FINAL

EASTERN BYPASS ENGINEERING EVALUATION/COST ANALYSIS (EE/CA) AT FORT McCLELLAN

FORT McCLELLAN, ALABAMA

Contract No. DACA87-95-D-0026
Task Order Annex E
Delivery Order No. 0004

April 2000

Prepared for:

US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE

by:

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Acronym and Abbreviation List

ADEM	Alabama Department of Environmental Management
A/E	Architecture/Engineering
ALDOT	Alabama Department of Transportation
ARAR	Applicable or Relevant and Appropriate Requirements
ASR	Archives Search Report
BCT	BRAC Cleanup Team
BIP	Blow-In-Place
BRAC	Base Realignment and Closure
CADD	Computer-Assisted Drafting and Design
cal	Caliber
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CESAM	US Army Engineering District, Mobile
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CWM	Chemical Warfare Materiel
DANS	Data Acquisition and Navigation System
DDESB	Department of Defense Explosives Safety Board
DoD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
EA	Environmental Assessment
EC	Engineering Control
EE/CA	Engineering Evaluation/Cost Analysis
EIC	Engineer-in-Charge
EM	Electromagnetic
EM-61	Geonics Model 61 Electromagnetic Induction Sensor
EOD	Explosive Ordnance Disposal
EPA	US Environmental Protection Agency
ERP	Emergency Response Plan
EZ	Exclusion Zone
FM	Field Manual
ft	foot or feet
FUDS	Formerly Used Defense Site
G-858	Geometrics Model 858 Cesium Vapor Magnetometer

GPO	Geophysical Prove-out
GPS	Global Positioning System
HE	High Explosive
IAW	In Accordance With
IC	Institutional Control
JPA	Joint Powers Authority
lbs	Pounds
m	Meters
mm	Millimeters
MOFB	Miniature Open-Front Barricade ("Bud Light")
MTV	Mobility, Toxicity, Volume
NAD83	1983 North American Datum
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDAI	No DoD Action Indicated
NGVD	National Geodetic Vertical Datum
NTCRA	Non-Time Critical Removal Action
OE	Ordnance and Explosives
OOU	Ordnance Operable Unit
ORS	Ordnance-Related Scrap
OSHA	Occupational Safety and Health Administration
PM	Project Manager
PRSC	Post Removal Site Control
QA	Quality Assurance
QC	Quality Control
ROW	Right-of-Way
RT-GPS	Real Time – Global Positioning System
SC&A	Sanford Cohen & Associates, Inc.
SOP	Standard Operating Procedures
SOW	Statement of Work
SM	Site Manager
SSHP	Site Safety and Health Plan
SSHO	Site Safety and Health Officer
SUXOS	Senior Unexploded Ordnance Supervisor
TDMD	Time Domain Metal Detector

UNS	Ultrasonic Navigation System
US	United States
USACE	United States Army Corps of Engineers
USAESCH	US Army Engineering and Support Center, Huntsville
USC	United States Code
UXO	Unexploded Ordnance
WAA	War Assets Administration
WP	Work Plan
WWII	World War II

EXECUTIVE SUMMARY

EASTERN BYPASS
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1.0 EXECUTIVE SUMMARY

The Eastern Bypass Engineering Evaluation/Cost Analysis (EE/CA) at the former Fort McClellan, Calhoun County, Anniston, Alabama was conducted to determine whether ordnance and explosives (OE) and ordnance-related scrap (ORS) exist within the boundary of the proposed eastern bypass right-of-way and to determine the nature and extent of possible OE occurrence. The EE/CA describes the findings of the fieldwork, with identification, analysis and recommendation of risk-reduction alternatives.

1.1 ZAPATAENGINEERING, P.A. conducted this work under Contract No. DACA87-95-D-0026-0004 (Task Order Annex E), from the US Army Engineering and Support Center, Huntsville (USAESCH), Alabama in accordance with the Statement of Work (SOW; Appendix A, herein). The purpose of this Task Order was to determine the nature and extent of possible ordnance and explosives occurrence within the proposed eastern bypass right-of-way, which will bisect the former Fort McClellan, and to prepare an EE/CA fully describing the risk analyses, removal and control alternatives and associated costs.

1.2 The purpose of this project was to identify the nature and extent of OE and ORS within the proposed eastern bypass right-of-way through visual and intrusive investigative activities and to develop and recommend the most technically and administratively feasible and cost effective removal and/or control alternatives to reduce the risk of exposure to OE items. These activities were performed in a manner consistent with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Section 104 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). ZAPATAENGINEERING prepared project-specific work plans for review and approval by the BRAC Cleanup Team (BCT). The workplans described site background and history, investigation objectives, proposed investigative activities, equipment, procedures, personnel and schedule.

1.3 A primary task essential to fully characterize the proposed eastern bypass was the geophysical investigation. The geophysical investigation was conducted to determine the nature and extent of OE occurrence within the proposed eastern bypass right-of-way. A corridor, with its boundaries extending approximately 1,250 feet to both sides of the bypass centerline, was established. Risk reduction alternatives presented in the EE/CA apply only to areas within the bypass right-of-way. The geophysical investigation was conducted both inside and outside the right-of-way, not extending beyond the corridor boundaries. ZAPATAENGINEERING maintained oversight of the geophysical investigation throughout the project. The geophysical investigation included historical document review, ground reconnaissance and a geophysical survey. Upon completion of the geophysical investigation, ZAPATAENGINEERING concluded that the proposed eastern bypass right-of-way should be subdivided into three Ordnance Operable Units (OOUs).

1.4 OOU1 is the portion of the proposed eastern bypass right-of-way in which intrusive sampling was conducted by ZAPATAENGINEERING. Preliminary investigations concluded the site likely was used as a training ground and, as such, the technical team expected to find training items. These expectations were confirmed with the discovery of various OE training items, such as four expended M69 60mm practice mortars and three expended 2.36-inch rockets. As directed by the USAESCH, discovery of these items resulted in completion of intrusive data collection efforts with only partial excavation of anomalies in the six areas of investigation.

1.5 A total of 12 grids within OOU1 was sampled, adhering to the approach described in the Final Work Plans and modified in coordination with the USAESCH while in the field. Based on the sampling effort, the density of OE/ORS items in OOU1 is estimated to be 2.78 items per acre. The density of UXO items in OOU1 is estimated to be 0.12 items per acre. The recommended risk reduction alternatives for OOU1 are clearance for intended land use in combination with institutional controls and construction support.

1.6 ZAPATAENGINEERING did not conduct a ground reconnaissance and intrusive investigation in OOU2. Data provided by the USAESCH indicates extensive surface OE (both UXO and ORS) and subsurface geophysical anomalies. The recommended risk reduction alternatives are clearance for intended land use in combination with institutional controls and construction support.

1.7 ZAPATAENGINEERING visually inspected OOU3. No geophysical investigations were conducted along this portion of the proposed eastern bypass right-of-way. One expended M18 smoke grenade and one expended simulation charge were noted during the visual inspection. No UXO items were discovered. Based on historical documents and evidence from the ground reconnaissance, this OOU is not situated within identified impact areas or range fans. ZAPATAENGINEERING recommends institutional controls and construction support as the risk reduction alternatives. Institutional controls include an educational program directed at highway construction personnel prior to and during construction efforts informing them of potential for ordnance contact and necessary OE avoidance actions.

