
**Final Engineering Evaluation/Cost Analysis
(EE/CA) Action
Memorandum Former Camp Croft
Army Training Facility
Spartanburg, South Carolina**

DERP-FUDS Site No. 104SC001600

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

Prepared by:
QST Environmental Inc.
Gainesville, Florida

April 1998

QST Project No. 3195165G



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Letter of Transmittal

To: Zapata Engineering, Inc. Date: May 8, 1998
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Project Number 3195165G-0600-3100

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List of Acronyms and Abbreviations

AOI	Areas of Interest
ARAR	applicable or relevant and appropriate requirement
ASR	Archive Search Report
CCATF	Camp Croft Army Training Facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
DERP	Defense Environmental Restoration Program
EE/CA	Engineering Evaluation and Cost Analysis
DoD	Department of Defense
ft	foot
FUDS	Formerly Used Defense Site
HFA	Human Factors Applications, Inc.
INPR	Inventory Project Report
NCP	National Oil and Hazardous Substances Contingency Plan
NFA	No Further Action
NGVD	National Geodetic Vertical Datum
NPL	National Priorities List
NTCRA	non-time critical removal action
OE	ordnance and explosives
OOU	ordnance operable unit
ORS	ordnance-related scrap
QST	QST Environmental Inc.
RAC	risk assessment code
ROE	Right of Entry
SASR	Supplemental Archive Search Report
TCRA	time critical removal action
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering Support Center, Huntsville
USC	United States Code
UXO	Unexploded Explosive Ordnance

**FINAL ENGINEERING EVALUATION/COST ANALYSIS (EE/CA)
ACTION MEMORANDUM
FORMER CAMP CROFT ARMY TRAINING FACILITY
SPARTANBURG, SOUTH CAROLINA**

The following document, Former Camp Croft Army Training Facility EE/CA Action Memorandum, was prepared and reviewed by the following persons, technically qualified to perform the work:

Robert Momberger, P.G., Project Manager
David Moccia, P.E., Project Director
Richard Wheeler, P.E., Project Engineer

PROFESSIONAL ENGINEER'S CERTIFICATION

This is to certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. In my professional judgment, and based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and technically complete.

NAME: David Moccia, P.E.

DATE: April 14, 1998

(Affix Seal)



1.0 Purpose

This document presents the determination of the risk-reduction actions that are recommended at the former Camp Croft Army Training Facility (CCATF) for the Phase II Engineering Evaluation and Cost Analysis (EE/CA). This determination was developed under the Defense Environmental Restoration Program (DERP), [10 United States Code (USC) 2701], and in general accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, 42 USC Section 9601 *et seq.*, and the National Oil and Hazardous Substances Contingency Plan (NCP), [40 Code of Federal Regulations (CFR) Part 300]. The selected actions are supported by documents contained in the administrative record established for this site.

2.0 Site Conditions and Background

2.1 Facility Description and History

2.1.1 Camp Croft Facility Description

The former CCATF covers approximately 19,000 acres and lies south of Spartanburg in Spartanburg County, South Carolina. Figure 2-1 shows the location and boundary of the former CCATF.

