiled or contaminated clothing before reuse (at least weekly laundering of work clothes is recommended).

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a cool, dry, well-ventilated area away from sources of open flame, heat, strong oxidizing agents, and ignition. Protect containers from physical damage. Use non sparking tools and explosion-proof electrical equipment. Prevent static electric sparks.

Avoid prolonged skin contact and breathing of vapors or mists.

No smoking in areas of use. Follow good hygienic practice in the use of this material. Do not wear oil contaminated clothing. Do not put oily rags into pockets. Wash exposed skin areas several times a day with soap and warm water when working with this material. DOT Classification: COMBUSTIBLE LIQUID

DATA SOURCE(S) CODE: 1,6,7,12

APPROVALS: MIS J. M. Miller
CRD
Industrial Hygiene and Safety 10-13-81

MEDICAL REVIEW: 21 October 1981

ATTACHMENT B
REPORT FORMS

(For Safety Staff only)	REPORT NO.	EROC CODE	UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT (For Use of this Form See Attached Instructions 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	d. SOCIAL SECURITY NUMBER	e. GRADE
		☐ MALE ☐ FEMALE	___ ___ ___ / ___ ___ / ___ ___ ___ ___	

f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ 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))	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME
/ /			(1) PRIME: (2) SUBCONTRACTOR:

e. CONTRACT NUMBER	f. TYPE OF CONTRACT	g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ CIVIL WORKS ☐ MILITARY ☐ OTHER (Specify)	☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER (Specify)	☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER (Specify)

4. CONSTRUCTION ACTIVITIES ONLY (Fill in line and corresponding code number in box from list - see instructions)

a. CONSTRUCTION ACTIVITY	(CODE)	b. TYPE OF CONSTRUCTION EQUIPMENT	(CODE)
	#		#

INJURY / ILLNESS INFORMATION (Include name on line and corresponding code number in box for items e, f & g - see instructions)

SEVERITY OF ILLNESS / INJURY	(CODE)	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY
	#			

e. BODY PART AFFECTED	(CODE)	g. TYPE AND SOURCE OF INJURY/ILLNESS	(CODE)
PRIMARY	#	TYPE	#
SECONDARY	#	SOURCE	#
f. NATURE OF ILLNESS / INJURY	#		

6. PUBLIC FATALITY (Fill in line and corresponding code number in box - see instructions)

a. ACTIVITY AT TIME OF ACCIDENT	(CODE)	b. PERSONAL FLOATATION DEVICE USED?
	#	☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐☐ PICKUP/VAN ☐☐ AUTOMOBILE ☐☐ TRUCK ☐☐ OTHER (Specify)	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER (Specify)	(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 corresponding code number in box from list - see instructions)

a. TYPE OF VESSEL/FLOATING PLANT	(CODE)	b. TYPE OF COLLISON/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	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL
CORPS _____	___ / ___ / ___		
CONTRACTOR _____	___ / ___ / ___		

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

GENERAL. Complete a separate report for each person who was *injured, caused,* or *contributed* to the accident (excluding uninjured personnel and witnesses). Use of this form for reporting USACE employee first-aid type injuries not submitted to the Office of Workers' Compensation Programs (OWCP) shall be at the descretion of the FOA commander. Please type or print legibly. Appropriate items shall be marked with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16. and 17.

INSTRUCTIONS FOR SECTION 1— ACCIDENT CLASSIFICATION. *(Mark All Boxes That Are Applicable.)*

a. GOVERNMENT. Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.

(1) INJURY/ILLNESS/FATALITY – Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 (injury), CA-2 (illness), or CA-6 (fatality) to OWCP; mark if accident resulted in military personnel lost-time or fatal injury or illness.

(2) PROPERTY DAMAGE – Mark the appropriate box if accident resulted in any damage of $1000 or more to government property (including motor vehicles).

(3) VEHICLE INVOLVED – Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY – Mark if the accident involved an in-house USACE diving activity.

b. CONTRACTOR.

(1) INJURY/ILLNESS/FATALITY – Mark if accident resulted in any contractor lost-time injury/illness or fatality.

(2) PROPERTY DAMAGE – Mark the appropriate box if accident resulted in any damage of $1000 or more to contractor property (including motor vehicles).

(3) VEHICLE INVOLVED – Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY – Mark if the accident involved a USACE Contractor diving activity.

c. PUBLIC.

(1) INJURY/ILLNESS/FATALITY – Mark if accident resulted in public fatality or permanent total disability. (The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander).

(2) VOID SPACE – Make no entry.

(3) VEHICLE INVOLVED – Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" is marked.

(4) VOID SPACE – Make no entry.

INSTRUCTIONS FOR SECTION 2 – PERSONAL DATA

a. NAME – (MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS). Enter last name, first name, middle initial of person involved.

b. AGE – Enter age.

c. SEX – Mark appropriate box.

SOCIAL SECURITY NUMBER – (FOR GOVERNMENT PERSONNEL ONLY) Enter the social security number (or other personal identification number if no social security number issued).

e. GRADE – (FOR GOVERNMENT PERSONNEL ONLY) Enter pay grade. Example: O-6; E-7; WG-8; WS-12; GS-11; etc.

f. JOB SERIES/TITLE – For *government civilian employees* enter the pay plan, full series number, and job title, e.g. GS-0810/Civil Engineer. For *military personnel* enter the primary military occupational specialty (PMOS), e.g., 15A30 or 11G50. For *contractor employees* enter the job title assigned to the injured person, e.g. carpenter, laborer, surveyor, etc..

g. DUTY STATUS – Mark the appropriate box.

(1) ON DUTY – Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.

(2) TDY - Person was on official business, away from the duty station and with travel orders at time of accident. Line-of-duty investigation required.

(3) OFF DUTY - Person was not on official business at time of accident

h. EMPLOYMENT STATUS – (FOR GOVERNMENT PERSONNEL ONLY) Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

INSTRUCTION FOR SECTION 3 – GENERAL INFORMATION

a. DATE OF ACCIDENT – Enter the month, day, and year of accident.

b. TIME OF ACCIDENT – Enter the local time of accident in military time. Example: 1430 hrs (not 2:30 p.m.).

c. EXACT LOCATION OF ACCIDENT – Enter facts needed to locate the accident scene. (installation/project name, building number, street, direction and distance from closest landmark, etc.,).

d. CONTRACTOR NAME

(1) PRIME – Enter the exact name (title of firm) of the prime contractor.

(2) SUBCONTRACTOR – Enter the name of any subcontractor involved in the accident.

e. CONTRACT NUMBER – Mark the appropriate box to identify if contract is civil works, military, or other: if "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 09-85-C-0100.

f. TYPE OF CONTRACT – Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.

g. HAZARDOUS/TOXIC WASTE ACTIVITY (HTW) – Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program (IRP) HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site (FUDS) activities and IRP activities will be treated separately. For Civil Works O&M HTW activities mark the "OTHER" box.

INSTRUCTIONS FOR SECTION 4 – CONSTRUCTION ACTIVITIES

a. CONSTRUCTION ACTIVITY – Select the *most appropriate* construction activity being performed at time of accident from the list below. Enter the activity name and place the corresponding code number identified in the box.

CONSTRUCTION ACTIVITY LIST

1. MOBILIZATION	14. ELECTRICAL
2. SITE PREPARATION	15. SCAFFOLDING/ACCESS
3. EXCAVATION/TRENCHING	16. MECHANICAL
4. GRADING (EARTHWORK)	17. PAINTING
5. PIPING/UTILITIES	18. EQUIPMENT/MAINTENANCE
6. FOUNDATION	19. TUNNELING
7. FORMING	20. WAREHOUSING/STORAGE
8. CONCRETE PLACEMENT	21. PAVING
9. STEEL ERECTION	22. FENCING
10. ROOFING	23. SIGNING
11. FRAMING	24. LANDSCAPING/IRRIGATION
12. MASONRY	25. INSULATION
13. CARPENTRY	26. DEMOLITION

b. TYPE OF CONSTRUCTION EQUIPMENT—Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

CONSTRUCTION EQUIPMENT

1. GRADER
2. DRAGLINE
3. CRANE (ON VESSEL/BARGE)
4. CRANE (TRACKED)
5. CRANE (RUBBER TIRE)
6. CRANE (VEHICLE MOUNTED)
7. CRANE (TOWER)
8. SHOVEL
9. SCRAPER
10. PUMP TRUCK (CONCRETE)
11. TRUCK (CONCRETE/TRANSIT MIXER)
12. DUMP TRUCK (HIGHWAY)
13. DUMP TRUCK (OFF HIGHWAY)
14. TRUCK (OTHER)
15. FORKLIFT
16. BACKHOE
17. FRONT-END LOADER
18. PILE DRIVER
19. TRACTOR (UTILITY)
20. MANLIFT
21. DOZER
22. DRILL RIG
23. COMPACTOR/VIBRATORY ROLLER
24. OTHER

INSTRUCTIONS FOR SECTION 5—INJURY/ILLNESS INFORMATION

a. SEVERITY OF INJURY / ILLNESS - Reference para 2-10 of USACE Suppl 1 to AR 385-40 and enter code and description from list below.

NOI	NO INJURY
FAT	FATALITY
PTL	PERMANENT TOTAL DISABILITY
PPR	PERMANENT PARTIAL DISABILITY
LWD	LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK
NLW	RECORDABLE CASE WITHOUT LOST WORKDAYS
RFA	RECORDABLE FIRST AID CASE
NRI	NON-RECORDABLE INJURY

b. ESTIMATED DAYS LOST—Enter the estimated number of workdays the person will lose from work.

c. ESTIMATED DAYS HOSPITALIZED—Enter the estimated number of workdays the person will be hospitalized.

d. ESTIMATED DAYS RESTRICTED DUTY—Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.

e. BODY PART AFFECTED—Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH
	CN	NOSE
	CR	THROAT, OTHER
	CT	TONGUE
	CZ	HEAD OTHER INTERNAL
ELBOW	EB	BOTH ELBOWS
	ES	SINGLE ELBOW
FINGER	F1	FIRST FINGER
	F2	BOTH FIRST FINGERS
	F3	SECOND FINGER
	F4	BOTH SECOND FINGERS
	F5	THIRD FINGER
	F6	BOTH THIRD FINGERS
	F7	FOURTH FINGER
	F8	BOTH FOURTH FINGERS
TOE	G1	GREAT TOE
	G2	BOTH GREAT TOES
	G3	TOE OTHER
	G4	TOES OTHER
HEAD, EXTERNAL	H1	EYE EXTERNAL
	H2	BOTH EYES EXTERNAL
	H3	EAR EXTERNAL
	H4	BOTH EARS EXTERNAL
	HC	CHIN
	HF	FACE
	HK	NECK/THROAT
	HM	MOUTH/LIPS
	HN	NOSE
	HS	SCALP
KNEE	KB	BOTH KNEES
	KS	KNEE
LEG, HIP, ANKLE, BUTTOCK	LB	BOTH LEGS/HIPS/ ANKLES/BUTTOCKS
	LS	SINGLE LEG/HIP ANKLE/BUTTOCK
HAND	MB	BOTH HANDS
	MS	SINGLE HAND
FOOT	PB	BOTH FEET
	PS	SINGLE FOOT
TRUNK, BONES	R1	SINGLE COLLAR BONE
	R2	BOTH COLLAR BONES
	R3	SHOULDER BLADE
	R4	BOTH SHOULDER BLADES
	RB	RIB
	RS	STERNUM (BREAST BONE)
	RV	VERTEBRAE (SPINE: DISC)
	RZ	TRUNK BONES OTHER
SHOULDER	SB	BOTH SHOULDERS
	SS	SINGLE SHOULDER
THUMB	TB	BOTH THUMBS
	TS	SINGLE THUMB
TRUNK, INTERNAL ORGANS	V1	LUNG, SINGLE
	V2	LUNGS, BOTH
	V3	KIDNEY, SINGLE
	V4	KIDNEYS, BOTH
	VH	HEART
	VL	LIVER
	VR	REPRODUCTIVE ORGANS
	VS	STOMACH
	VV	INTESTINES
	VZ	TRUNK, INTERNAL: OTHER

f. NATURE OF INJURY/ILLNESS - Select the most appropriate nature of injury / illness from the list below. This nature of injury / illness shall correspond to the primary body part selected in 5e, above. Enter the nature of injury / illness name on the line and place the corresponding CODE letters in the box provided.