INTRODUCTION

EASTERN BYPASS
ENGINEERING EVALUATION/COST ANALYSIS (EE/CA)
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US ARMY ENGINEERING AND SUPPORT CENTER
HUNTSVILLE

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2.0 INTRODUCTION

ZAPATAENGINEERING, P.A. was tasked to prepare an Engineering Evaluation/Cost Analysis (EE/CA) for the proposed eastern bypass right-of-way. The Technical Team involved with the project consists of the USAESCH, ZAPATAENGINEERING, P.A., USA Environmental, Inc. and Sanford Cohen & Associates (SC&A).

2.1 Project Authorization

ZAPATAENGINEERING, P.A. conducted this work under Contract No. DACA87-95-D-0026-004 (Task Order Annex E), from the USAESCH. The purpose of this Task Order was to determine the nature and extent of possible ordnance and explosives occurrence within the proposed eastern bypass right-of-way which will bisect former Fort McClellan, and to prepare an Engineering Evaluation/Cost Analysis (EE/CA) fully describing the risk analysis, removal and control alternatives and associated costs.

2.2 Project Objectives

In an effort to characterize the risk associated with OE along the proposed eastern bypass right-of-way, ZAPATAENGINEERING separated the right-of-way into three areas (or operable units) based on historical land use, findings of previously conducted ground reconnaissance efforts and the proposed land reuse. This facilitated a manageable approach to evaluating the entire proposed eastern bypass right-of-way without assigning the most conservative (and most expensive) risk reduction alternative to the entire bypass right-of-way. The objective of this project was to evaluate the proposed eastern bypass right-of-way, evaluate the risks associated with construction of the bypass and ancillary activities and recommend the most technically feasible and cost effective approach for reducing the risk of exposure to OE items.

2.2.1 Project Process

This EE/CA process involved conducting visual and intrusive field investigations to characterize the type and extent of ordnance items within the proposed bypass right-of-way. Analysis of the field investigation data enabled ZAPATAENGINEERING to determine the risks associated with the construction of the proposed bypass and to evaluate and recommend effective risk reduction alternatives. An Action Memorandum will be prepared subsequent to the EE/CA presenting the recommended risk reduction alternatives. Risk reduction alternatives and/or institutional controls supplemental to those presented in the Action Memorandum may be evaluated based upon the findings of the recommend removal actions.

2.3 Project Organization

Fieldwork at an OE site requires a high level of expertise from many different organizations. An organizational chart for the Fort McClellan project is presented on Figure 2-1. The organizational chart identifies the various organizations and essential personnel involved throughout the course of the project. The Technical Team consists of the US Army Engineering and Support Center, Huntsville (USAESCH), ZAPATAENGINEERING, P.A., USA Environmental, Inc. and Sanford Cohen & Associates (SC&A). Figure 2-2 presents a matrix identifying the roles and responsibilities of each organization during the specific phases of the project. The role of each team member is detailed below.

Figure 2-1 Organizational Chart

Former
Fort McClellan

Proposed Eastern Bypass EE/CA

Organizational Chart

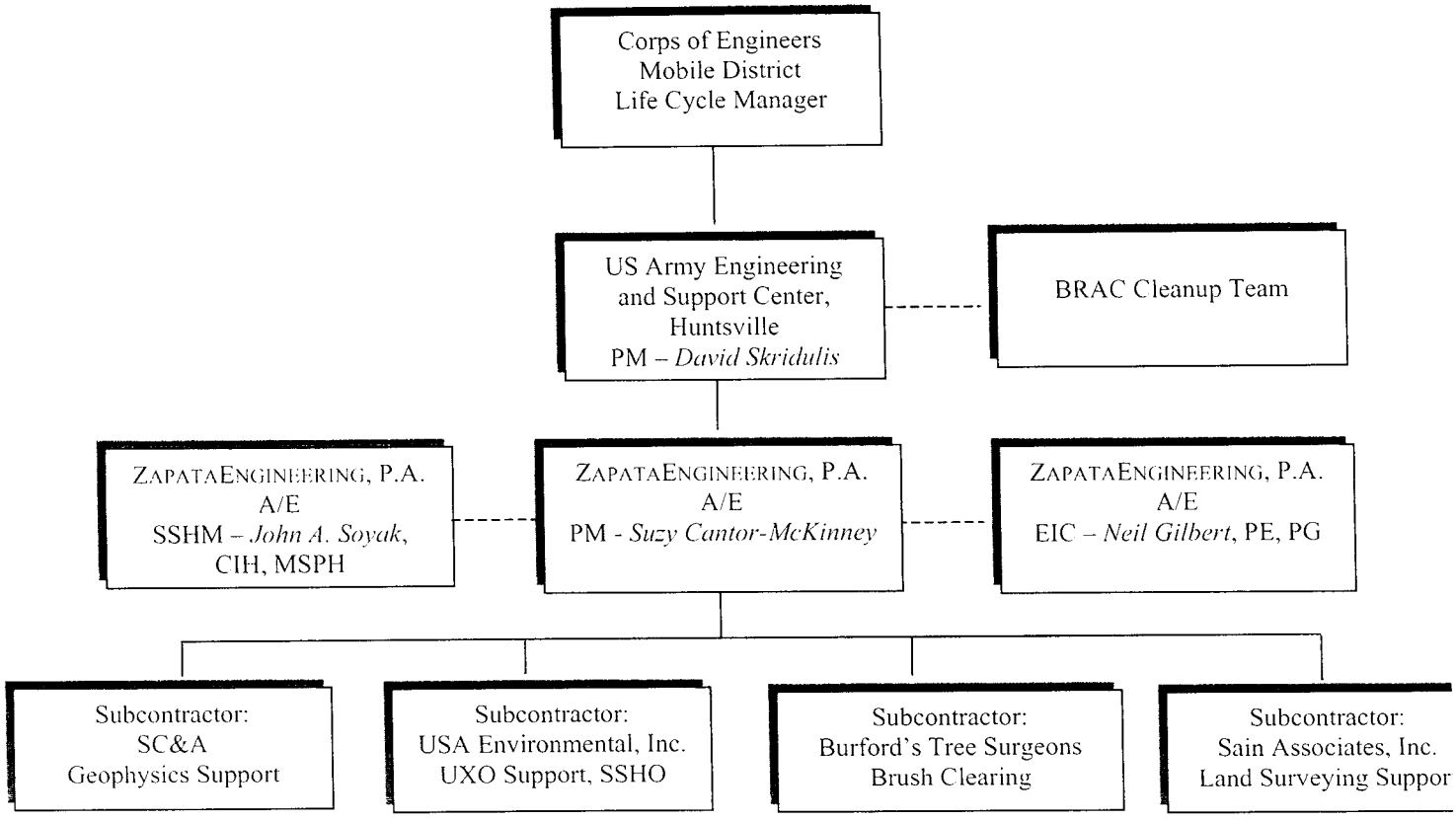

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Figure 2-2 Roles and Responsibilities