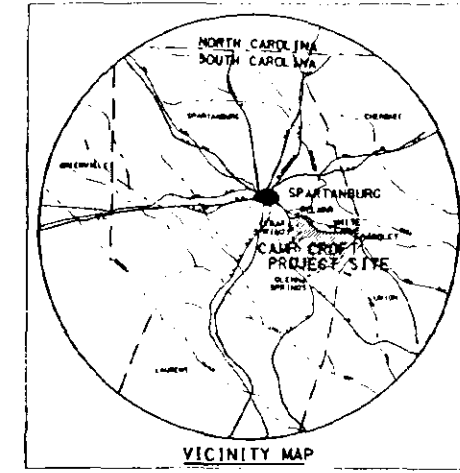
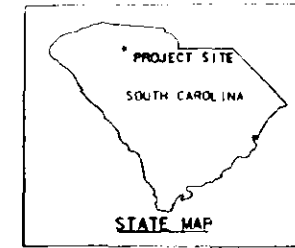
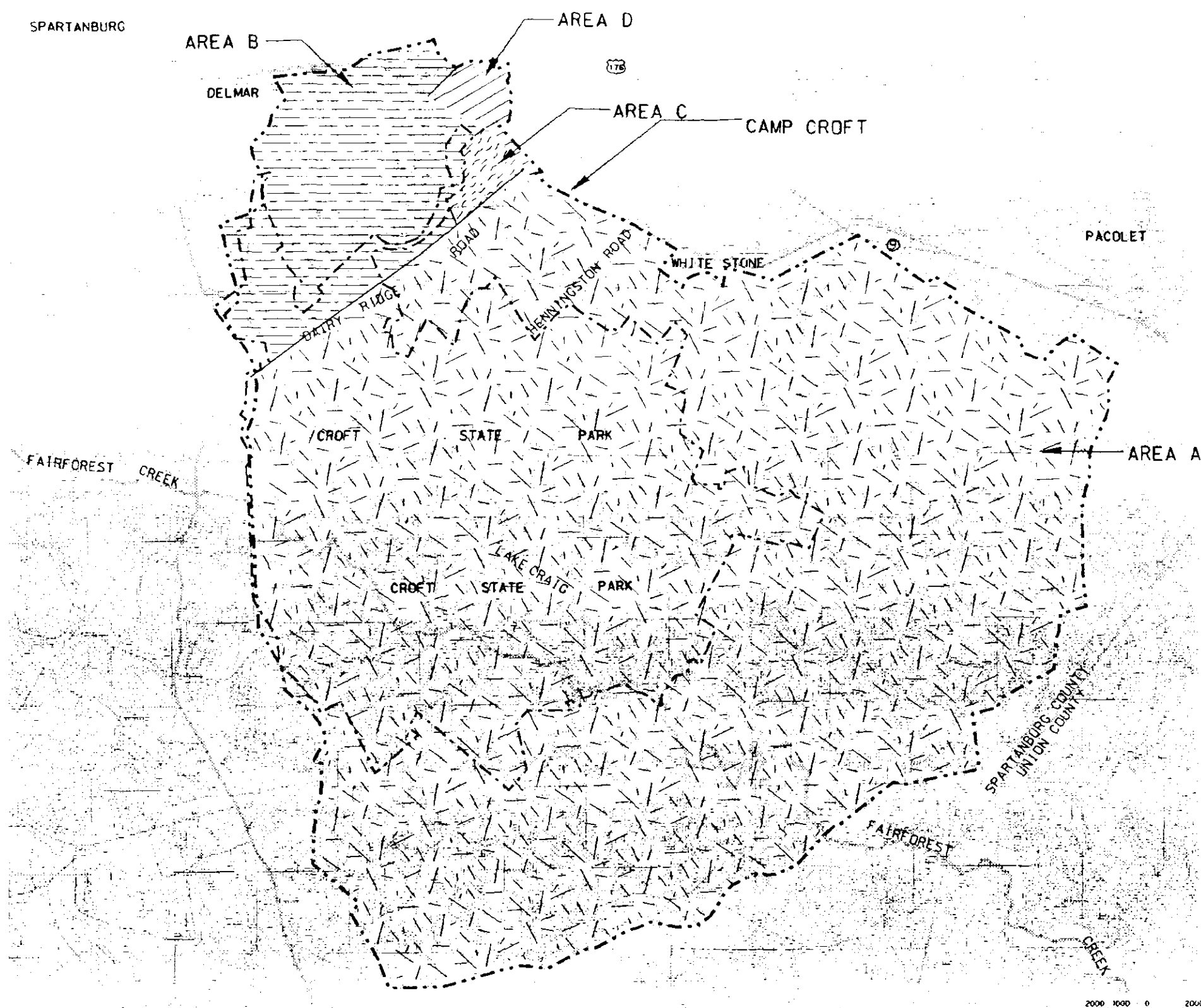
2.1.2 General Military History

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 (16,929 acres); and a troop housing (cantonment) area with attached administrative quarters (1,742 acres). The firing ranges at the former CCATF consisted of pistol, rifle, machine gun, mortar, anti-aircraft, and anti-tank ranges. Ordnance and explosives/unexploded explosives ordnance (OE/UXO) that may be encountered at the former CCATF include: .30-caliber (cal) and .50-cal small arms rounds; 20-mm hand and rifle smoke, tear gas, and incendiary grenades; 60- and 81-mm high explosive (HE) 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 (199 acres) where realistic chemical warfare training was conducted, and a practice grenade court (175 acres). The training range impact area (Area A), cantonment (Area B), grenade court (Area C), and gas chambers and gas obstacle course (Area D) locations are shown in Figure 2-1.

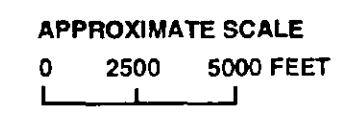
2.1.2.1 In 1947, the entire acreage of the former CCATF was declared surplus by the War Assets Administration. By 1950, the Army sold the land in pieces to organizations and businesses. This sale also included the transfer of 7,088 acres of land to the South Carolina Commission of Forestry for the creation of 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 evidence of past chemical training is found at the site.

2.1.3 EE/CA Investigation Areas

Much of the former CCATF has been considered potentially contaminated with OE because incomplete record keeping and limited availability of archive data has not been sufficient to eliminate areas from further investigation. The main areas of EE/CA investigations have been in the former training range impact area. Additional areas were investigated in the former cantonment area and the practice grenade court area. The gas chamber/gas obstacle course no longer exists and no historical recorded evidence was located to document and confirm the presence of chemical warfare material (CWM) or OE since site closure [ASR, U.S. Army Corps of Engineers (USACE), 1994]. One hundred-thirty sampling grids were investigated by QST during the January through March 1997 Phase II EE/CA investigation at former



- LEGEND**
- : CAMP CROFT BOUNDARY
 - : CROFT STATE PARK BOUNDARY
 - Ⓡ Ⓢ : INTERSTATE, STATE HIGHWAY
 - AREA A : TRAINING RANGE IMPACT AREA
 - AREA B : CANTONMENT AREA
 - AREA C : GRENADE COURT
 - AREA D : GAS CHAMBERS AND GAS OBSTACLE COURSE AREA



**Figure 2-1
FORMER CCATF TRAINING AREAS**

SOURCE: QST.