* The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
*TRAUMATIC INJURY OR DISABILITY	TA	AMPUTATION
	TB	BACK STRAIN.
	TC	CONTUSION; BRUISE; ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TQ	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/ INFECTIVE/PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
	T3	TRAUMATIC HEART CONDITION
	T4	TRAUMATIC MENTAL DISORDER; STRESS; NERVOUS CONDITION
	T8	TRAUMATIC INJURY – OTHER (EXCEPT DISEASE, ILLNESS)

**A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time. For practical purposes, an occupational illness/disease or disability is any reported condition which does not meet the definition of traumatic injury or disability as described above.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
**NON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY		
RESPIRATORY DISEASE	RA	ASBESTOSIS
	RB	BRONCHITIS
	RE	EMPHYSEMA
	RP	PNEUMOCONIOSIS
	RS	SILICOSIS
	R9	RESPIRATORY DISEASE, OTHER
VIROLOGICAL, INFECTIVE & PARASITIC DISEASES	VB	BRUCELLOSIS
	VC	COCCIDIOMYCOSIS
	VF	FOOD POISONING
	VH	HEPATITIS
	VM	MALARIA
	VS	STAPHYLOCOCCUS
	VT	TUBERCULOSIS
	V9	VIROLOGICAL/INFECTIVE/ PARASITIC – OTHER
DISABILITY, OCCUPATIONAL	DA	ARTHRITIS, BURSITIS
	DB	BACK STRAIN, BACK SPRAIN
	DC	CEREBRAL VASCULAR CONDITION; STROKE
	DD	ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)
	DE	EFFECT OF ENVIRONMENTAL CONDITION
	DH	HEARING LOSS
	DK	HEART CONDITION
	DM	MENTAL DISORDER, EMOTIONAL STRESS NERVOUS CONDITION
	DR	RADIATION
	DS	STRAIN, MULTIPLE
	DU	ULCER
	DV	OTHER VASCULAR CONDITIONS
	D9	DISABILITY, OTHER
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL
	SC	CHEMICAL
	S9	DERMATITIS, UNCLASSIFIED

g. TYPE AND SOURCE OF INJURY/ILLNESS (CAUSE) - Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the initiating source of the incident (see example 1, below). Examples:

(1) An employee tripped on carpet and struck his head on a desk.
TYPE: 210 (fell on same level) SOURCE: 0110 (walking/working surface)

NOTE: This example would NOT be coded 120 (struck against) and 0140 (furniture).

(2) A Park Ranger contracted dermatitis from contact with poison ivy/ oak.
TYPE: 510 (contact) SOURCE: 0920 (plant)

(3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.
TYPE: 410 (punctured by) SOURCE: 0830 (metal)

(4) An employee was driving a government vehicle when it was struck by another vehicle..
TYPE: 600 (traveling in) SOURCE: 0421 (government-owned vehicle, as driver)

NOTE: The Type Code 600, "Traveling in" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST
	FELL, SLIPPED, TRIPPED
0210	FELL ON SAME LEVEL
0220	FELL ON DIFFERENT LEVEL
0230	SLIPPED, TRIPPED (NO FALL)
	CAUGHT
0310	CAUGHT ON
0320	CAUGHT IN
0330	CAUGHT BETWEEN
	PUNCTURED, LACERATED
0410	PUNCTURED BY
0420	CUT BY
0430	STUNG BY
0440	BITTEN BY
	CONTACTED
0510	CONTACTED WITH (INJURED PERSON MOVING)
0520	CONTACTED BY (OBJECT WAS MOVING)
	EXERTED
0610	LIFTED, STRAINED BY (SINGLE ACTION)
0620	STRESSED BY (REPEATED ACTION)
	EXPOSED
0710	INHALED
0720	INGESTED
0730	ABSORBED
0740	EXPOSED TO
0800	TRAVELING IN

CODE	SOURCE OF INJURY NAME
0100	BUILDING OR WORKING AREA
0110	WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC)
0120	STAIRS, STEPS
0130	LADDER
0140	FURNITURE, FURNISHINGS, OFFICE EQUIPMENT
0150	BOILER, PRESSURE VESSEL
0160	EQUIPMENT LAYOUT (ERGONOMIC)
0170	WINDOWS, DOORS
0180	ELECTRICITY

CODE	SOURCE OF INJURY NAME
0200	ENVIRONMENTAL CONDITION
0210	TEMPERATURE EXTREME (INDOOR)
0220	WEATHER (ICE, RAIN, HEAT, ETC.)
0230	FIRE, FLAME, SMOKE (NOT TOBACCO)
0240	NOISE
0250	RADIATION
0260	LIGHT
0270	VENTILATION
0271	TOBACCO SMOKE
0280	STRESS (EMOTIONAL)
0290	CONFINED SPACE
0300	MACHINE OR TOOL
0310	HAND TOOL (POWERED: SAW, GRINDER, ETC.)
0320	HAND TOOL (NONPOWERED)
0330	MECHANICAL POWER TRANSMISSION APPARATUS
0340	GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)
0350	VIDEO DISPLAY TERMINAL
0360	PUMP, COMPRESSOR, AIR PRESSURE TOOL
0370	HEATING EQUIPMENT
0380	WELDING EQUIPMENT
0400	VEHICLE
0411	AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE
0412	AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE
0421	DRIVER OF GOVERNMENT VEHICLE
0422	PASSENGER OF GOVERNMENT VEHICLE
0430	COMMON CARRIER (AIRLINE, BUS, ETC.)
0440	AIRCRAFT (NOT COMMERCIAL)
0450	BOAT, SHIP, BARGE
0500	MATERIAL HANDLING EQUIPMENT
0510	EARTHMOVER (TRACTOR, BACKHOE, ETC.)
0520	CONVEYOR (FOR MATERIAL AND EQUIPMENT)
0530	ELEVATOR, ESCALATOR, PERSONNEL HOIST
0540	HOIST, SLING CHAIN, JACK
0560	CRANE
0561	FORKLIFT
0580	HANDTRUCK, DOLLY
0600	DUST, VAPOR, ETC.
0610	DUST (SILICA, COAL, ETC.)
0620	FIBERS
0621	ASBESTOS
0630	GASES
0631	CARBON MONOXIDE
0640	MIST, STEAM, VAPOR, FUME
0641	WELDING FUMES
0650	PARTICLES (UNIDENTIFIED)
0700	CHEMICAL, PLASTIC, ETC.
0711	DRY CHEMICAL—CORROSIVE
0712	DRY CHEMICAL—TOXIC
0713	DRY CHEMICAL—EXPLOSIVE
0714	DRY CHEMICAL—FLAMMABLE
0721	LIQUID CHEMICAL—CORROSIVE
0722	LIQUID CHEMICAL—TOXIC
0723	LIQUID CHEMICAL—EXPLOSIVE
0724	LIQUID CHEMICAL—FLAMMABLE
0730	PLASTIC
0740	WATER
0750	MEDICINE
0800	INANIMATE OBJECT
0810	BOX, BARREL, ETC.
0820	PAPER
0830	METAL ITEM, MINERAL
0831	NEEDLE
0840	GLASS
0850	SCRAP, TRASH
0860	WOOD
0870	FOOD
0880	CLOTHING, APPAREL, SHOES
0900	ANIMATE OBJECT
0911	DOG
0912	OTHER ANIMAL
0920	PLANT
0930	INSECT
0940	HUMAN (VIOLENCE)
0950	HUMAN (COMMUNICABLE DISEASE)
0960	BACTERIA, VIRUS (NOT HUMAN CONTACT)

CODE	SOURCE OF INJURY NAME
1000	PERSONAL PROTECTIVE EQUIPMENT
1010	PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
1020	RESPIRATOR, MASK
1021	DIVING EQUIPMENT
1030	SAFETY BELT, HARNESS
1040	PARACHUTE

INSTRUCTIONS FOR SECTION 6 — PUBLIC FATALITY

a. ACTIVITY AT TIME OF ACCIDENT—Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the *most* appropriate primary activity area (water related, non-water related or other activity), the code number for "Other", and write in the activity being performed at the time of the accident.

WATER RELATED RECREATION

1. Sailing
2. Boating—powered
3. Boating—unpowered
4. Water skiing
5. Fishing from boat
6. Fishing from bank dock or pier
7. Fishing while wading
8. Swimming/supervised area
9. Swimming/designated area
10. Swimming/other area
11. Underwater activities (skin diving, scuba, etc.)
12. Wading
13. Attempted rescue
14. Hunting from boat
15. Other

NON-WATER RELATED RECREATION

16. Hiking and walking
17. Climbing (general)
18. Camping/picnicking authorized area
19. Camping/picnicking unauthorized area
20. Guided tours
21. Hunting
22. Playground equipment
23. Sports/summer (baseball, football, etc.)
24. Sports/winter (skiing, sledding, snowmobiling etc.)
25. Cycling (bicycle, motorcycle, scooter)
26. Gliding
27. Parachuting
28. Other non-water related

OTHER ACTIVITIES

29. Unlawful acts (fights, riots, vandalism, etc.)
30. Food preparation/serving
31. Food consumption
32. Housekeeping
33. Sleeping
34. Pedestrian struck by vehicle
35. Pedestrian other acts
36. Suicide
37. "Other" activities

b. PERSONAL FLOTATION DEVICE USED—If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

INSTRUCTIONS FOR SECTION 7—MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE—Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved, mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.

b. TYPE OF COLLISION—Mark appropriate box.

c. SEAT BELT—Mark appropriate box.