Organization	Records Review and Site Visit	Ground Reconnaissance	*TASKS* Work Plans	Geophysics and Mapping	Sampling	EE/CA
USAESCH	Provides ASR, EA, and records. Leads site visit.	Approves revised abbreviated SSHP. Participates in ground reconnaissance.	Review and approval.	Program Management.	Program Management.	Review and approval.
COE MOBILE DISTRICT			Review and comment			Review and acceptance
ZAPATAENGINEERING A/E CONTRACTOR	Reviews records, prepares abbreviated Site Safety and Health Plan, attends site visit.	Prepares abbreviated Site Safety and Health Plan, conducts ground reconnaissance.	Primary author.	Contracts for surveying and geophysical efforts.	Project Management.	Primary author. Participates in public meetings.
USA Environmental, Inc.	Attends site visit.	Participates in ground reconnaissance.	Secondary author with lead on Intrusive Excavation and Safe Holding Area Plan.	Conducts geophysical prove-out and survey.	Provides UXO escort, performs excavation.	
SC&A	Attends site visit.		Secondary author with lead on Geophysical Investigations Plan.	Data analysis and mapping for geophysical prove-out and survey.		Primary author of Appendix B-4, Geophysical Survey.
Sain Associates, Inc.				Performs site surveying.		
Burford's Tree Surgeons				Performs brush clearing for prove-out and mapping.	Performs brush clearing prior to intrusive excavation.	
BCT			Review and acceptance.			Review and acceptance.

2.3.1 US Army Engineering and Support Center, Huntsville

The USAESCH, as the implementing agency for execution of this project, provided expertise for all OE activities. The USAESCH responsibilities included procurement of Architecture/Engineering (A/E) services, direction of the A/E contractor (ZAPATAENGINEERING), control of the budget and schedule, and coordination of document reviews.

2.3.2 US Army Engineer District, Mobile

The US Army Corps of Engineers, Mobile District, is the Life Cycle Project Manager for this project. District responsibilities include the review of project workplans and documents.

2.3.3 ZAPATAENGINEERING, P.A.

ZAPATAENGINEERING is the prime contractor to the USAESCH and provides all engineering support and services for the project. ZAPATAENGINEERING is responsible for performance of the activities detailed in the Statement of Work (SOW) in Appendix A, as well as control of the project schedule and budget.

2.3.4 USA Environmental, Inc.

USA Environmental is a subcontractor to ZAPATAENGINEERING. As such, USA Environmental provided all ordnance and explosives (OE) services necessary to conduct the field investigation. Services provided by USA Environmental included all visual OE inspections while participating in each of the fieldwork efforts, including ground reconnaissance, brush clearing, location surveying and geophysical prove-out and data collection. USA Environmental conducted the subsurface sampling activities during the intrusive investigation. For each field effort, they provided properly trained and qualified personnel for all OE operations. USA Environmental's Senior UXO Supervisor (SUXOS) conducted (assisted by ZAPATAENGINEERING personnel) initial and daily safety briefings and maintained associated safety records.

2.3.5 Sanford Cohen & Associates, Inc. (SC&A)

SC&A, a subcontractor to ZAPATAENGINEERING, was responsible for data analysis, mapping and interpretive input of geophysical investigations.

2.3.6 Burford's Tree Surgeons

Burford's Tree Surgeons, a subcontractor to ZAPATAENGINEERING, conducted brush removal in the prove-out area, sample grids and access routes. Burford's Tree Surgeons also assisted with the burial of seed items in the geophysical prove-out grid. During the intrusive investigation, Burford's assisted with the transport of the miniature open-front barricade (MOFB) at the investigation site.

2.3.7 Sain Associates, Inc.

Sain Associates, Inc., a subcontractor to ZAPATAENGINEERING, conducted location surveys and mapping for all sample area boundaries and all grid hubs throughout the study site. Sain Associates, Inc. also surveyed the locations of the known test items in the geophysical prove-out grid.

2.3.8 Base Realignment and Closure (BRAC) Cleanup Team (BCT)

The BCT is comprised of representatives of former Fort McClellan, including the Directorate of the Environment, Alabama Department of Environmental Management (ADEM), the US Environmental Protection Agency (US EPA) and the United States Army Corps of Engineers (USACE). The BCT reviews, comments and consents to all deliverables under this contract, including the EE/CA.

2.4 Definitions

The following definitions will be used throughout this report (sources are indicated in parentheses):

- **Anomaly** – an electronic data point measured with a geophysical instrument that deviates excessively from background data points in surrounding areas.

- **Area** – a small portion of the overall site that is to be thoroughly investigated.

- **Conventional Ordnance and Explosives (OE)** – The term "conventional OE" refers to ordnance and explosives other than CWM, BWM and nuclear ordnance (ER 1110-8153).

- **Corridor** – the portion of the proposed eastern bypass that contains the centerline, the right-of-way and a buffer zone, which extends outward approximately 1,250 feet from either side of the centerline.

- **Explosive Ordnance Disposal (EOD)** – the detection, identification, field evaluation, rendering safe, recovery, evacuation and disposing of explosive ordnance that has been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, materials or environment (Draft ETL 385-1-2).

- **EOD Personnel** – active duty military personnel responsible for EOD.

- **Exposure** – an "exposure" to UXO is defined when an individual has traversed or worked on a site in close proximity to ordnance, whether or not the individual knows the ordnance was present (it may be buried). An accident or injury is not necessarily assumed to occur when an exposure has taken place. The definition of "close proximity" varies depending upon the specific activity.

- **Grid** – a subdivision of an area with varying dimensions, but usually 100 ft by 100 ft.

- **Ordnance and Explosives (OE)** – OE consists of either (1) or (2) below:

  (1) Ammunition, ammunition components, chemical or biological warfare material or explosives that have been abandoned or expelled from demolition pits or burning pads, lost, discarded, buried or fired. Such ammunition, ammunition components and explosives are no longer under accountable record control of any

DoD organization or activity (HQDA Policy Memorandum "Explosives Safety Policy for Real Property Containing Conventional OE").

A. Chemical Warfare Materiel (CWM) – An item configured as a munition containing a chemical substance that is intended to kill, seriously injure, or incapacitate a person through its physiological effects. Also includes V- and G- series nerve agent, H- series blister agent, and lewisite in other-than-munition configurations. Due to their hazards, prevalence and military-unique application, chemical agent identification sets (CAIS) are also considered CWM. CWM does not include: riot control agents; chemical herbicides; smoke and flame producing items; or soil, water, debris, or other media contaminated with chemical agent (HQDA Interim Guidance for Biological Warfare Materiel and Non-Stockpile Chemical Warfare Materiel Response Activities).

B. Biological Warfare Materiel (BWM) – An item configured as a munition containing an etiologic agent that is intended to kill, seriously injure, or incapacitate a person through its physiological effects; includes biological agent identification sets. BWM can also include etiologic agents that are designed to damage or destroy crops that are intended for human consumption (HQDA Interim Guidance for Biological Warfare Materiel and Non-Stockpile Chemical Warfare Materiel Response Activities).

C. Unexploded Ordnance (UXO) – Military munitions that have been primed, fuzed, armed, or otherwise prepared for action, and have been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material and remain unexploded either by malfunction, design or any other cause (40 CFR 266.201).

D. Training Ammunition – Ammunition used for training persons in marksmanship, handling weapons, etc. (Glossary of Ordnance Terms, Ordnance Engineering Handbook Office, Duke University).

(i). Inert Ammunition – Ammunition or ammunition components void of explosive or chemical material. An inert material may be used to represent an explosive filler or material (AR 385-65).