**FORMER CAMP CROFT ARMY
TRAINING FACILITY
SPARTANBURG, SC**

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CCATF. Forty-nine grids were sampled in Croft State Park. Eighty-one grids were sampled in privately owned areas. Although some areas were developed (with homesites), most private properties investigated were undeveloped.

2.1.3.1 Croft State Park Area Phase II EE/CA Investigations

Croft State Park consists of approximately 7,000 acres or one-third of the former CCATF total of 19,000 acres. The previous Phase I EE/CA investigations in the park centered around the high use areas (camping grounds, the equestrian area, hiking and horse trails). The number of park visitors, which averaged approximately 155,000 a year between 1992 to 1995, was reduced to 54,000 in 1996 (according to Croft State Park Ranger, March 1997). The closure of park areas for the Phase I EE/CA investigations was the primary cause for the reduction of visitors in 1996. The majority of the 1997 Phase II EE/CA sampling grids were in more remote areas of the park.

2.1.3.2 Private Property Phase II EE/CA Investigations

Approximately 12,000 acres, or two-thirds of the former CCATF, is privately owned. The former cantonment area is now primarily housing developments, small businesses, and a golf course. The majority of the former training range impact area (to the south, southeast, and east of the park) is wooded and undeveloped, with some homesites. Right-of-entries (ROEs) were not received for some sites which therefore could not be investigated.

2.1.4 Special Environmental Requirements

The region within the boundaries of the former CCATF includes Croft State Park. The park contains known sensitive environmental resources such as endangered plant species. QST closely coordinated site activities with park personnel and employed a local botanist to visit each grid area. No endangered or threatened plant species were found on any of the investigated grid sites. Many endangered or threatened plant and animal species may inhabit the Spartanburg County, South Carolina region.

2.1.4.1 The only known area of archeological significance at the former CCATF site is the soapstone quarry, located east of Highway 56 in Croft State Park. The soapstone quarry is located within the boundary of ordnance operable unit (OOU) 10A.

2.1.5 Physical Location

To facilitate the evaluation of risk-reduction alternatives for the Phase II EE/CA, four additional OOs (OOU9 through OOU12) were identified based on the similarity of previous site activity, type of land ownership (private or public), and remedial requirements. Each of the four OOs were subdivided into sectors based on their geographical locations (see Figure 2-2).