INSTRUCTIONS FOR SECTION 8—PROPERTY/ MATERIAL INVOLVED

a. NAME OF ITEM—Describe all property involved in accident. Property/material involved means material which is damaged or whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number (NSN) whenever applicable.

b. OWNERSHIP—Enter ownership for each item listed. (Enter one of the following: *USACE; OTHER GOVERNMENT; CONTRACTOR; PRIVATE*)

c. $ AMOUNT OF DAMAGE—Enter the total estimated dollar amount of damage (parts and labor), if any.

INSTRUCTIONS FOR SECTION 9 – VESSEL/ FLOATING PLANT ACCIDENT

a. TYPE OF VESSEL/FLOATING PLANT – Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel/ floating plant.

VESSEL/FLOATING PLANTS

1. ROW BOAT
2. SAIL BOAT
3. MOTOR BOAT
4. BARGE
5. DREDGE/HOPPER
6. DREDGE/SIDE CASTING
7. DREDGE/DIPPER
8. DREDGE/CLAMSHELL BUCKET
9. DREDGE/PIPE LINE
10. DREDGE/DUST PAN
11. TUG BOAT
12. OTHER

b. COLLISION/MISHAP – Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

1. COLLISION W/OTHER VESSEL
2. UPPER GUIDE WALL
3. UPPER LOCK GATES
4. LOCK WALL
5. LOWER LOCK GATES
6. LOWER GUIDE WALL
7. HAULAGE UNIT
8. BREAKING TOW
9. TOW BREAKING UP
10. SWEPT DOWN ON DAM
11. BUOY/DOLPHIN/CELL
12. WHARF OR DOCK
13. OTHER

INSTRUCTIONS FOR SECTION 10 – ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT – Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

INSTRUCTIONS FOR SECTION 11 – CAUSAL FACTORS

a. Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:

(1) DESIGN – Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?

(2) INSPECTION/MAINTENANCE – Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?

(3) PERSON'S PHYSICAL CONDITION – Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?

(4) OPERATING PROCEDURES – Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?

(5) JOB PRACTICES – Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?

(6) HUMAN FACTORS – Was the person under undue stress (either internal or external to the job)? Did the task tend towa overloading the capabilities of the person; i.e., did the job require tracking and reacting to many external inputs such a displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? D the task require reach, strength, endurance, agility, etc., at o beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Wa the person inadequately rested to perform safely?

(7) ENVIRONMENTAL FACTORS – Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in th accident?

(8) CHEMICAL AND PHYSICAL AGENT FACTORS – Did exposure to chemical agents (either single shift exposure or long-term exposure) such as dusts, fibers (asbestos, etc.), silica, gases (carbon monoxide, chlorine, etc.,), mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, by products of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation (UV radiation created during welding, etc.) contribute to the accident/incident?

(9) OFFICE FACTORS – Did the fact that the accident occurred i an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?

(10) SUPPORT FACTORS – Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources (in terms of employee skills, number of workers, and adequate supervision) available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation etc?

(11) PERSONAL PROTECTIVE EQUIPMENT – Did the person fail to use appropriate personal protective equipment (gloves, eye protection, hard-toed shoes, respirator, etc.) for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard(s)? Did lack of o inadequate maintenance of protective gear contribute to the accident?

(12) DRUGS/ALCOHOL – Is there any reason to believe the person's mental or physical capabilities, judgement, etc., were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".

b. WRITTEN JOB/ACTIVITY HAZARD ANALYSIS – Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. *I one was performed, attach a copy of the analysis to the report.*

INSTRUCTIONS FOR SECTION 12 – TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK? – For the purpose of this section "trained" means the person has been provided the necessary information (either formal and/or on-the-job (OJT) training) to competently perform the activity/task in a safe and healthful manner.

b. TYPE OF TRAINING – Mark the appropriate box that best indicates the type of training; (classroom or on-the-job) that the injured person received before the accident happened.

c. DATE OF MOST RECENT TRAINING – Enter the month, day, and year of the last *formal* training completed that covered the activity-task being performed at the time of the accident.

INSTRUCTIONS FOR SECTION 13—CAUSES

a. DIRECT CAUSES—The direct cause is that single factor which most directly lead to the accident. See examples below.

b. INDIRECT CAUSES—Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13:

a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.
Direct cause: failure to provide fall protection at elevation.
Indirect causes: failure to enforce USACE safety requirements; improper training/motivation of employee (possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.

b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (note USACE vehicle was in proper/safe working condition).
Direct cause: failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.
Indirect cause: Failure of employee to pay attention to driving (defensive driving).

INSTRUCTIONS FOR SECTION 14—ACTION TO ELIMINATE CAUSE(S)

DESCRIPTION—Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

INSTRUCTIONS FOR SECTION 15—DATES FOR ACTION

a. BEGIN DATE—Enter the date when the corrective action(s) identified in Section 14 will begin.

b. COMPLETE DATE—Enter the date when the corrective action(s) identified in Section 14 will be completed.

c. TITLE AND SIGNATURE—Enter the title and signature of supervisor completing the accident report. For a GOVERNMENT employee accident/illness the immediate supervisor will complete and sign the report. For PUBLIC accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For CONTRACTOR accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE Supervisor shall also sign the report. Upon entering the information required in 15.d, 15.e and 15.f below, the responsible USACE supervisor shall forward the report for management review as indicated in Section 16.

d. DATE SIGNED—Enter the month, day, and year that the report was signed by the responsible supervisor.

e. ORGANIZATION NAME—For GOVERNMENT employee accidents enter the USACE organization name (Division, Branch, Section, etc.) of the injured employee. For PUBLIC accidents enter the USACE organization name for the person identified in block 15.c. For CONTRACTOR accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

f. OFFICE SYMBOL—Enter the latest complete USACE Office Symbol for the USACE organization identified in block 15.e.

INSTRUCTIONS FOR SECTION 16—MANAGEMENT REVIEW (1st)

1ST REVIEW—Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15.c shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief (2nd review) for review and comment.

INSTRUCTIONS FOR SECTION 17—MANAGEMENT REVIEW (2nd)

2ND REVIEW—The FOA Staff Chief (i.e., FOA Chief of Construction Operations, Engineering, Planning, etc.) shall mark the appropriate box, review the completed report, provide substantive comments, sign date, and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18—SAFETY AND OCCUPATIONAL HEALTH REVIEW

3RD REVIEW—The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc. are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review comment, and signature.

INSTRUCTION FOR SECTION 19—COMMAND APPROVAL

4TH REVIEW—The FOA Commander shall (to include the person designated Acting Commander in his absence) review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Health Office. Signature authority shall not be delegated.

Environmental
Science &
Engineering, Inc.

WORK SITE HEALTH & SAFETY AUDIT

Project:_____ Project #:_____
Client:_____ Location:_____
Service being provided:_____
ESE Employees: _____ _____
_____ _____
SHSO:_____ Project Mgr:_____
Sub-Contractor:_____
Auditor:_____ Date:_____

****

1.0	**Employee Safety**			
1.1	Safety Glasses worn	Y	N	N/A
1.2	ANSI Z87 approved	Y	N	N/A
1.3	Tinted approved	Y	N	N/A
1.4	Side shields	Y	N	N/A
1.5	Hard Hats worn by employees	Y	N	N/A
1.6	Hard Hats worn by sub-contractors	Y	N	N/A
1.7	Steel Toe Shoes/Boots worn	Y	N	N/A
1.8	Work Gloves	Y	N	N/A
1.9	Chemical Resistant gloves worn	Y	N	N/A
1.10	Correct gloves available	Y	N	N/A
1.11	PPE Coveralls worn	Y	N	N/A
1.12	Correct coveralls available	Y	N	N/A
1.13	Respirators available	Y	N	N/A
1.14	Correct cartridges on-hand	Y	N	N/A
1.15	Respirators worn when needed	Y	N	N/A
1.16	Hearing protection worn	Y	N	N/A
1.17	Average hours worked in a day? _____			
2.0	**Health & Safety Plan**			
2.1	HASP On-Site	Y	N	N/A
2.2	HASP signed by ESE employees	Y	N	N/A
2.3	HASP signed by sub-contractors	Y	N	N/A
2.4	Know emergency facility	Y	N	N/A
2.5	Know potential chemicals	Y	N	N/A
2.6	Knowledge of Client's H&S Plan	Y	N	N/A
2.7	Tailgate Safety Meeting being held	Y	N	N/A
3.0	**Site Safety**			
3.1	First Aid Kit Available	Y	N	N/A
3.2	First aid kit full	Y	N	N/A
3.3	Eye wash available	Y	N	N/A
3.4	Fire extinguisher	Y	N	N/A

3.4	Extinguisher charged	Y	N	N/A
3.5	Potable Water	Y	N	N/A
3.6	Work Zones delineated	Y	N	N/A
3.7	Safety Cones/Barricades	Y	N	N/A
3.8	Site kept clean	Y	N	N/A
3.9	Equipment decontaminated properly	Y	N	N/A

4.0 Monitoring Equipment

4.1	Chemical monitoring device available	Y	N	N/A
4.2	Type of device?_____			
4.3	Calibrated daily	Y	N	N/A
4.4	PER form complete	Y	N	N/A
4.5	PER form completed daily	Y	N	N/A

5.0 Equipment

5.1	Safety hooks	Y	N	N/A
5.2	Equipment clean	Y	N	N/A
5.3	Broken parts	Y	N	N/A
	Explain _____			
5.4	Cables burred	Y	N	N/A
5.5	Condition good of support equipment	Y	N	N/A
	Explain _____			
5.6	Guards in place	Y	N	N/A

6.0 UST Work Y N N/A

If yes, continue

6.1	Confined Space Permit completed	Y	N	N/A
6.2	CSP used for only one day	Y	N	N/A
6.3	Tank inerted	Y	N	N/A
	Inert method used _____			
6.4	Tank atmosphere levels recorded	Y	N	N/A
	Cutting method used _____			
6.5	Tank grounded	Y	N	N/A
6.6	Men entering pit for sampling	Y	N	N/A
	Method used _____			
6.7	Pit walls shored or use angle of repose	Y	N	N/A

7.0 Unsafe Acts or Conditions

_____

_____

SAFETY MEETING RECORD FORM

Site name: _____

Location: _____

Meeting date: _____ Meeting time: _____

Meeting conducted by: _____

Topics Discussed

_____

_____

_____

_____

Accidents Reviewed

_____

_____

_____

_____

Suggestions/ Comments Made

_____

_____

_____

Revision 00
January 1992

SITE SPECIFIC TRAINING RECORD FORM

Site Name: _____

Location: _____

Meeting date: _____ Meeting time: _____

Meeting conducted by: _____

The following topics shall be discussed;

Biological Hazards
Chemical Hazards
Radiological Hazards
Physical Hazards
Toxicology
Personal Hygiene
Rights and Responsibilities under OSHA
Monitoring Plan
Site Safety and Health Plan
Standard Operating Procedures
Personal Protective Equipment
Medical Monitoring Program
Decontamination
Emergencies
Public Relations

Suggestions/Comments: _____

_____

_____

_____

Meeting Participants' Signatures:

_____

_____

_____

_____

_____

_____

_____

_____

EMPLOYEE/VISITOR LOG

NAME	DATE	ORGANIZATION

Revision 00
January 1992

ATTACHMENT C
LIGHTNING PROTECTION MEMORANDUM

FROM: JEFF NEECE

TO: ALL OEW SAFETY SPECIALISTS

SUBJECT: LIGHTNING PROTECTION FOR NON-DOD EXPLOSIVE STORAGE SITES

1. When it is determined that lightning protection is required on explosive storage areas at OEW projects, the following minimum standards shall be met. Information was derived from Chapter 7, DOD Standard 6055.9-STD. Chapter 7 lists the references used to design the lightning protection systems for DOD explosive storage. I had USAEDH personnel with experience in the above subject, review this document and provide guidance for these field lightning protection standards.