(ii). Dummy ammunition – Ammunition or ammunition components having the appearance of actual items. Dummy ammunition is used for exhibits and for training operations, such as assembly and handling, and dry run operations of weapons or weapon systems (AR 385-65).

(iii). Empty Ammunition – Ammunition or ammunition components void of any type of filler (AR 385-65).

(iv). Practice ammunition – Ammunition or ammunition components used for training. Practice ammunition simulates a service item in weight, design and ballistic properties. A practice round may be inert or have a small quantity of explosive filler, such as black powder used as a spotting charge (AR 385-65).

(2) Explosive Soil – Explosive soil refers to mixtures of explosives in soil, sand, clay or other solid media at concentrations such that the mixture itself is explosive.

(a) The concentration of a particular explosive in soil necessary to present an explosion hazard depends on whether the particular explosive is classified as "primary" or "secondary". Guidance on whether an explosive is classified as "primary" or "secondary" can be obtained from the OE Mandatory Center of Expertise or Chapters 7 and 8 of TM 9-1300-214, Military Explosives.

(b) Primary explosives are those extremely sensitive explosives (or mixtures thereof) that are used in primers, detonators, and blasting caps. Primary explosives are easily detonated by heat, sparks, impact or friction. Examples of primary explosives include Lead Azide, Lead Styphanate, and Mercury Fulminate.

(c) Secondary explosives are bursting and boostering explosives (i.e., they are used as the main bursting charge or as the booster that sets off the main bursting charge). Secondary explosives are much less sensitive than primary explosives. They are less likely to detonate if struck or when exposed to friction or electric sparks. Examples of secondary explosives include Trinitroluene (TNT), Composition B and Ammonium Picrate (Explosive D).

(d) Soil containing 10 percent or more by weight of any secondary explosive or mixture of secondary explosives is considered "explosive soil". This determination was based on information provided by the USAESCH as a result of studies conducted and reported in USAESCH Report AMXTH-TE-CR 86096.

(e) Soil containing propellants (as opposed to primary or secondary high explosives) may also present explosive hazards.

- **Ordnance Operable Unit (OOU)** – a portion of an overall ordnance site that is separated to allow individual assessment of and response to the project objectives.

- **Ordnance-Related Scrap (ORS)** – a military munition or components thereof which contain no explosive, pyrotechnic, or chemical agent. These can be, but are not limited

to, practice munitions without spotting charges, drill rounds, inert training munitions, and expended ejection munitions. Fragments of military munitions, which have functioned as designed or were recovered from areas where munitions were intentionally destroyed, are ordnance scrap if they have no explosive, pyrotechnic, or chemical filler (CEHNC-OE-CX, IGD 98-04, 23 March 1998).

- **Other** – non-munitions material found at ordnance sites. This category can include banding, wire, trash, auto parts, shipping boxes, or any kind of material that has been abandoned or discarded at an OE site that was never a component of military munitions. Ferrous rocks that activate geophysical instruments during investigations and are removed from a site are classified as "other" (CEHNC-OE-CX, IGD 98-04, 23 March 1998).

- **Right-of-Way (ROW)** – the portion of the proposed eastern bypass that contains the centerline and areas 100 to 450 feet from either side of the centerline.

- **Small Arms** – ordnance items of caliber 0.50 and smaller (CEHNC-OE-CX, IGD 99-02, 21 April 1999).

- **Training Device** – A device, item or equipment designed or modified for use by the trainee in training (Glossary of Ordnance Terms, Ordnance Engineering Handbook Office, Duke University).

SITE DESCRIPTION

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3.0 SITE DESCRIPTION

The former Fort McClellan is an inactive US Army post located in Calhoun County, Alabama occupying approximately 45,679 acres. The main post encompassed approximately 18,766 acres. Documented military use at Fort McClellan began in 1912 when the Alabama National Guard used part of the site as a Field Artillery Range. The installation was deactivated for a brief period of time in the late 1940s but was reactivated in 1950 and remained active until September 1999. The former Fort McClellan is in the Eastern Valley and Ridge Physiographic Province of Alabama, which has a highly variable topography. Most of the undeveloped areas in the installation consist of dense hardwood and pine stands with shrub underbrush. Results of previous site investigations are discussed in Section 3.5.

3.1 Site Location

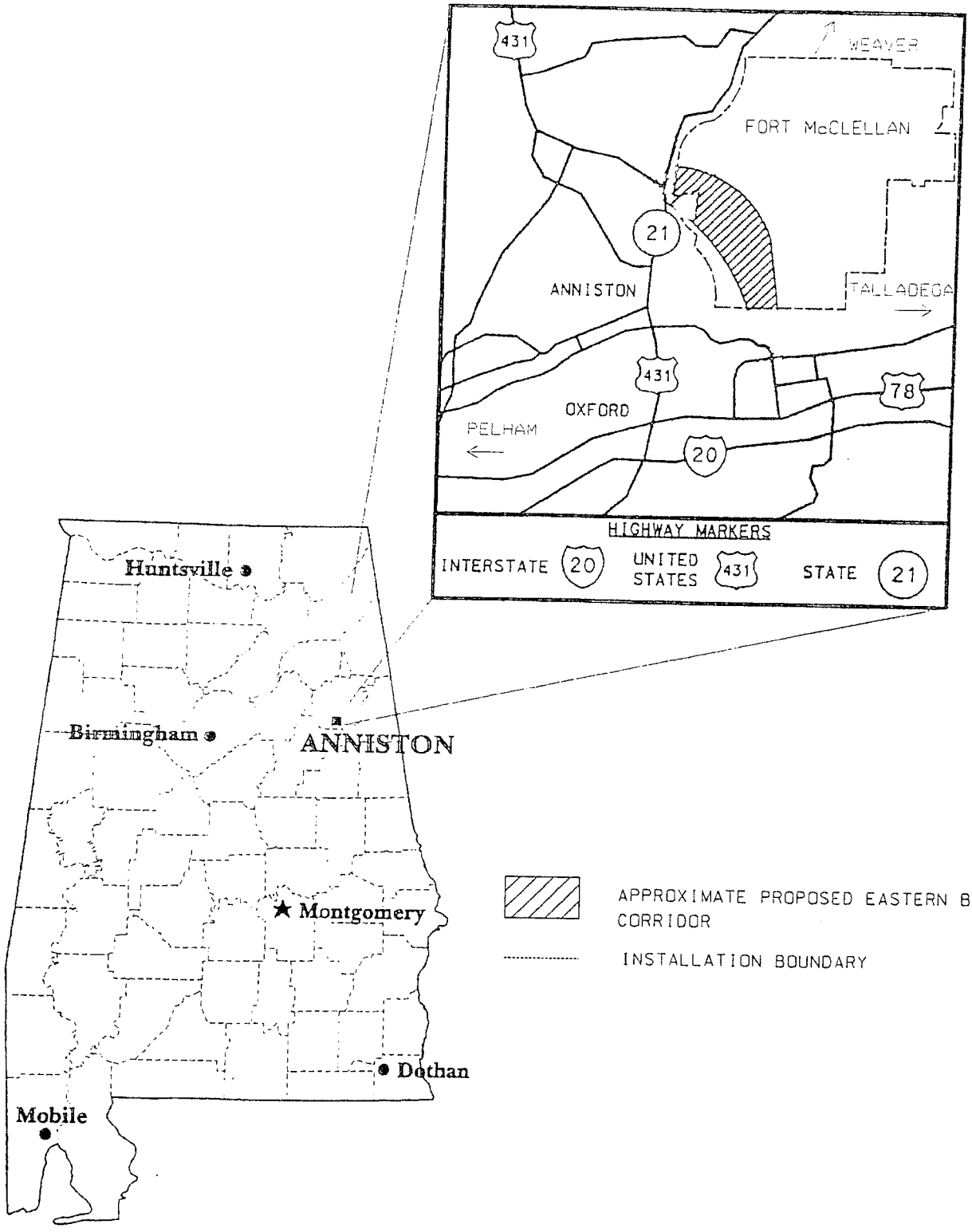
The former Fort McClellan main post is bounded to the south and west by the City of Anniston and to the northwest by the City of Weaver. Adjoining the former main post to the east is the Choccolocco Corridor, which connects the post to the Talladega National Forest. Figure 3-1 depicts the general location of former Fort McClellan and the proposed eastern bypass corridor within the State of Alabama. Figure 3-2 presents a map of the western side of the former Fort McClellan main post illustrating the proposed eastern bypass right-of-way. The proposed eastern bypass right-of-way through former Fort McClellan is surrounded by an approximately 1,250-foot buffer zone on either side of the right-of-way centerline, forming the proposed eastern bypass corridor. The purpose of the EE/CA is to determine the nature and extent of possible OE occurrence within the proposed eastern bypass right-of-way only. Portions of the corridor beyond the right-of-way were included in the investigation to determine the extent of OE occurrence that could possibly be encountered during construction activities for the right-of-way.