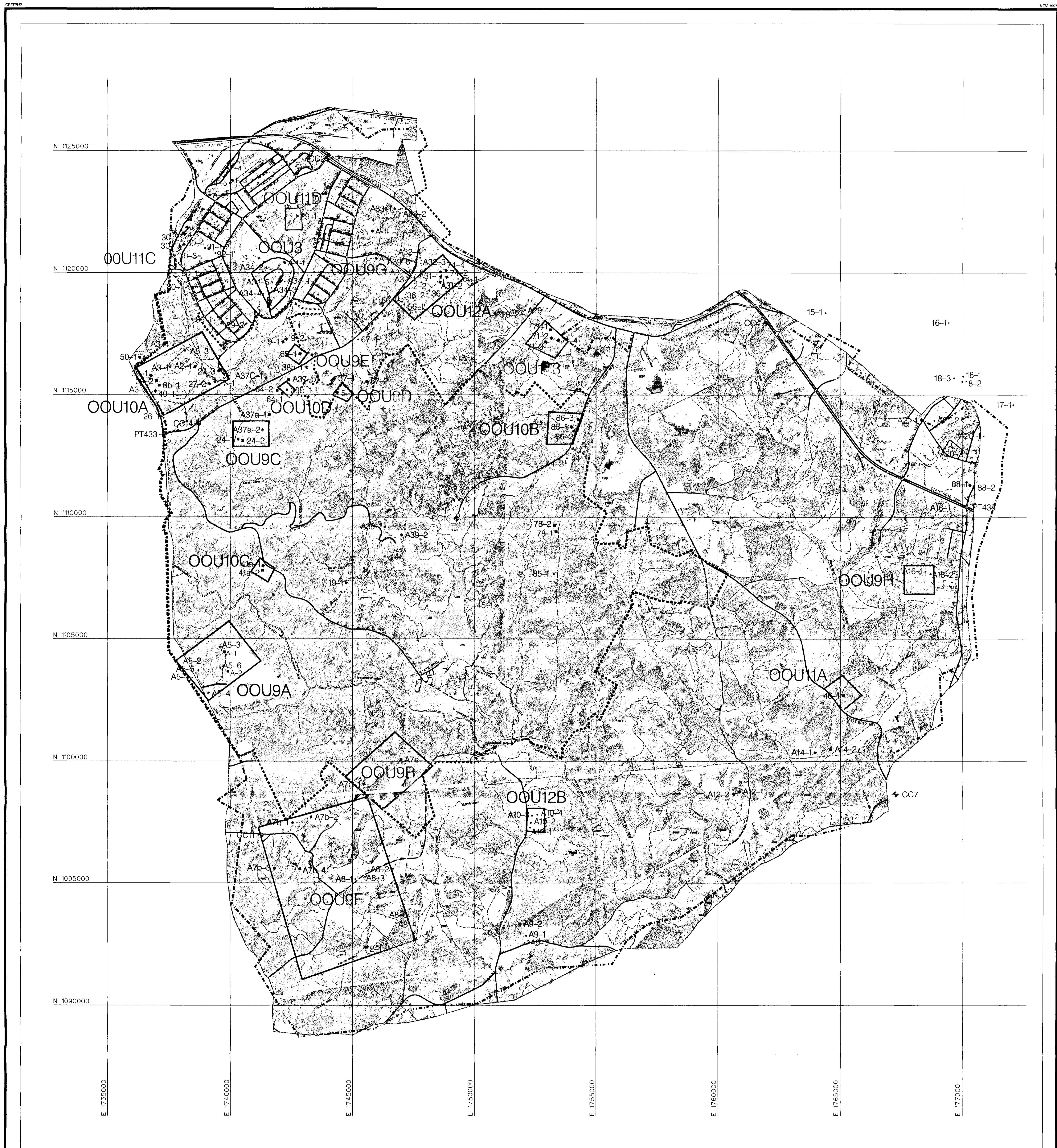


Figure 2-2
 OOU LOCATIONS PHASE II EECA INVESTIGATION
 SOURCE: GST 1997, USGS 1983

LEGEND

	APPROXIMATE BOUNDARY OF FORMER CAMP CROFT AREA		CONTROL POINT
	BOUNDARY OF CROFT STATE PARK		50 x 50 FOOT SURVEY GRID
	ROADS		100 x 100 FOOT SURVEY GRID
	STREAMS		HFA SURVEY GRID
	ORDNANCE OPERABLE UNITS		SURVEY MONUMENT

NOTE: COORDINATES ARE STATE PLANE IN FEET.

0 500 1000
 METERS

0 1500 3000
 FEET

SCALE: 1" = 1500'

N

FORMER CAMP CROFT ARMY
 TRAINING FACILITY
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- OOU9 (A through H) - Small Arms Area
- OOU10 (A, B, C and D) - Grenade and Mortar Areas Within Croft State Park
- OOU11 (A, B, C and D) - Grenade and Mortar Areas Outside Croft State Park
- OOU12 (A and B) - UXO Areas Outside Croft State Park

2.1.5.1 The Phase I EE/CA OOU3 Area was investigated further during the Phase II EE/CA. OOU3, known as the Wedgewood Subdivision, is located within the former CCATF Cantonment Area (see Figure 2-2).

2.1.6 Exposure to Contamination

No known hazardous substances as defined by section 101(14) of CERCLA are known to exist at the site. The substances of critical concern at the site include high explosives that may be contained in the warheads of rockets and various incendiary substances that may be found in practice bombs. These substances are relatively stable and unlikely to migrate any substantial distance from the warhead casing or from the bodies of the practice bombs.

2.1.6.0.1 The primary hazard associated with ordnance is from the accidental detonation of the item rather than any potential toxic effect of the explosive or incendiary substances. Exposure of the public or the environment to ordnance items occurs by unearthing the item either by natural forces or manual excavation by human activities. Once uncovered, contact with the explosive item may cause detonation.

2.1.6.1 OOU3 - Wedgewood Subdivision

OOU3 was previously investigated as part of the Camp Croft Phase I EE/CA investigation. This OOU was revisited during the Phase II investigation to determine if additional areas within the Wedgewood Subdivision may require clearance. The OOU3 investigation area included selective locations within the approximately 46 acres that comprise the entire Wedgewood Subdivision. OOU3 is located in an area that was formerly used as a practice grenade range. The field team identified 2.36-inch rocket fragments on the northwest side of the investigation area (adjacent to the golf course). This may have been overshoot from another local firing range.

2.1.6.1.1 Human Factors Applications Inc. (HFA), performed a non-time critical removal action (NTCRA) in the OOU3 area that was delineated in QST's Camp Croft Phase I EE/CA report (ESE, 1996a). During their investigation, HFA performed a complete clearance within the previous OOU3. A total of seven live Mk II Fragmentation Grenades were found during the NTCRA investigation. The total HFA investigation area was approximately 3.0 acres. The resulting ordnance density found by HFA is approximately 2.68 UXOs per acre.

2.1.6.2 OOU9 — Small Arms Areas

OOU9 comprises approximately 1,036 acres including 306 acres inside Croft State Park and 730 acres outside of Croft State Park. This OOU includes areas where only items from small arms fire were found during the Phase II EE/CA investigation. OOU9 is subdivided into eight sectors based on their physical location. Sectors A through E were located inside the park, Sectors F through G were located outside the park boundaries. All the sectors included in OOU9 are presented in Figure 2-2. Items found in OOU9 include 30 caliber cartridges, empty flare casings, M-1 clips, one 37-mm APT, M-1 Stripper Clip, and a grenade ring. The hazards associated with the items found are very low. All items found were less than 16 inches deep. Most items were found less than 8 inches deep.

2.1.6.3 OOU10 — Grenade, Mortar, and Rocket Scrap Found in Park

OOU10 includes 210 acres of Croft State Park where ordnance related scrap (ORS) was found during the Phase II EE/CA investigation. OOU10 is subdivided into four sectors based on their physical location (see Figure 2-2). Sector 10A includes approximately 157 acres in the northwest corner of the Croft State Park, Sector 10B includes approximately 37 acres in the northeast corner of Croft State Park. Sector 10C includes approximately 11 acres along the entrance road to the park on the east side of Croft State Park. Sector 10D includes 5 acres located near Dairy Ridge Road on the western side of the site. The property within OOU10 is administered by the South Carolina Parks Department.