2. Figure 1 is a drawing of a typical ATF type explosive magazine and a lightning protection system.

a. The lightning rod shall be made of steel or copper. It is located at least 6 feet from the magazine. The height of the lightning rod shall depend upon the location of the magazine. The magazine shall be inside a 45 degree arch that runs from the top of the lightning rod to the surface. (see fig.1)

b. A grounding rod of at least 3/4 inch solid steel or copper and ten feet long shall be driven into the ground. (Chapter 7, section D describes alternatives for a grounding system) The top of the grounding rod shall be at least one foot below the surface.

c. A grounding wire of 2/o AWG stranded bare wire (copper is best) shall be run from the magazine to the grounding rod. The same type wire shall be run from the lightning rod to the grounding rod. The wires shall be buried at least one foot below the surface.

d. Prior to connecting the ground wires from the lightning rod or magazine to the grounding rod, the grounding rod must have a ground resistance check conducted(using the Fall-of-Potential method). Enclosure 2 describes this test and shows an example of the type of tester needed to conduct the test. The grounding rod must show a resistance of < less than 25 ohms to meet explosive storage requirements.

e. After the grounding rod has met the above requirements each wire from the lightning rod to the grounding rod and from the magazine to the grounding rod shall be checked with a OHM meter to ensure continuity. The wires are then connected from the magazine to the grounding rod and from the lightning rod to the grounding rod.

3. The connections should be a part of the contractors weekly safety checks. The contractor should include these inspection in his Safety Log. This system should protect our explosive storage areas from accidental detonations from lightning strikes.

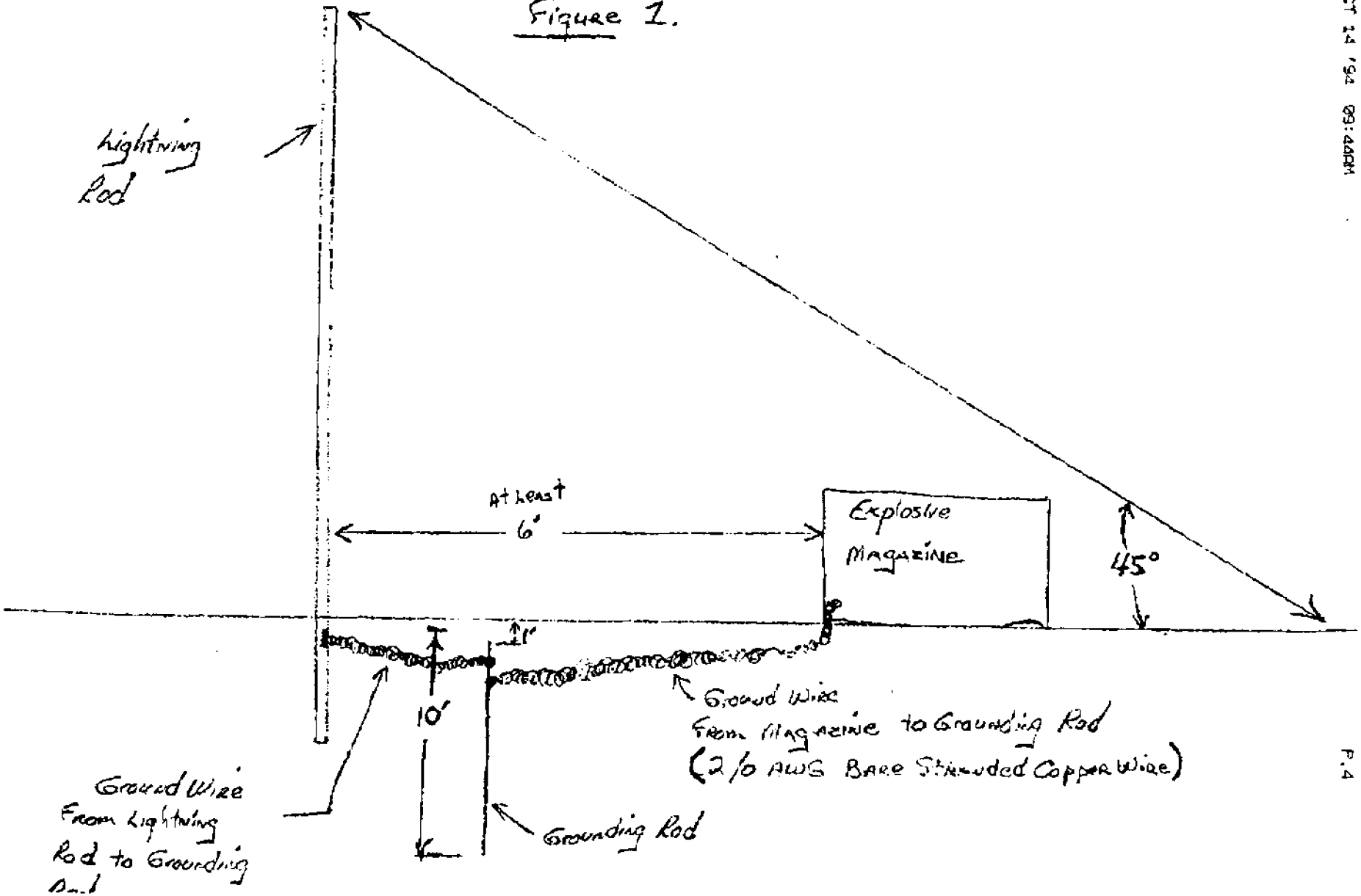
4. Remember there are companies out there whose only business is lightning protection. If their design differs greatly from this guidance we must have it reviewed prior to erection.

5. Enclosure 2 is some general information about ground resistance testing and how it is properly conducted. I talked to a Mr. William Brewer, ED-ME and if we have a problem on lightning he can help us.

ENCl 1. (Figure 1)
ENCL 2. (5 pages, Ground Resistance Testing)

Not to Scale

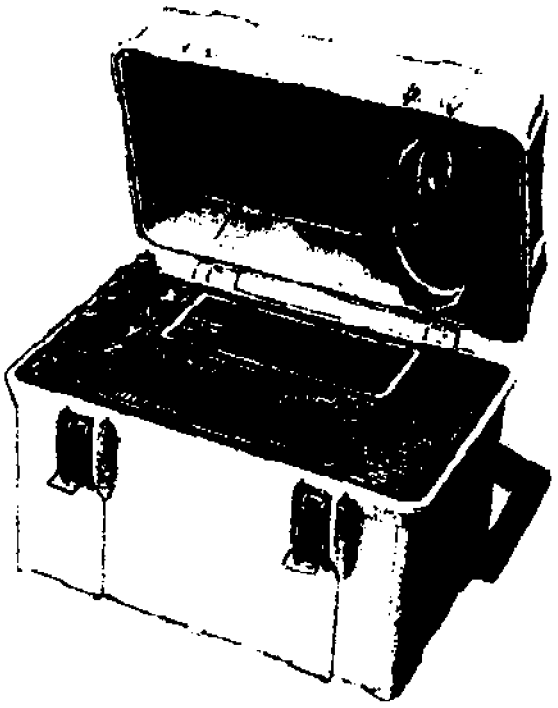
Figure 1.



Digital Ground Resistance Tester Model 4500

Features

- Designed to measure very low resistance on large grounding systems (ground grids, ground mats)
- 3½-digit LCD display eliminates operator reading error
- 3 selectable test current ranges for high accuracy under difficult conditions
- Rechargeable batteries
- Rugged dust- and water-resistant carrying case
- High 20 kΩ range allows soil resistivity measurements with four-point method
- Dual indicators—blinking display and arrow show excess stray current or auxiliary electrode resistance
- Very large display



Digital Ground Tester Model 4500 shown approximately 1/8 size

Applications

The AEMC Digital Ground Tester Model 4500 is designed to perform ground resistance measurements of extremely low value on large grounding systems, under difficult conditions such as high stray currents or excessive resistance from auxiliary electrodes.

This rugged, easy-to-use tester can measure up to 20 kΩ, and gives the operator direct reading with a resolution of one milliohm. Soil resistivity measurements are conducted easily using the four-point method on the 20 kΩ range. Both a blinking display and arrow indicate excess stray current levels, excessive resistance between ground and current electrodes, or lack of continuity between leads and electrodes.

Specifications

Ranges	2Ω	20Ω	200Ω	2000Ω	20 KΩ
Resolution	1 mΩ	10 mΩ	0.1 Ω	1Ω	10Ω
Recommended Current ranges	10 mA or 50 mA	2 mA, 10 mA, 50 mA		2 mA 10 mA	2 mA 10 mA

To obtain the best performance when the resistance is high, use low current values; when interference is high, use high current values.

Accuracy:
± 2% of the reading, ± 1 digit (from 10 to 100% of each range)
5 mΩ from 0 to 0.2Ω on the 2Ω range
For best resolution and accuracy, operator will select next range down for readings below 10% of range

3 selectable test current ranges:
50 mA, 10 mA, 2 mA
Maximum voltage electrode resistance:
50 kΩ on 20Ω, 200Ω, 2000Ω, and 20 kΩ ranges. On these ranges, the resistance in the voltage circuit will introduce an error of 0.5%/10 kΩ.
5 kΩ on the 2Ω range. On this range, the resistance in the voltage circuit will introduce an error of 0.5%/5 kΩ.

Understanding Ground Resistance Testing

Make sure your ground is a good ground!

Why have a ground?

A good ground system maintains a reference potential for instrument safety, protects against static electricity, and limits the system-to-frame voltage for operator safety. Grounding provides a discharge path for short currents and lightning, prevents damage from surges on power lines, and is essential, as well, for protecting the operation of electronic process controls and communications, and for meeting NEC, OSHA, and other electrical standards.

What kind of conductor is a ground system?

The resistance within a ground system is composed of the following:

- the resistance of the ground rod
- the resistance of contact between the ground rod and the soil directly in contact with the ground rod
- the resistance of the body of earth surrounding the ground rod

In general, the resistance of the ground rod and the resistance of contact between the ground rod and soil are small compared to the resistance of the body of earth surrounding the ground rod.

A well accepted explanation of a ground system as a conductor is to consider the earth surrounding an electrode or ground rod as a series of conductive shells of equal thickness, as shown in Figure 1. The current flowing from the ground will flow through these shells.