3.2 Site Demographics

Former Fort McClellan is located in Calhoun County at the foothills of the Appalachian Mountains. The surrounding communities including Weaver, Pelham Range and Anniston (the county seat) offer multiple centers of activity such as Oxford Lake and Civic Center, Cheaha State Park, Jacksonville State University, Anniston Museum of Natural History, Northeast Alabama Regional Medical Center and several theaters, park facilities and golf courses.

3.2.1 According to the 1990 Census of Population and Housing, Calhoun County is home to approximately 116,032 people within a 7,609 square-mile area, averaging 15 people per square mile. The percentage of individuals under age 18 is 24.5 percent; the percentage over age 65 is 13.5 percent. The median age is 35. According to 1998 population estimates, approximately 79.29 percent of the population is white, 19.14 percent black, 0.88 percent Asian or Pacific Islander and 0.69 percent other races. The work force of Calhoun County is broken down into the following: employed armed forces, 5.12 percent; employed civilians, 51.97 percent; unemployed civilians, 4.82 percent; and others not in the labor force, 38.09 percent.

3.2.2 Housing in Calhoun County is composed of 46,753 multiple and single family dwellings. Approximately 47 percent of the households are owner occupied with a median property value of $51,806. Approximately 24 percent of the households are rental units with a median monthly rent of $218.



MAP FROM BARGE, WAGGONER, SUMNER, AND CANNON, 1998

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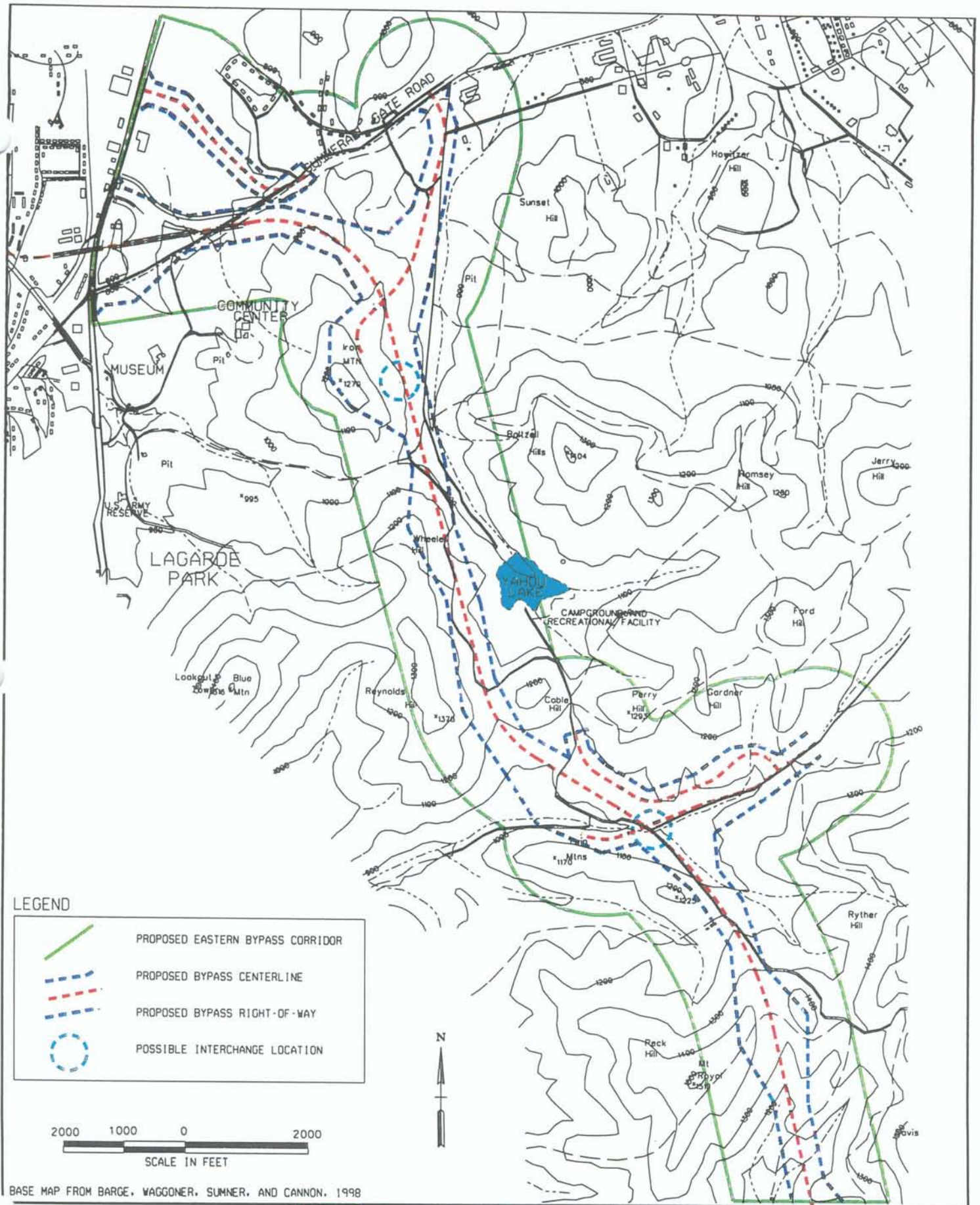
	CONTRACT #: DACA87-95-D-0026	PROJECT #: 982503	PAGE: 3-2	DRAWN BY: MSA	SCALE: NTS	FIGURE 3-1



BASE MAP FROM BARGE, WAGGONER, SUMNER, AND CANNON, 1998

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PROJECT TITLE: FORMER FORT McCLELLAN PROPOSED EASTERN BYPASS
DRAWING TITLE: RIGHT-OF-WAY AND CORRIDOR

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3.2.3 Calhoun County's medical facilities serve as the medical center and the court system serves as the legal and accounting center of northeast Alabama. Retail, entertainment and recreational establishments also thrive in this area.