2.1.6.3.1 The EE/CA sampling indicated that the entire OOU contains significant amounts of ORS. The ORS is indicative of high order detonations in most of the sampled grids. Practice rounds found during the investigation may also contain small charges that could create a hazard to someone finding the item and mishandling it. All fragments of ordnance items found were less than 20-inches deep with most items less than 1 ft deep. All sectors within OOU10 were within the park area. These areas were heavily forested. The undergrowth in these areas is not dense due to the thick canopy.

2.1.6.4 OOU11 — Grenade, Mortar, and Rocket Scrap Found Outside Park Area

OOU11 includes 87 acres outside of Croft State Park where ORS was found during the Phase II EE/CA investigation. OOU11 is subdivided into four sectors based on physical location (see Figure 2-2). Sector 11A includes approximately 25 acres west of Croft State Park on the west side of Whitestone Road. Sector 11B includes approximately 31 acres north of Croft State Park and southeast of the intersection between Route 295 and Henningston Road. Sector 11C includes approximately 17 acres northwest of Croft State Park on the east side of Kelsey Creek Road and northwest of the intersection of Cedar Springs Road and Huntington Drive. Sector 11D includes 14 acres on the Cotton Club Golf Course north of the Wedgewood Subdivision. OOU 11 is privately owned by local residents or commercially.

2.1.6.4.1 The EE/CA sampling indicated that the entire OOU11 contains significant amounts of ORS. The ORS is indicative of high order detonations in most of the sampled grids. Practice rounds found during the investigation may also contain small charges that could create a hazard to someone finding and mishandling the item. All fragments of ordnance items found were less than 20 inches deep with most items less than 1 ft deep.

2.1.6.4.2 As OOU11 is privately owned and undeveloped, with the exception of Sector 11D, it is estimated that less than 100 individuals per year will visit these properties. There are few recreational activities other than hiking, which occurs on these properties. There are approximately 25,000 visitors per year to the golf course.

2.1.6.5 OOU12 — UXO Areas Outside Park Area

OOU12 includes 94 acres outside of Croft State Park where live UXOs were found during the Phase II EE/CA investigation. OOU12 is subdivided into two sectors based on physical location (see Figure 2-2). Sector 12A, includes approximately 78 acres north of the Croft State Park on the southeast of the intersection between Dairy Ridge Road and State Route 295. Sector 12B includes approximately 16 acres located south of Croft State Park and west of Forest Mill Road.

2.1.6.5.1 The EE/CA sampling indicated that OOU12 contains significant amounts of UXO and ORS. The ORS and UXO is indicative of high order detonations in most of the sampled grids. Practice rounds found during the investigation may also contain small charges that could create a hazard to someone finding and mishandling the item. All fragments of ordnance items found were less than 21 inches deep at OOU 12A and at 4 inches deep at OOU12B. Most items were found less than 1-ft deep.

2.1.7 Site Status

Former CCATF is not included in the national priorities list (NPL) and is not recommended for inclusion due to the nature and extent of contamination. There are no sites on the NPL resulting from OE contamination.

2.1.7.1 The EPA Hazard Ranking System was not used during the screening process for this site. In its place, USACE used the Risk Assessment Procedure for Ordnance and Explosive Waste developed by USAESCH in accordance with MIL-STD 882C and AR 385-10. The risk assessment code (RAC) is used to prioritize actions at formerly used defense sites (FUDS). The procedure is primarily a screening tool used to determine which sites may require further study and evaluation. The OE risk assessment is based on best available information resulting from records searches, reports of Explosive Ordnance Disposal detachment actions, field observations, interviews, and measurements. However, it does not fully address the probability that the public will actually encounter and be injured by OE.

2.1.7.2 The RAC scores and recommended actions are summarized as follows:

- RAC 1 Imminent Hazard - Expedite Inventory Project Report (INPR) - immediately contact USAESCH,
- RAC 2 High priority on completion of INPR - recommend further action by USAESCH,
- RAC 3 Complete INPR - recommend further action by USAESCH,
- RAC 4 Complete INPR - recommend further action by USAESCH, and
- RAC 5 Recommend no further action.

2.1.7.3 The RAC score for former CCATF was evaluated by USACE, Charleston District. Former CCATF was assigned a hazard severity value of 45, corresponding to a "catastrophic" hazard severity. A hazard probability value of 27 was assigned, corresponding to a "frequent" hazard. Applying these scores, a RAC 1 (Imminent Hazard) was determined at the former CCATF. USAESCH concurred with the RAC evaluation.

2.2 Previous Actions to Date

The War Assets Administration inspected and decontaminated the CCATF property "to the extent deemed reasonably necessary and consistent with economic limitations" prior to the sale of the land to the public during the late 1940s.

2.2.1 1984 Site Survey of Former CCATF

In 1984, USACE-CD 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.

2.2.2 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.

2.2.3 1991 Preliminary Assessment

In 1991, USACE-CD conducted a Preliminary Assessment Study of this site. This study determined that the site was eligible for further investigation under 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.

2.2.4 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.

2.2.5 1995-1996 CCATF Phase I EE/CA

In 1995 and 1996, QST completed a Phase I 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 OOU's where OE/UXO was either previously confirmed or suspected. Six OOU's were within Croft State Park and the remaining three OOU's were private property sites located outside the park but within the former CCATF boundary.