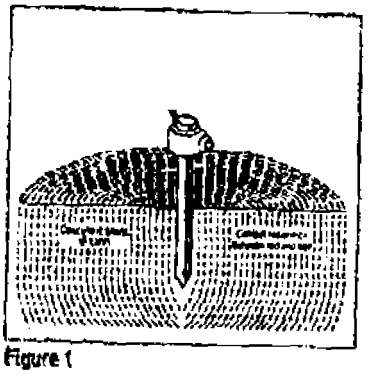


Figure 1

The earth shell closest to the ground rod has the smallest surface area, and consequently offers the greatest resistance. As the distance from the electrode increases, the cross-sectional area of each shell increases. At some remote point, adding shells does not significantly add to the earth resistance surrounding the ground rod. This is known as the effective resistance area, and it is chiefly dependent on the driven depth and diameter of the ground rod.

How do we measure the resistance of a ground system?

Ground resistance, often referred to as the ground rod resistance, is the ohmic resistance between a grounding electrode and a grounded reference electrode located at a remote distance. A remote distance is such that the interaction between the two electrodes is nil.

When measuring resistance between a ground rod and the surrounding earth, only one terminal is available, namely, the ground rod. This can be confusing when ground resistance measurements are to be made, since resistance is generally measured between two points. In practice, ground resistance measurement is still done between two points, which are the rod under test and an auxiliary electrode connected to the Y terminal of the ground tester. To understand how this measurement is done, it is necessary to examine the principle of operation of a ground tester, in this case, AEMC's Digital Ground Resistance Tester.

Principle of Operation

The resistance test method described below is referred to as the Fall-of-Potential method.

In order to establish connections with the earth, two auxiliary electrodes are driven at intervals into the soil, in a straight line from the ground rod under test, as illustrated in Figure 2. A tape measure is laid out along these electrodes in order to keep track of the distances.

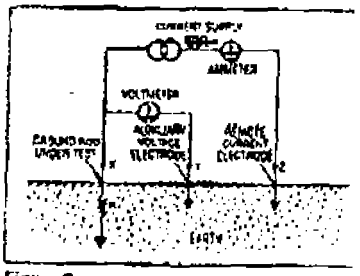


Figure 2

As the figure shows, a current generator supplies a constant current between the ground rod under test (X) and a remote current electrode (Z).

A series of measurements of the voltage drops between the ground rod under test and a remote electrode (Y), called the auxiliary voltage electrode, are made by moving the auxiliary voltage electrode Y, in steps, away from the electrode under test, X.

The resistance at each distance is then obtained by applying Ohm's law:

$$R = \frac{\text{voltage drop}}{\text{constant current}}$$

Questions? Call P. 800-343-1391

Digi Ground Vomeg Model 8400

It's versatile and it's simple

Features

- One instrument performs four functions:
  - Ground Resistance Test
  - Continuity Test
  - Insulation Resistance Test
  - Voltage Test
- Direct reading: large, easy to see LCD display
- Verification beeper on continuity range for measurements of 20Ω or less
- Warning light indicates presence of AC voltage
- High interrupting capacity fuse and circuit breaker for operator safety
- Lightweight, portable carrying case makes it easy to transport instrument and accessories into the field for onsite measurements
- Self-checking circuit warns of invalid readings, taking the mystery out of ground testing
- High rejection of stray currents
- Rugged ABS plastic case
- Patented ground rod design

Applications

The AEMC Digi Ground Vomeg Model 8400 with its four-in-one design permits electrical contractors and engineers to make on-site measurements of ground resistance, ground conductor continuity, insulation resistance, and line voltage — all with one portable instrument. Values are indicated on a large direct-reading LCD display.

Specifications

General

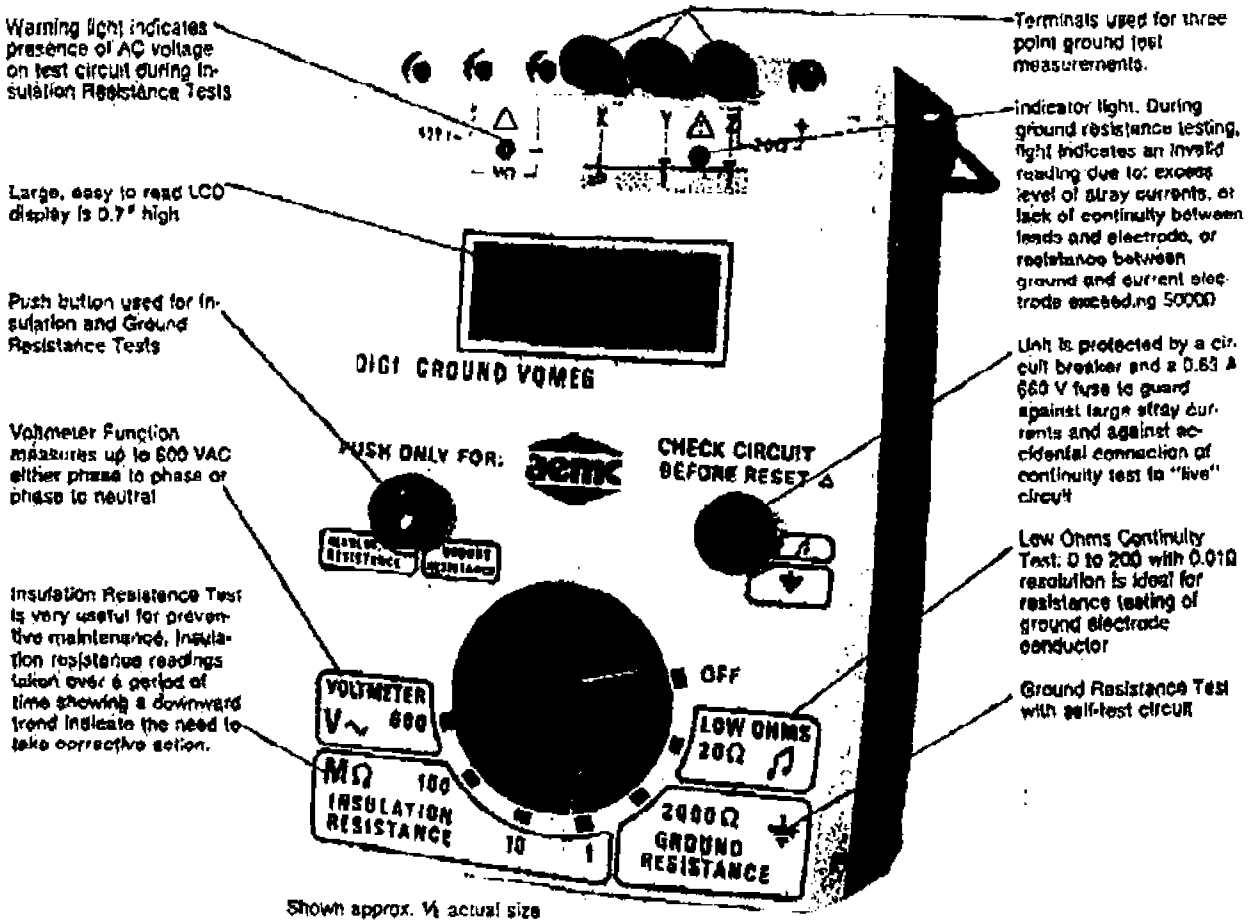
Display:
3½ digit LCD display 0.7" high

Power:
Eight 1.5 V alkaline "AA" cells

Dielectric test:
2000 V RMS at 50 Hz for one minute

Dimensions:
7.7" × 5.2" × 3.75" (19.6 × 13.2 × 9.5 cm)

Weight: 2 lb 2 oz (1 kg)



Shown approx. ½ actual size

Check ground rods, ground mats, ground grids

Meet NEC, OSHA, IEEE standards

(Note: the AEMC ground tester will display the resistances directly.) Using the results of these measurements, the operator will then be able to plot a graph in which the resistance (R) is a function of the distance between X and Y. Figure 3 is an example of such a graph.

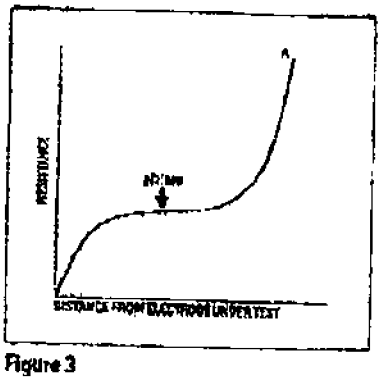


Figure 3

Curve A in figure 3 shows a long plateau where the resistance is relatively constant. This is the effective resistance area.

Interpretation of the graph

If the remote current electrode was placed far enough away from the electrode under test, the curve will resemble curve A in Figure 4. Note that there is a long plateau in this curve where resistance is relatively constant. This is the area of effective resistance and represents the resistance of the ground electrode. From the plateau area, the resistance increases rapidly as the voltage electrode Y enters into the earth shells surrounding the remote current electrode Z.

How remote should the remote current electrode be?

The remote current electrode must be located at a sufficient distance from the electrode under test to avoid interaction between the two effective resistance areas. As a rule of thumb, for one ground rod, the deeper the rod under test has been driven, the farther away the remote current electrode should be placed.

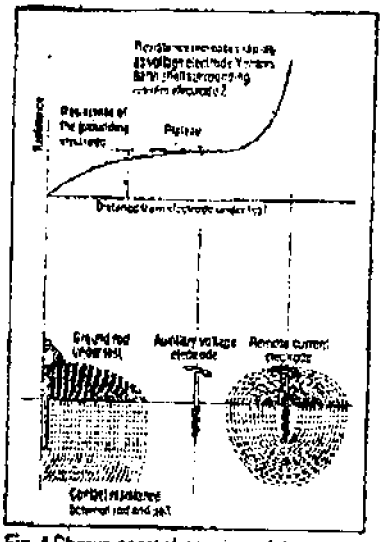


Fig. 4 Shows correct spacing of the electrodes.

What happens if the remote current electrode is too close?

If the remote current electrode Z is placed too close to the electrode under test, the effective resistance areas of both the electrode under test and the remote current electrode will overlap one another. In that case, the curve of the resistance in function of distance will look like the one shown in Figure 5, and no plateau will be found. To correct this situation and minimize the interaction of the two electrodes, the remote current electrode should be placed farther from the ground rod.

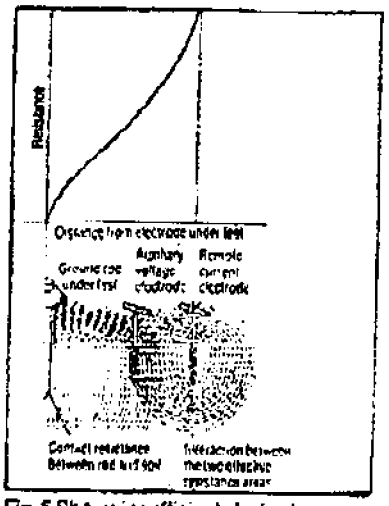


Fig. 5 Shows insufficient electrode spacing

No definite distance between the electrode under test and the remote electrode can be given, since this distance is relative to the diameter of the electrode tested, its length, the homogeneity of the soil tested, and particularly, the effective resistance areas involved. However, an approximate distance may be determined from the following chart, which is given for a homogeneous soil and an electrode of one inch in diameter.