3.2.4 A variety of industries including federal and civilian government, services, durable goods manufacturing and the area's agricultural industry are strong contributors to the local economy. Mead Ink, Hager (hinges), Parker Hannifin (valves), Bear (knives), Springs Industries (comforters) and Allied Signal (aircraft systems) are just a few of the more than 150 industries located in Calhoun County. Honda has chosen Lincoln, Alabama, just 14 miles southeast of Anniston, as the site for their new automotive facility scheduled to open in 2002.

3.3 Site History

Documented military use at former Fort McClellan began in 1912 when the Alabama National Guard used part of the site as a Field Artillery Range. However, there is a possibility that during the Spanish American War (1898), units stationed at Camp Shipp in the Blue Mountain area used portions of what is now former Fort McClellan for artillery training. In 1917, Congress authorized the establishment of Camp McClellan. In 1929, the camp was officially designated as Fort McClellan. Following World War II, in June 1947, the Fort was put into an inactive status. The Fort was reactivated in January 1950 and remained an active army post until September 1999.

3.3.1 The history of Fort McClellan, as described in the Archives Search Report (ASR) Findings (1999) and Archives Search Report Conclusions and Recommendations (1999) includes training activities and demonstrations that used conventional weapons (i.e., mortars, anti-tank guns and artillery pieces). Chemical warfare training occurred during several periods of time that included the use of such items as chemical agent identification sets, smoke pots, flame field expedients, rifle and smoke grenades. A review of the ASR Conclusions and Recommendations indicates that the majority of the chemical inventory was transferred from Fort McClellan in 1976. In 1987, the Chemical Decontamination Training Facility located in the northeast corner of Fort McClellan became operational. The location of the old Chemical Weapons Demonstration Area is illustrated on Figure 3-3.

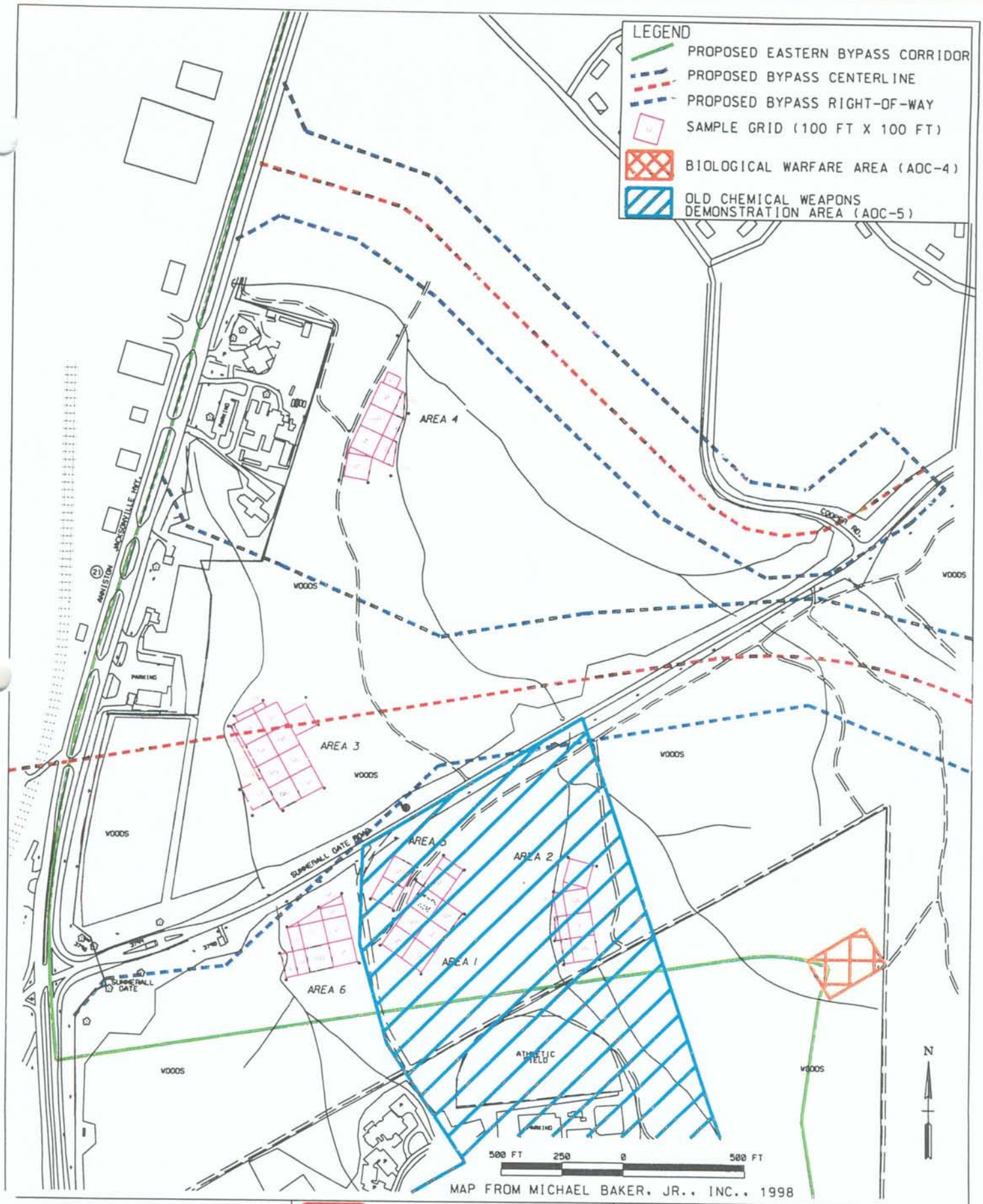
3.3.2 Under the Base Realignment and Closure (BRAC) Program, Fort McClellan closed in September 1999.

3.4 Environmental Setting

The geology, hydrology, topography and vegetation of former Fort McClellan play an important role in the overall geophysical investigation. Each of these settings and their relationship to the investigation are discussed in the following paragraphs. Selection of areas for geophysical investigation was based on evidence of military activity noted during the ground reconnaissance, density of tree cover, slope and site accessibility.