2.2.5.1 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.

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

2.2.5.3 Phase I EE/CA recommendations were as follows:

- OOU1A No Further Action (NFA)
- OOU1B Surface Clearance
- OOU2 Surface Clearance
- OOU3 Clearance to Depth
- OOU4 NFA
- OOU5 NFA
- OOU6 Government Buyback (This recommendation was rejected and the government is pursuing a design effort to utilize a combination of NFA, surface clearance, and clearance to depth.)
- OOU7 Clearance to Depth
- OOU8 NFA

2.2.6 1995-1996 Evaluation and Mapping

In 1995 to 1996, QST performed orthophotography and geographic information system (GIS) 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 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.

2.2.6.1 This report presented the results of analyses for the former CCATF. The analyses focused on the characterization and prioritization of potential OE and included GIS, historical records evaluation, and the integration of synthetic aperture radar (SAR) data. SAR data were evaluated as a potential technological tool in OE detection.

2.2.6.2 The initial investigation focused on the identification of select areas of interest (AOI) and used historical and current information. These AOI formed the basis for subsequent evaluations and analyses. Aerial photography and orthophotography, SAR image analysis, and Digital Evaluation Models were used to identify potential OE sites and adjacent properties.

2.2.7 1996 Supplemental Archive Search Report (SASR)

In March 1995, USAESCH authorized QST to prepare an Supplemental Archive Search Report (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 DoD database-Defense Technical Information Center, 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 in June 1995; and
- Conducted windshield surveys or drive by surveys to locate possible OE sites.

2.2.7.1 As a result of the SASR (ESE, 1996c) submitted to USAESCH on March 1996, 134 sites were identified as having potential OE contamination: 95 sites were identified based on interviews and archive information and 39 additional areas were identified through the aerial photography, orthophotography, and SAR image analysis.

2.2.8 1996 Supplemental Engineering Report

In October and November 1995, QST performed a site reconnaissance of each of the 134 sites identified in the SASR, where a ROE was available from the owner(s) (ESE, 1996d). ROEs were available and a site reconnaissance was conducted at 97 of the 134 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 identifying OE and/or ordnance training sites. Windshield surveys or drive by visual surveys were conducted at 19 sites. QST was unable to conduct a site reconnaissance or windshield survey at 18 sites. A Final Supplemental Engineering Report was submitted to USAESCH in March 1996.

2.2.8.1 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 information, each site received the following rating as to the need for further or no further investigations:

- Twenty-six sites received a High-Priority rating.
- Twenty-eight sites received a Medium Priority rating.
- Thirty-four sites received the Low Priority rating.
- Forty-six sites received a No Further Reconnaissance rating.

2.3 Current Actions

A removal action (clearance for use) is currently ongoing at the Phase I EE/CA OOU6 site. There are no ongoing removal actions at the Phase II OOU's.

2.3.1 During the Phase II EE/CA investigation, USACE Charleston District has supervised community awareness activities, including the following:

- A public meeting held during the SASR interview process, and
- A public hearing held to receive public comments on the draft-final Phase II EE/CA.

2.3.2 Proposed actions represent a continuation and enhancement of current actions.

2.4 Role of State and Local Authorities

2.4.1 State and Local Actions to Date

All of the removal actions performed to date have been initiated and completed by the U.S. Government. While local authorities have been involved in responses to past discoveries of OE at the site, neither the state nor local governments have undertaken any formal action to assess the extent of ordnance contamination. Local authorities have been made aware of the nature of the contamination.

2.4.1.1 The state and local authorities have cooperated with USACE, Charleston and USAESCH during this investigation, providing valuable local and historical information and guidance on conducting investigations and removal actions with minimal disruption to the environment. The South Carolina School for the Deaf and Blind assisted USACE, Charleston by providing rooms for the public meetings to inform the public of OE hazards and solicit community input on removal alternatives.

2.4.2 Potential for Continued State/Local Response

USACE expects the continued support of state, county, and city agencies to implement the recommended alternative. Implementing the recommended alternative would require agencies to maintain informational signs, provided by USACE, Charleston and USAESCH.

2.4.2.1 Affected agencies were provided with copies of the draft-final EE/CA.

2.4.2.2 One of the major roles of state and local authorities is to identify applicable or relevant and appropriate requirements (ARARs). A list of ARARs is included in Table 3-3 of the Final Phase II EE/CA report. USACE, Charleston and USAESCH expects the state and local agencies to confirm, clarify, and elaborate on the list provided, if necessary.

3.0 Threats to Public Health, Welfare, or the Environment

3.1 Threats to Public Health or Welfare

The primary hazard associated with ordnance is from the accidental detonation of the item rather than any potential toxic effect of the explosive or incendiary substances. Public or environment exposure to ordnance items occurs by unearthing the item either by natural forces or excavation by human activities. Once uncovered, contact with the explosive item could cause detonation.

3.1.1 Significant quantities of OE are likely to be present within portions of the former CCATF. Most remaining OE is subsurface. Although there is some potential for exposure to surface OE, the primary threat to public health or welfare would occur as the result of intrusive human activities.