ELECTRODE PLACEMENT*	
Driven depth of electrode under test:	Distance to remote current electrode:
6 ft	72 ft
8 ft	80 ft
10 ft	88 ft
12 ft	96 ft
18 ft	115 ft
20 ft	120 ft
30 ft	140 ft

*Note: The figures given above are only rough approximations. Distances will vary depending on the factors described in the above paragraph.

Appendix E

Demolition/Disposal Standard Operating Procedure

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Experience and ongoing training programs have proven to be the best management tool for disposal operations. Every effort must be focused on personal and team performance and training. Adherence to policies and procedures will greatly enhance the overall success of any demolition task and will ensure the safety of all personnel involved. It is the responsibility of all personnel to follow this Standard Operating Procedure (SOP) and to bring to the attention of management personnel, any shortcomings that could jeopardize any facet of the project.

1.2 This SOP will be followed by all OES personnel engaged in explosive disposal operations. However, situations may exist that will warrant additional safety measures, such as fire trucks, medical personnel, and protective clothing. The site supervisor and SSHO/QCS have the overall responsibility to comply with the minimum requirements and upgrade the requirements as needed. These will then be forwarded to U.S. Army Engineering and Support Center, Huntsville (USAESCH) for approval.

1.3 The purpose of this SOP is to provide guidelines for the disposal of ordnance explosive/unexploded ordnance (OE/UXO) recovered during this project.

2.0 DEMOLITION RESPONSIBILITIES

2.1 SITE SUPERVISOR

The site supervisor is responsible for complete assurance of adequate housekeeping at all times and will visit the location periodically to see that operations are carried out in a safe, efficient, and economical manner.

2.2 UXO SUPERVISOR/DISPOSAL TEAM LEADER

All disposal activities will be under the direct control of an experienced and trained UXO supervisor that is familiar with and charged with the responsibility for all activities within the disposal area. The team leader is responsible for ensuring all operators are thoroughly familiar with the nature of the materials handled, the hazards involved, and the applicable precautions. The team leader will be present during all disposal operations.

2.3 SITE SAFETY AND HEALTH OFFICER/QUALITY CONTROL SPECIALIST

The SSHO/QCS for the site is responsible for ensuring that safe disposal operations are being conducted and that all personnel are trained in the materials and equipment being used. The SSHO/QCS will conduct periodic safety audits of the disposal team (demolition team) and assist them, as necessary.

The SSHO/QCS will inspect the disposal area and the adjacent area after firing to ensure that there are no kickouts, hazardous UXO/OE components, or other hazardous items. In addition, the area will be checked with a magnetometer upon the completion of removal actions for any UXO/OE or metallic debris. If necessary, an additional disposal shot will be set to dispose of any hazardous ordnance material. All metallic debris verified as nonhazardous ordnance will be placed with the scrap and inert ordnance for disposition at the Defense Reutilization and Marketing Office (DRMO) or to a local scrap dealer.

3.0 GENERAL SAFETY PRECAUTIONS

3.1 This SOP will be maintained by the team leader and available to all personnel on request. There will be no deviation or change from this SOP without prior approval of the site supervisor and the SSHO/QCS. Any conditions or circumstances that are identified and not covered within this SOP will be immediately reported to the team leader for necessary action. Each operator must read and be thoroughly familiar with this SOP to ensure that all general safety regulations and safe work practices are observed. All personnel assigned to disposal operations are required to read and adhere to the requirements contained in this SOP.

3.2 The explosive limits within the boundaries of the former Camp Croft Army Training Facility have not been established. The explosive limit must be based on the UXO item being destroyed.

3.3 In the event of an electrical storm, all disposal operations will immediately cease.

3.4 In the event of a fire, extinguish it with available equipment if possible; if unable to do so, notify the City of Spartanburg Fire Department and evacuate the area.

3.5 All safety regulations applicable to materials involved will be complied with.

3.6 Methods of demolition will be in accordance with this SOP and approved changes thereto.

3.7 Adequate fire protection and first aid equipment will be provided at all times.

3.8 Care will be taken to limit exposure to a minimum number of personnel, consistent with safe and efficient operations.

3.9 Work locations will be maintained in a neat and orderly condition.

3.10 All hand tools shall be maintained in a good state of repair.

3.11 Equipment and/or vehicle operators will have in their possession a valid drivers license.

3.12 Personnel will wash face and hands after handling explosives prior to eating, smoking, or drinking.

3.13 No multiple disposal pits will be used.

4.0 EXPLOSIVE DISPOSAL SAFETY PRECAUTIONS

4.1 If practical and observable, a red warning flag will be displayed at the disposal area, and the area will be secured prior to demolition activities. If emergency personnel are summoned, they will be escorted into the area.

4.2 An observer will be stationed at each corner of the disposal area, outside the fragmentation/blast zone, where there is a good view of the air and land approaches to the disposal area prior to any detonations. It will be the responsibility of the observers to alert the supervisor if any aircraft, vehicles, or personnel are sighted approaching the general demolition area.

4.3 Two-way RF transmitters will be operated as stipulated in TM9-1375-213-12, Table 2.3, during all disposal operations.

4.4 An area 10 feet (ft) in diameter will be cleared of dry grass, leaves, and other extraneous combustible materials around the demolition area, if possible.

4.5 No demolition activities will be conducted if there is less than a 1,000 ft ceiling and/or if wind velocity is in excess of 20 miles per hour (mph).

5.0 VEHICLE SAFETY PRECAUTIONS

5.1 No more than two persons will ride in a vehicle transporting explosives. If explosives are being transported in an open bed truck or trailer bed, no person is allowed to ride in the bed.

5.2 Vehicles will not be refueled when carrying explosives. Vehicles must be at least 100 ft from magazines or trailers containing explosives before refueling.

5.3 Vehicles transporting explosives will be broom cleaned of visible explosive residue before releasing the vehicles for other duties.

6.0 SPECIAL SAFETY REQUIREMENTS FOR DISPOSAL ACTIVITIES

6.1 Explosives safety precautions (Appendix C of this WP) will be adhered to at all times.

6.2 Fragmentation tables will be reviewed; however, special considerations must be allowed for mortar effect of projectiles.

6.3 UXO or explosives to be destroyed by detonation will be covered with not less than 3 ft of sand/soil, if possible. The disposal charges will be placed in contact with the item(s) to be detonated and secured in place by tape or earth packed over the charges.

6.4 Special requirements for using electric detonators and electric blasting circuits are as follows:

1. Electric detonators and electric blasting circuits may be energized to dangerous levels from outside sources such as static electricity, induced electric currents, and radio communication equipment. Safety precautions will be taken to reduce the possibility of a premature detonation of the electric detonator and explosive charges. Radios will not be operated while the disposal area is primed or during the priming process.
2. Care should be taken to remove all existing commercial radio and electrical hazards prior to the priming process.
3. The shunt will not be removed from the leg wires of the detonator until the moment of checking the circuit.

NOTE: *When testing the detonator, prior to connecting the detonator to the firing circuit, the lead wires of the detonator must be short circuited by twisting the bare ends of the wires together*

immediately after testing. The wires will remain short circuited until time to connect them to the firing circuit.

4. When uncoiling/unwinding the leg wires of the electrical detonator, keep the detonator (explosive end) pointing away from the body and away from other personnel. Hold the detonator lead wires approximately 1 inch from the detonator body. Straighten the leg wires by hand, and do not throw or wave the wires through the air to loosen the coil.
5. At the power source end of the blasting circuit, the ends of the firing wires will be shorted or twisted together at all times, except when actually firing the charge or testing the circuit. The connection between the detonator and the circuit firing wires must not be made unless the power end of the firing wires are shorted.
6. Blasting or demolition operations will not be conducted during an electrical storm or when a storm is approaching. All operations will be suspended, detonator wires and firing wires will be short-circuited, all personnel will leave the disposal area and evacuate to a safe location.
7. Prior to making connections to the blasting machine, the firing circuit will be tested with a galvanometer for electrical continuity and ohmic resistance to ensure the blasting machine has the capacity to initiate the shot. The individual assigned to make the connections will not complete the circuit at the blasting machine and will not give the signal for detonation until satisfied that all personnel in the vicinity have been evacuated to a safe distance. When used, the blasting machine or its actuating device will be in the blaster's possession at all times.

6.5 All weather information will be obtained from the U.S. Weather Service. Windspeed and wind direction will be logged in before the start of the daily operations. If any changes in the weather are noticed, an update will be obtained.

6.6 A minimum of 30 seconds will be maintained between each detonation.

6.7 On completion of disposal activities at the end of the project, surface exposed scrap metal, casings, fragments, and related items will be recovered from the disposal area and disposed of in accordance with contracted procedures. All scrap metal and debris will be inspected for explosive residue and certified inert by the site supervisor and QCS.

6.8 When operating in accordance with the conditions of this procedure, the disposal operations should not present a noise problem to the surrounding community. However, if a noise complaint is received, the name, address, and phone number of the complainant should be recorded and reported to the site supervisor, who in turn, will report it to USAESCH. Every effort will be made to control noise.

6.9 Materials generated from the disposal operation (i.e., packaging materials) must be disposed of in accordance with all applicable property disposal and environmental procedures.

6.10 On completion of the project, the disturbed ground surface will be thoroughly inspected for UXO/OE. The site will be filled and leveled to inhibit erosion.

7.0 METEOROLOGICAL CONDITIONS

7.1 Disposal operations will not be conducted during electrical storms or thunderstorms.

7.2 Disposal operations will be restricted to periods when surface windspeed is less than 20 mph.

7.3 Disposal operations will not be conducted during periods of reduced visibility (full and unrestricted view of disposal area) caused by, but not limited to rain, dense fog, blowing snow, sand, or dust storms.

7.4 Disposal operations will not be carried out on extremely cloudy days, which are defined as overcast days (more than 90 percent cloud cover) or a ceiling of less than 1,000 ft.

7.5 Demolition operations will not be initiated until at least 1/2 hour after sunrise and will be concluded by at least 1/2 hour before sunset.

7.6 Disposal operations will not be conducted during heavy inversion conditions. If any weather condition is not acceptable, operations will be postponed.

7.7 The disposal team leader will ensure that the Daily Activities Log and the Ordnance Accountability Log are properly filled out for each day of operations.

7.8 No disposal operation will be left unattended during the active portion of the operation.

8.0 PRE-DEMOLITION/DISPOSAL PROCEDURES

The success of any operation is dependent on a thorough briefing, covering all phases of the task.

8.1 TEAM LEADER BRIEFING

Prior to each day of activities, the team leader will brief all personnel involved in explosive disposal operations in the following areas:

1. Type of OE/UXO being destroyed,
2. Type of counter charge or explosive being used,
3. Placement and quantity of counter charge,
4. Method of initiation (electric or non electric),
5. Means of transporting and packaging explosives,
6. Route to the disposal site,
7. Equipment being used to effect detonation,
8. Misfire procedures, and
9. Post shot clean up of area.