3.4.1 Geology

The former Fort McClellan is in the Eastern Valley and Ridge Physiographic Province of Alabama. Figure 3-4 illustrates the mappable geologic surface formations and structures within and around the proposed eastern bypass right-of-way, as interpreted from Alabama Geological



MAP FROM MICHAEL BAKER, JR., INC., 1998

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DRAWING TITLE: OLD CHEMICAL WEAPONS DEMONSTRATION AREA

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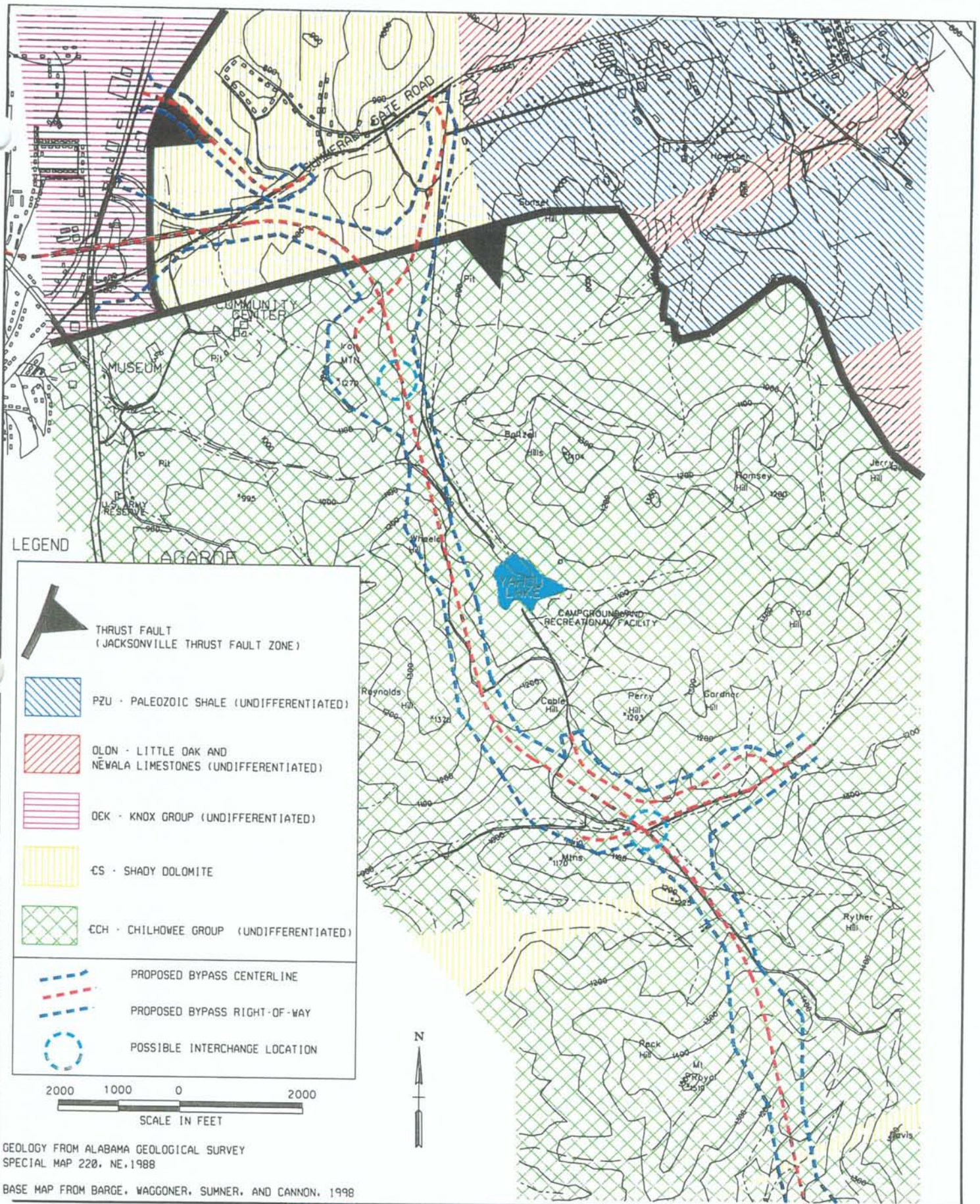

GEOLOGY FROM ALABAMA GEOLOGICAL SURVEY
SPECIAL MAP 220, NE, 1988

BASE MAP FROM BARGE, WAGGONER, SUMNER, AND CANNON, 1998

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DRAWING TITLE: GEOLOGIC MAP

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Survey Special Map 220, NE. The geologic surface units consist of Paleozoic-age (Cambrian, Ordovician and Mississippian) conglomerates, dolomites, limestones and shales. The Jacksonville Fault, a low-angle thrust fault, bisects the western portion of the installation, likely following the creek bed adjacent to Areas 3 and 6 within OOU1 of the proposed eastern bypass right-of-way. Five prominent geologic surface units are present within and around the proposed corridor. They are, from oldest to youngest, the Chilhowee Group, Shady Dolomite, Knox Group, Little Oak and Newala Limestones and Paleozoic Shale. Excluding the identifiable Shady Dolomite, all units are composed of undifferentiated stratigraphic units. The three units present within the proposed eastern bypass right-of-way are the Chilhowee Group, the Shady Dolomite and the Knox Group.

3.4.1.1 The early Cambrian Chilhowee Group covers most of the southern portion of the installation and is also the predominant geologic unit within the proposed eastern bypass right-of-way. It consists of light- to medium-gray arkose, arkosic conglomerate and discontinuous mudstone overlain by greenish-gray mudstone, with minor siltstone and sandstone. Light-gray pebbly quartzose sandstone dominates the upper portion of the unit.

3.4.1.2 The early Cambrian Shady Dolomite is mapped in the far western and central portions of the installation and is the predominant geologic unit in the northern parts of the proposed eastern bypass right-of-way. The six areas identified for data collection are located within an area mapped as Shady Dolomite. This unit is also present in two distinct bands at the southern end of the proposed eastern bypass. It consists of a bluish-gray or pale-yellowish-gray, thick-bedded siliceous dolomite and coarsely crystalline chert.

3.4.1.3 The late Cambrian to early Ordovician Knox Group is mapped in the western-most portion of the installation. It consists of light gray to light brown, locally sandy dolomite, dolomitic limestone and limestone, with abundant light-colored chert.

3.4.1.4 The early Ordovician Little Oak and Newala Limestones are mapped in three distinct areas near the center of the installation beyond the boundaries of the bypass right-of-way. The Little Oak Limestone consists of dark-gray, medium- to thick-bedded fossiliferous, argillaceous to silty limestone containing chert nodules. It locally includes thin beds of bentonite in upper portions of the formation. The Newala Limestone consists of light- to dark-gray, thick-bedded micritic and peloidal limestone and minor dolomite.

3.4.1.5 The Paleozoic (Mississippian) Shale is mapped near the center of the installation and is not present within the proposed eastern bypass right-of-way. It consists of dark-gray shale and mudstone; locally containing thin interbeds and lenses of dark-greenish-gray sandstone. This undifferentiated formation likely includes the Ordovician Athens Shale and Mississippian Floyd Shale in the unit near the proposed eastern bypass right-of-way.

3.4.2 Hydrogeology

Few hydrogeological assessments of regional groundwater flow patterns have been conducted in the area surrounding former Fort McClellan. Aquifers in the area are developed in residual soil derived from weathering of bedrock, within fractured bedrock, along fault lines and within karstic units. Groundwater flow is generally toward major surface-water features. However,

because of differential weathering, variable fracturing and the potential for conduit flow, topography as an indicator of groundwater flow direction must be used with caution. Groundwater intersecting the ground surface has resulted in numerous springs, which act as important sources of discharge and water supply in the area (SAIC, 1999).

3.4.2.1 Precipitation is the primary source of recharge to groundwater in Calhoun County and thrust fault-zones form conduits for groundwater movement. Points of discharge are springs, effluent streams and lakes. Shallow groundwater on former Fort McClellan occurs principally in the residuum developed from Cambrian sedimentary and carbonate bedrock units of the Weisner Formation, part of the Chilhowee Group and locally in Ordovician carbonates. Bedrock permeability may be locally enhanced by fracture zones associated with thrust faults and by solution of limestones. Surface-water movement into sinkholes provides another source of groundwater recharge and locally has facilitated the formation of caves (SAIC, 1999).