3.2 Threats to the Environment

OE that may be present at the site presents no threat to the environment as long as the OE item remains undisturbed. Damage to protected plant and animal species and to wetland habitats could occur during excavation to remove the item or to detonate the item in place. During the EE/CA investigation, no endangered or threatened plant species were found on any of the investigated grid sites. However, Croft State Park (located within the boundaries of the former CCATF) contains known sensitive environmental resources such as endangered plant species. Many endangered or threatened plant and animal species may inhabit the Spartanburg County, South Carolina Region. Close coordination with all applicable agencies must be maintained during the planning and execution of any excavation in areas where these species may be found to minimize the potential for damage to the environment.

4.0 Endangerment Determination

The presence of OE at this site presents an imminent and substantial endangerment to public health and welfare. The response action selected in this Action Memorandum is required to reduce/manage the risk to the public.

5.0 Proposed Actions and Estimated Costs

This EE/CA addresses five areas where OE/UXO was either previously confirmed or suspected within the CCATF (a FUDS). These areas, defined as OOU's, were evaluated to determine the risk presented by ordnance that may remain after facility closure. These OOU's were as follows:

- OOU3 - Expansion of 1996 EE/CA OOU3 Area, Wedgewood Subdivision (private residential property north of the park)
- OOU9 (A through H) - Small Arms Areas
- OOU10 (A, B, C, and D) - Grenade and Mortar Areas Within Park
- OOU11 (A, B, C, and D) - Grenade and Mortar Areas Outside Park
- OOU12 (A and B) - UXO Areas Outside Park

5.0.1 Figure 2-2 shows the location of these OOU's.

5.0.2 This EE/CA was the second EE/CA (designated as the Phase II EE/CA) performed by QST at the former CCATF. The Phase I EE/CA report was completed in January 1996. OOU3 was the only Phase I EE/CA site that was revisited during Phase II.

5.0.3 Description of Risk-Reduction Alternatives

Alternatives to reduce the risk of public exposure were considered for each OOU. Alternatives included in the EE/CA process were as follows:

- Alternative 1 — No Further Action,
- Alternative 2 — Institutional Controls,
- Alternative 3 — Surface Clearance, and
- Alternative 4 — Clearance For Use.

5.0.3.1 The *No Further Action* alternative would mean that no action will be implemented to reduce risk of public exposure. *Institutional Controls* is a limited action alternative that uses public information and land use restrictions to minimize public exposure to OE. *Surface Clearance* would involve performing a visual survey of the surface and removal of OE from the ground surface, near surface, or any OE that is partially buried. *Clearance for use* would involve all activities necessary to fully locate, excavate, and remove OE to a depth conducive with the expected land use, public access, and overall health and safety of the affected community.

5.1 Proposed Risk-Reduction Alternative

5.1.1 Proposed Risk-Reduction Alternatives Description and Selection Rationale

5.1.1.1 OOU3 — Expansion of 1996 EE/CA OOU3 Area

As also recommended in the Phase I EE/CA Report (ESE, 1996a), Alternative 4, Clearance for Use, is the recommended alternative for the expanded OOU3, based on the following rationale:

- OOU3 is primarily a moderately to densely populated residential development.
- ORS items were detected during the EE/CA Phase I and II investigations.
- Future construction may unearth subsurface UXO.
- Alternative 4 reduces the likelihood that members of the public would encounter OE.
- Alternative 4 is administratively feasible.
- Implementing Alternative 4 would meet the clearance to depth requirements of the various land uses.
- Alternative 4 is technically feasible.
- Only properties where the landowner provides right-of-entry will be investigated.

5.1.1.2 OOU9 — Small Arms Areas (A through H)

Alternative 1, No Further Action, is the recommended alternative for OOU9. This alternative was selected based on the following rationale:

- The OE-related materials found were small arms scrap in small quantities.
- UXO items were not detected at the OOU9 during the EE/CA investigation.
- Alternative 1 would likely receive community acceptance.
- Alternative 1 is administratively feasible.
- Implementing Alternative 1 would cause no inconvenience to the community and no risk to workers.
- Alternative 1 is technically feasible.

5.1.1.3 OOU10 (A, B, C, and D) - Grenade and Mortar Areas Within Park

Alternative 3, Surface Clearance, is recommended for the OOU10 grenade and mortar areas within the park. This alternative was selected based on the following rationale:

- OOU10 is a state-owned property and intrusive activities can be controlled.
- Significant amounts of ORS were collected from OOU10 during the EE/CA investigation.
- The presence of OE is likely in the impact areas.
- Alternative 3 reduces the likelihood that members of the public would encounter OE.
- Alternative 3 is technically feasible, although clearance of heavy brush in some areas will make implementation difficult.

- Alternative 3 is administratively feasible, although it will require close coordination with park officials.
- Because OOU10 is owned by the State of South Carolina, Alternative 3 would be implementable and the ROEs would be obtainable on the entire OOU.
- Because OOU10 is an established Croft State Park, future construction will be minimal and construction can be controlled.