8.2 DAILY SAFETY BRIEFING

The SSHO will conduct a daily safety brief for all personnel involved in explosive disposal operations in the following areas:

1. Care and handling of explosive materials,
2. Personal hygiene,
3. Two-man rule,
4. Potential trip/fall hazards,
5. Horse play,
6. Remain alert for any explosive hazards,
7. Location of emergency shelter (if available),
8. Parking area for vehicles (vehicles must be positioned for immediate departure with engines running),
9. Wind direction (toxic fumes),

10. Location of first aid kit and fire extinguisher(s),
11. Route to nearest hospital or emergency aid station,
12. Type of communications in event of an emergency, and
13. Storage location of counter charges and detonators.

8.3 PERSONNEL ASSIGNMENTS

The following specific tasks will be assigned to the disposal team and completed prior to completing disposal activities. These tasks may or may not have to be accomplished for each shot. It is the responsibility of the disposal team leader to ensure that all tasks are performed.

1. Contact local police, fire department, and Federal Aviation Administration (FAA), as required;
2. Contact hospital/emergency response personnel;
3. Secure all access roads and paths to the disposal area;
4. Visually check area for any unauthorized personnel;
5. Check firing wire for continuity and shunt;
6. Prepare designated area, as required;
7. Check continuity of detonators;
8. Designate technician to maintain custody of blasting machine or fuze igniters;
9. Secure detonators in a safe location; and
10. Place counter charge in desired location on UXO.

8.4 PREPARING EXPLOSIVE CHARGE FOR INITIATION

1. Ensure firing wire is shunted;
2. Connect detonator to the firing wire;
3. Isolate or insulate all connections;
4. Prime the counter charge (place detonator in counter charge);
5. Depart to firing point and conduct head count (if using non-electric firing system, obtain head count, yell **"Fire in the Hole"** three times using bull horn, pull igniters and depart to designated safe area);

6. Activate the siren on the bull horn for 10 seconds, or yell "**Fire in the Hole**" three times using bullhorn;
7. Take cover; (if using electric firing system) connect firing wires to blasting machine and initiate charge; and
8. Remain in designated safe area until the team leader announces "**All Clear.**"

9.0 POST DEMOLITION/DISPOSAL PROCEDURES

Do not approach a smoking hole or allow personnel out of the designated safe area until cleared to do so.

1. After the **"All Clear"** signal, check area for low orders or kickouts;
2. Backfill hole as necessary; and
3. Police all equipment.

10.0 MISFIRE PROCEDURES

A thorough check of all equipment, firing wire, and detonators will prevent most misfire situations.

10.1 ELECTRIC MISFIRES

To prevent electric misfires, require one technician to be responsible for all electrical wiring in the circuit. If a misfire does occur, it must be cleared with extreme caution. The technician that is most familiar with the circuit is the logical choice to investigate and correct the situation.

1. Check blasting machine connections and make a second attempt to initiate charge;
2. If unsuccessful, disconnect firing wire and connect to another blasting machine (if available) and attempt to initiate charge;
3. If unsuccessful, disconnect the firing wire from the blasting machine shunt and commence a 30-minute wait period;
4. After the wait period has expired, a designated technician will proceed down range to inspect the firing system; a safety observer must watch from a protected area;
5. Disconnect and shunt the detonator leg wires, connect a new detonator to the firing circuit and prime the charge without disturbing the original detonator; and
6. Follow normal procedures for effecting initiation of the charge.

11.0 RECORDKEEPING REQUIREMENT

11.1 The disposal site team leader will ensure that accurate accountability of all UXO disposed of is completed and that an inventory record of all explosives used as disposal charges is maintained.

11.2 The SSHO/QCS will monitor the entries in the log for completeness, accuracy, and compliance with meteorological conditions.

11.3 The disposal team leader will enter all data in the Ordnance Accountability Log. The quantities recovered should be equal to the quantities destroyed. An accurate accountability of explosives expended for disposal operations will be maintained.

11.4 OES will retain a permanent file of all disposal records, including permits, magazine data cards, training records, inspector reports, waste manifests, if applicable, and operating logs.

12.0 STORAGE AND TRANSPORT OF EXPLOSIVES

12.1 STORAGE AREA

All explosives and detonators will be stored in approved explosive magazines located in a secure area, in an approved storage configuration. No explosives will be picked up prior to sunrise. All unused explosives will be returned to storage prior to sunset. The storage bunkers will remain double locked at all times. No single individual will have access to both keys. The site supervisor and the SSHO will retain keys within their possession. This procedure will ensure that two man control of all explosives is maintained. The contractor shall provide the storage area location in the WP and on a site map prior to mobilization.

12.2 TRANSPORT

Explosives will be transported to the disposal areas via a pickup truck or similar vehicle containing a first-aid kit, fire extinguisher, and non-sparking wood or vinyl lined truck bed; or the explosives will be placed in a wood or plastic container.

13.0 EMERGENCIES

13.1 All emergency facilities including fire support can be reached via telephone by dialing the numbers indicated in Table 12-1 of the project SSHP (Appendix D of this Work Plan).

Appendix F

Field Investigation Equipment Plan

FIELD INVESTIGATION EQUIPMENT PLAN

TABLE OF CONTENTS

1.0 FIELD INVESTIGATION EQUIPMENT PLAN

1.1 The purpose of this field investigation equipment plan is to provide information of types and sources of equipment that will be required to complete the field investigation activities.

1.2 The field investigation activities for this EE/CA project will include conventional OE/UXO geophysical survey methods, OE/UXO excavation and removal as necessary, and OE/UXO handling/disposal procedures. OE/UXO sampling will be combined with surrounding sampling site features to produce sampling site maps depicting the information and data collected at each sampling site. These methods and procedures are detailed in Section 3.0 of the Work Plan.

1.3 All personnel will follow at all times the OE/UXO Operations Plan and Site Safety and Health Plan procedures outlined in the referenced Work Plan sections and appendices, unless the procedures are modified and agreed to by ESE and EOD subcontractor and approved in writing by the USAESCH representative. All equipment provided for field investigation activities for this project will be in strict accordance with these plans, in order to assure the safety of field personnel at all times. Personal protective equipment (PPE) is specified in the Site Safety and Health Plan rather than in this appendix.

1.4 If CWM materials are discovered during these field investigation activities, all work will cease, the site will be rendered safe using approved SSHP procedures, and the USAESCH representative will be contacted for further instructions. For that reason, this equipment plan does not specify equipment for CWM-type field investigation activities.

2.0 GEOPHYSICAL SENSOR SURVEY UNITS

2.1 GENERAL

The geophysical sensor surveys conducted at the EE/CA sampling sites will use a manual sensor survey system known as "mag and flag." This system consists of the use of an appropriate portable field magnetometer in a field sweep mode, following surveyed 5-ft wide lanes to thoroughly cover the sampling site layout.

2.2 GEOPHYSICAL EQUIPMENT REQUIREMENTS

During the implementation of an EE/CA investigation, a statistically significant number of the total anomalies detected will be excavated. The purpose of the EE/CA sampling is not to remove all ordnance items from the grid site. Therefore, there is no reduction of liability implied. With this in mind, standard detection equipment that will be easy to use on all grid site conditions encountered during an investigation with the reliability required for EE/CA sampling will be evaluated for use. The geophysical equipment selected for use at an EE/CA site must be able to detect most anomalies found at the site to a depth of 3 ft.

2.2.1 GEOPHYSICAL EQUIPMENT EVALUATION

ESE reviewed current geophysical technologies to determine the type of equipment that will meet the requirements of ability to detect individual anomalies, reliability, portability (easy to handle through trees and shrubs), and cost. After review of available geophysical methods, ESE has selected the use of a hand-held magnetometer at Former Camp Croft.

2.2.1.1 Several hand-held magnetometers were evaluated based on portability, weight, reliability, and cost. These include the Schonstedt GA-72, Schonstedt GA-52, Magnatrac 102, and the Foerster MK26.

2.2.1.2 Portability is important due to the difficult terrain and location of most of the sites. The selected magnetometer must be easily manipulated in areas of brush, vines, and between trees. The instrument must be easy to carry through hilly terrain. The length of the instrument is important as an instrument too long will be difficult to operate in the forested areas, and a shorter length would require shorter lane widths.

2.2.1.3 The weight is an important criteria as heavier pieces of equipment will generate more strain on the operator and make it difficult for him to operate the equipment efficiently without rest or replacement. Therefore, the weight will decrease the productivity during the geophysical survey task.

2.2.1.4 The equipment must be reliable and rugged enough to perform in field conditions, and be able to detect OE buried up to 3 ft deep.

2.2.1.5 The cost is being evaluated based on the manufacturer price. ESE has contacted the manufacturers of the analyzed equipment for retail pricing. It is assumed that the rental rate of each piece of equipment will be directly related to the retail price.

2.2.1.6 The analyses are presented in Table 2-1. As a result, ESE has chosen the Schonstedt GA-52C, the Schonstedt GA-72C, or the Magnatrac 102 for the geophysical survey. OES selected to use a Schonstedt GA-72C as the primary geophysical instrument. This unit has been used in the industry for many years and has been proven reliable at the Former Camp Croft site during previous investigations. During the former EE/CA investigation at the Former Camp Croft site, all the anomalies from every seventh lane were entirely excavated. No anomalies were missed.

Table 2-1. Magnetometer Analysis

Instrument	Reliability	Portability	Weight	Cost
Schonstedt GA-52Cd	Previously used on sites. Approved for USACE QA.	Length-42.5 inches	3.0 lbs	$795
Schonstedt GA-72Cd	Previously used on sites.	Length-34.5 inches	2.5 lbs	$895
Magnatrac 102	Approved for USACE QA.	Length- 42 inches	3.0 lbs	$550
Foerster MK-26*	Approved for USACE QA. Extremely reliable.	Probe- 30.8 inches Handle-57.7 inches**	13.5 lbs	$16,515

*Foerster Ferrix L configuration is evaluated.

**Due to probe and handle configuration, the Foerster is cumbersome in forested terrain.

3.0 TRANSPORTATION AND CONSTRUCTION EQUIPMENT

3.0.1 Various types of transportation and construction equipment may be required during the completion of EE/CA site field investigations.

3.1 ON-ROAD VEHICLES

Vehicles required for on-road service during the project may include standard automobiles, trucks, or vans. The use of company-owned or rental vehicles of this type will be in accordance with all state and local laws and regulations regarding registration, insurance, and driver licensing. All state and local laws and regulations regarding vehicle use on highways will be complied with. In particular, speed limits on non-paved county roads will be limited to stated speeds, or lower speeds if required based on weather conditions, road conditions, other hazards, and local traffic patterns. All on-road vehicles will be maintained at a high level of maintenance to avoid untimely breakdowns and schedule delays. Vehicle planning will include enough redundancy to prevent vehicle-related schedule delays.

3.1.1 Transportation of OE/UXO onsite over paved roads using conventional vehicles will be in complete accordance with the project SSHP and the OE/UXO Operational Plan.