5.1.1.4 OOU11 (A, B, C, and D) - Grenade and Mortar Areas Outside Park

Alternative 4, Clearance for Use, is the recommended alternative for OOU11. This alternative was selected based on the following rationale:

- Alternative 4 is the most effective alternative for overall protection to public health and the environment.
- Alternative 4 is effective and permanent for all activities above clearance depth.
- During the EE/CA field investigation, ORS items indicative of high order detonations and possible risk were discovered.
- Alternative 4 is technically feasible, although clearance of heavy brush will make implementation difficult in some areas.
- Alternative 4 would probably have local government acceptance.
- The community would favorably view the risk-reduction of Alternative 4.
- Alternative 4 would reduce the likelihood that members of the public would encounter OE.
- OOU11 is privately owned and there is no control over future intrusive activities.

5.1.1.4.1 In OOU11D, no clearance is needed on the portions of the golf course that have been previously developed (e.g., greens, fairways, sand traps). This acreage is not included in these recommendations.

5.1.1.5 OOU12 (A and B) - UXO Areas Outside Park

Alternative 4, Clearance for Use, is the recommended alternative for OOU12. This alternative was selected based on the following rationale:

- Alternative 4 offers the most effective overall protection to public health and the environment.
- UXO and ORS items indicative of high order detonations and possible risk were detected at OOU12A and OOU12B during the EE/CA investigation.
- Alternative 4 reduces the likelihood that members of the public would encounter OE.
- Alternative 4 is effective and permanent for all activities above clearance depth.
- Alternative 4 is technically feasible, although clearance of heavy brush will make implementation difficult in some areas.
- Alternative 4 would probably have local government acceptance.
- The community would favorably view the risk-reduction of Alternative 4.

5.1.2 EE/CA

An EE/CA has been performed and has been included in the Administrative Record for this project. Copies of the draft document were placed on file at a repository established at the Spartanburg County Public Library in Spartanburg, South Carolina for the public to review existing project documentation. This repository contains documentation for the project so the public can stay informed of the investigation and the response actions proposed for the former range. During public presentations, the public was encouraged to visit the repository and examine the records placed on file at that location. During the public comment period, a public meeting was held to allow the public an opportunity to ask questions or comment on any aspect of the project.

5.1.3 Applicable or Relevant and Appropriate Requirements (ARARs)

5.1.3.1 Assessment of ARARs

ARARs are "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, response action, location, or other circumstance found at a CERCLA site" 40 CFR 300.5.

5.1.3.1.1 ARAR selection depends on the hazardous substances present at the site, site characteristics and location, and the specific actions selected for a remedy. Therefore, these requirements may be chemical-, location-, or action-specific. Chemical-specific ARARs are health- or risk-based concentration limits set for specific hazardous substances, pollutants, or contaminants. Location-specific ARARs address circumstances such as the presence of endangered species on the site or the location of the site within a 100-year floodplain. Action-specific ARARs control or restrict particular types of response actions selected as alternatives for implementing risk-reduction alternatives.

5.1.3.1.2 There are no chemical-specific ARARs applicable for implementing risk-reduction alternatives at sites contaminated with OE. Location- and action-specific ARARs potentially applicable for implementing the alternatives at the former CCATF are presented in Table 3-3 of the Final EE/CA Report.

5.1.4 Project Schedule

Implementing the recommended risk-reduction alternative should proceed as soon as funds can be allocated. No significant obstacles to the full implementation of the alternatives currently exist or are expected in the future.

5.2 Estimated Costs

Alternative 4, Clearance for Use, was selected as the recommended risk-reduction alternative for OOU3 (Expansion of 1996 EE/CA OOU3 Area). The estimated cost to implement this alternative is approximately \$3,000,000. This cost is due to the large number of anomalies found during the EE/CA investigation. The cost is also greater than expected due to the use of the blast boxes for engineering controls. A 10-percent increase to the cost is assumed based on the results of the EE/CA field investigations.

5.2.1 Alternative 1, No Further Action was selected as the recommended risk-reduction alternative for OOU9 (A through H), Small Arms Area. There is no cost associated with implementing this alternative.

5.2.2 Alternative 3, Surface Clearance, was selected as the recommended risk-reduction alternative for OOU10 (A, B, C, and D), grenade and mortar areas within the park. The estimated cost to implement this alternative is \$745,000.

5.2.3 Alternative 4, Clearance For Use, was selected as the recommended risk-reduction alternative for OOU11 (A, B, C, and D), grenade and mortar areas outside the park. The estimated cost to implement this alternative is approximately \$700,000.

5.2.4 Alternative 4, Clearance For Use, was selected as the recommended risk-reduction alternative for OOU12 (A and B) areas outside the park. The estimated cost to implement this alternative is approximately \$2,600,000.

6.0 Expected Change in the Situation Should Action Be Delayed or Not Taken

Delay in informing the public of the risks associated with contact with OE at the site may result in accidental detonation of an ordnance item that may be found by a resident or visitor to the area.

7.0 Outstanding Policy Issues

No outstanding policy issues have been developed.

8.0 Enforcement

Not applicable.

9.0 Recommendation

This decision document represents the selected risk-reduction alternatives for the former Camp Croft Army Training Facility, Spartanburg County, South Carolina. The chosen risk-reduction alternatives have been developed in general conformance with CERCLA as amended and is consistent with the NCP. This decision is based on the administrative record for the site.

9.0.1 Conditions at the site meet the NCP section 300.415(b)(2) criteria for implementing risk-reduction alternatives and approval of the proposed alternative is recommended.

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Lt. Colonel, U.S. Army
District Engineer

Date

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