3.1.2 On-road vehicles used to transport off-road equipment by trailer will comply with all state and local traffic regulations as stated above. Parking and loading/unloading will be conducted in such a manner that local traffic is not interfered with, and in a safe manner.

3.2 OFF-ROAD VEHICLES

Off-road vehicles anticipated for this project include 4-wheel drive standard vehicles and 4-wheel all-terrain vehicles (ATVs). ATVs will be towed to the site by trailer and only used off of driveable roadways. ATVs will be used to transport project team members and portable equipment to off-road remote EE/CA sampling sites, where appropriate. ATVs may be necessary where wet weather conditions exist in conjunction with absence of roadways.

4.0 ANALYTICAL AND MONITORING EQUIPMENT

4.1 WEIGHING EQUIPMENT

Appropriate portable analytical scales or weighing equipment may be used during the field investigation activities to weigh metallic debris, as required. Any equipment of this type used on site will be calibrated and documented in accordance with the project QC Plan.

4.1.1 Alternatively, metallic debris accounted for during OE/UXO handling and disposal operations may be weighed offsite in rolloff boxes or other approved pre-weighed containers by commercial vendors at commercial scales locations. Appropriate chain-of-custody documentation will be generated if offsite weighing of metallic debris is conducted.

4.2 MONITORING EQUIPMENT

Specific chemical hazard monitoring is not anticipated for OE/UXO field investigation activities at the site. However, monitoring instruments may be needed for evaluating physical hazards such as noise, heat, or cold stress. A description of the instruments required, along with the operating procedures, is contained in Section 8.0 of the SSHP (Appendix D of the WP). The instrument will be calibrated daily or as specified by the equipment manufacturer, and calibration data documented as required by the project QC Plan.

Appendix G

Environmental Resources Protection Plan

ENVIRONMENTAL RESOURCES PROTECTION PLAN

TABLE OF CONTENTS

ENVIRONMENTAL RESOURCES PROTECTION PLAN

1.0.1 This Environmental Resources Protection Plan (ERPP) has been prepared as requested in the Statement Of Work (SOW) for the EE/CA at the former Camp Croft Army Training Facility (CCATF), Spartanburg, South Carolina. The purpose of the ERPP is to ensure compliance with the National Environmental Policy Act (NEPA) and Army Regulation (AR) 200-2 such that proposed activities at the site avoid or minimize potential adverse environmental impacts.

1.1 FIELD ACTIVITIES INVOLVING ENVIRONMENTAL RESOURCES

The EE/CA site characterization field investigation is designed to identify and remove/dispose ordnance, including fragments, at 216 EE/CA sampling sites within the boundaries of the former CCATF. The current plan includes detailed field investigations at defined CCATF areas of potential impact where public activities may occur, and where sensitive natural and historic environments may exist.

1.1.1 VEGETATIVE SPECIES REMOVAL

1.1.1.1 The EE/CA field investigation will include brush clearing involving perennial species (3 inches in diameter or smaller). This action is required to operate and maneuver field equipment which will be used to conduct geophysical surveys. Specific field sampling sites will be reviewed with the State Historic Preservation Officer (SHPO) and representatives of State of South Carolina, Department of Parks, Recreation and Tourism, to ensure that critical habitat and known cultural resources are avoided. A botanist and/or biologist familiar with the species found in Croft State Park will be onsite to assist in the identification of protected species prior to any tree cutting.

1.1.1.2 If any larger specimens (trees) are determined to impact the investigation, ESE will advise USACE and SCDPRT. No further site action will be taken without full coordination and approval of USACE and SCDPRT.

1.1.2 SOIL DISPLACEMENT

During ordnance removal activities, soil may be displaced by intrusive excavation of small areas (typically 2-ft by 2-ft or less).

1.1.2.1 This Work Plan will be reviewed by the South Carolina SHPO prior to conducting any intrusive excavation procedures at any CCATF sampling site. Where request is made by the agency, an agency official will be allowed to visit sampling sites with the field investigation team, and to indicate where excavation may not be permitted without prior agency approval. Any sites identified as potential preservation sites will be staked in the field and alternative sampling sites will be investigated in the immediate area under the same property ownership. If alternative sampling sites cannot be located by this method, coordination with the SHPO will be completed to determine conditions under which intrusive excavation can be completed.

1.1.2.2 All excavations will be restored by backfilling with the displaced soil. Each site will be regraded to its former condition so that local drainage is not modified. Backfilling and regrading will be accomplished manually with shovels and rakes.

1.1.3 STREAMBED SEDIMENT DISTURBANCE

Sampling activities will not be performed in streambeds or stream banks.

1.2 KNOWN SENSITIVE ENVIRONMENTAL RESOURCES

Numerous streams, ponds, wetlands, and bottomland hardwood forests occur throughout the site. A large (117 acre) lake is also present on site and is terminus for several of the streams and is directly associated with wetlands and bottomland forests. Preservation of these communities will be accomplished by avoiding intrusive assessment methods.

1.2.1 ENDANGERED ANIMAL SPECIES HABITAT

Wildlife species of concern known to occur or having potential for occurrence at or near the site are presented in Table G-1. These data reflect the most recent United States Fish and Wildlife Service (USFWS) listing. Species listings for Spartanburg County and the state are included in Attachment A. Both lists were confirmed current by the Natural Heritage coordinator for South Carolina. Verification of the lists was performed verbally during a phone conversation on September 14, 1994.

1.2.2 ENDANGERED PLANT HABITAT

Plant species of concern known to occur or having potential for occurrence at or near the site are presented in Table G-2. These data reflect the most recent USFWS listing. Species listings for Spartanburg County and the state are included in Attachment A. Both lists were confirmed current by the Natural Heritage coordinator for South Carolina. Verification of the lists was performed verbally during a phone conversation on September 14, 1994. Helianthus laevigatus and Carex gracilescens are mentioned in the Croft State Park Management Plan as confirmed sightings and are listed in the plan as threatened or endangered. Helianthus laevigatus is listed on the Spartanburg County list provided by Natural Heritage, but its legal status is undetermined. Carex gracilescens is not currently on the county list, but it is on the current state list; however, its status is undetermined. Currently, federal, state, and county lists do not qualify Carex gracilescens as threatened or endangered. Neither of these two species appeared on the USFWS lists.

1.2.3 ARCHAEOLOGICAL RESOURCES

1.2.3.1 Information provided in the Croft State Park Management Plan (South Carolina Department of Parks, Recreation, and Tourism, Division of State Parks, 1989) provides detailed accounts of the archaeological resources present throughout this site. Homesites, foundations, road and agricultural remnants, artifacts, and natural history landmarks of historical significance can be found in

Table G-1. Endangered and Threatened Wildlife (50 CFR 17.11 & 17.12, July 15, 1991)

Species		Historic Range	Status
Common name	Scientific name		
Bat, gray	Myotis grisescens	Southeastern US	E
Cougar, eastern	Felis concolor couguar	Eastern North America	E
Panther, Florida	Felis concolor coryi	USA (LA & AR east to SC & FL)	E
Crane, whooping	Grus americana	USA (Rocky Mtns east to Carolinas)	E
Eagle, bald	Haliaeetus leucocephalus	N. America south to N. Mexico	E
Falcon, peregrine	Falco peregrinus	Worldwide	E
Pelican, brown	Pelecanus occidentalis	USA (Carolinas to TX)	E
Plover, piping	Charadrius melodus	USA (Atlantic & Gulf coasts)	E
Stork, wood	Mycteria americana	USA (TX to Carolinas)	E
Tern, least	Sterna antillarum	USA (Atlantic & Gulf coasts)	E
Tern, roseate	Sterna dougallii dougallii	Coasts of Atlantic Basin	E
Woodpecker, ivory-billed	Campephilus principalis	USA (southeastern)	E
Woodpecker, red-cockaded	Picoides (=Dendrocopos) borealis	USA (southeastern)	E
Alligator, american	Alligator mississippiensis	Southeastern USA	E
Snake, eastern indigo	Drymarchon corais couperi	USA (SC)	T
Tortoise, gopher	Gopherus polphemus	USA (SC)	T
Beetle, American burying (=Giant carrion beetle)	Nicrophorus americanus	USA (Eastern states south to FL)	E

Source: ESE.

Table G-2. Endangered and Threatened Plants (50 CFR 17.11 & 17.12, July 15, 1991)

Species		Historic Range	Status
Common name	Scientific name		
Bunched arrowhead	Sagittaria fasciculata	USA (NC, SC)	E
Michaux's sumac	Rhus michauxii	USA (NC, SC, GA)	E
Canby's dropwort	Oxypolis canbyi	USA (MD, SC, NC)	E
Harperella	Ptilimnium nodosum	USA (AL, GA, SC, NC)	E
Dwarf-flowered heartleaf	Hexastylis naniflora	USA (NC, SC)	T
Schweinitz's sunflower	Helianthus schweintzii	USA (NC, SC)	E
Black-spored quillwort	Isoetes malanospora	USA (GA, SC)	E
Pondberry	Lindera melissifolia	USA (AL, FL, NC, SC)	T
Swamp pink	Helonias bullata	USA (GA, MD, NC, SC)	T
Relict trillium	Trillium reliquum	USA (AL, GA, SC)	E
Small whorled pogonia	Isotria medeoloides	USA (DC, DE, GA, SC)	E
Rough-leaved loosestrife	Lysimachia asperulaefolia	USA (NC, SC)	E
Mountain sweet pitcher-plant	Sarracenia rubra ssp. jonesii	USA (NC, SC)	E
Miccosukee gooseberry	Ribes echinellum	USA (FL, SC)	T
Little amphianthus	Amphianthus pusillus	USA (AL, GA, SC)	T
Treefrog, pine barrens	Hyla andersonii	USA (FL, AL, NC, SC)	E

Source: ESE.

abundance. Sampling activities will not be conducted in known or suspected archaeological sites.

1.3 POTENTIAL ENVIRONMENTAL RESOURCE IMPACTS

The primary potential environmental resources impacts of the Camp Croft site characterization field investigation will result from limited vegetative clearing and ordnance excavation activities. Procedures outlined in this plan will be strictly followed to avoid violation of any state or local environmental statutes or regulations, or unnecessary disturbance of natural habitats.

1.4 REQUIRED MITIGATION PROCEDURES

Camp Croft field investigation activities have been developed to avoid impacts to sensitive resources. For this reason, extensive mitigation is not anticipated. However, the following general mitigation procedures will be followed during all field activities:

1. Impacts to sensitive species will be minimized during the field investigation activities by avoiding known or suspected sensitive wildlife habitats identified during preliminary site assessment tasks.
2. Areas that receive brush clearing treatment will be allowed to revegetate naturally after field survey activities are completed. Ordnance excavation activities will not disturb local drainage patterns.
3. Wetland impacts will be minimized by avoiding work in mapped wetlands and wetlands identified during the site selection process.
4. Field team members will be required to meet with Croft State Park biologists prior to initiating the study to receive onsite education and guidance regarding environmental resources to be protected.
5. If major mitigation is required, it will be accomplished by USACE, Charleston District.