3.4.3 Agronomy

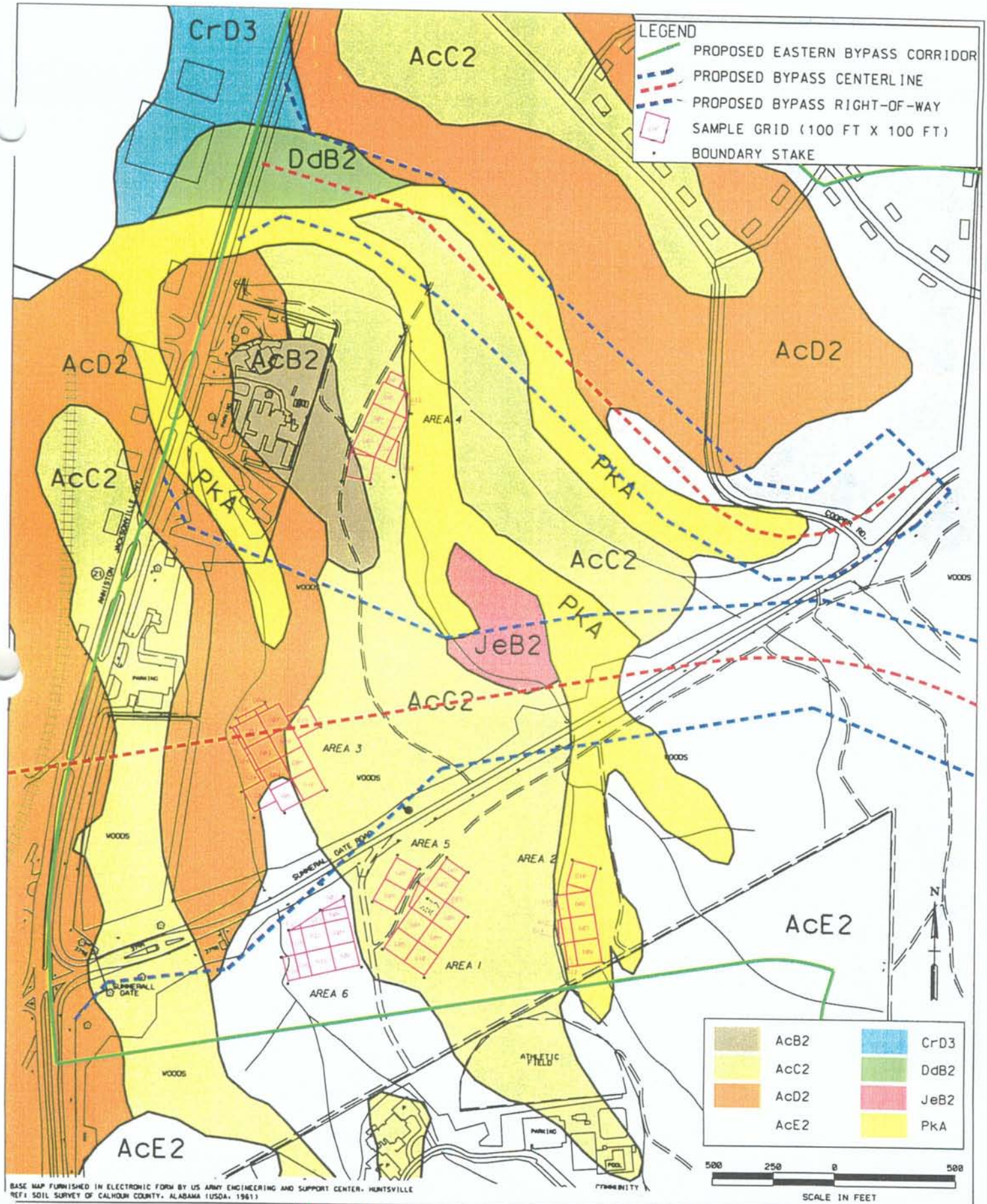
The soils in OOU1 are shallow, steep and stony and usually underlain by sandstone, limestone and shale (USDA, 1961). Many of the soil series in the county have developed from transported material, rather than from in-situ (residual) material. Much of the transported product has been washed from parent sedimentary rocks; some was brought in by the Coosa River from soils underlain by sandstone and shale. Soils differ within each series depending upon the composition of the upland material, the amount of mixing of materials, age and drainage conditions. Five soil classifications are represented across OOU1.

3.4.3.1 **Anniston and Allen Series**

Anniston and Allen gravelly loams dominate the subject area and are mapped as large areas separated by narrow, north-south trending *Philo and Stendal Series* soil along drainage systems and locally by *Jefferson* soils (see Figure 3-5). Anniston and Allen soils are often located on slopes at the bases of higher ridges and mountains.

3.4.3.1.1 The Allen Series and Anniston Series consist of acidic, well drained alluvium or colluvium whose development is largely the product of continued weathering and transport of soils from higher elevations. The parent rocks are sandstone, quartzite or shale. At the surface, down to a depth of a few inches, the Allen Series is mainly grayish brown fine sandy loam. Anniston soil, while like in composition, is darker red or reddish brown at the surface. The subsurface soil of each unit is typically dark red sandy clay loam. Deeper soils are gravelly sandy clay and extend to depths greater than 40 inches. Sandstone and quartzite cobbles are found throughout each unit. The Anniston Series and the Allen Series are similar and are combined for mapping purposes in much of Calhoun County.

3.4.3.1.2 Infiltration and runoff are moderate to average. Permeability is considered moderate and the capacity for available moisture is relatively high. Root zones commonly are thick. Fertility and organic matter are moderate to low. The unit is well suited to agricultural or developed use. Erosion varies widely depending upon slope. Much of the acreage is used for cropland; additional areas are wooded, pastured or otherwise developed. A brief summary of sub-units of *Anniston and Allen gravelly loam* follows.



BASE MAP FURNISHED IN ELECTRONIC FORM BY US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE
REF: SOIL SURVEY OF CALHOUN COUNTY, ALABAMA (USDA, 1961)

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DRAWING TITLE: SOIL SURVEY MAP

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3.4.3.1.3 Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded (AcB2)
This is a friable soil that has developed along fans at the base of mountains and in alluvium on foot slopes. The alluvium ranges in thickness from two feet to more than eight feet. The color of the surface ranges from dark brown to reddish-brown. The sub-soil ranges from clay loam to clay or silty-clay loam. Infiltration and runoff are medium. Permeability is moderate and the capacity for available moisture is high. Root material is generally abundant to 12 inches or more. Severely eroded areas are uncommon.

3.4.3.1.4 Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded (AcC2)
Severely eroded places are more common on the surface. A few shallow gullies are present. Erosion is a risk because of the slopes. The unit is suitable for cultivation and has been developed for pasture and urban uses.

3.4.3.1.5 Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded (AcD2)
These soils have a steeper slope, the upper part at the soil column is thinner and runoff is more rapid than for the above unit. Severely eroded benches and shallow gullies are common where not managed. Non-vegetated areas exhibit a reddish brown to dark reddish brown gravelly clay loam surface soil. Infiltration is slow and capacity for available moisture is low.

3.4.3.1.6 Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded (AcE2)
As with the above unit, these soils have a strong slope, still thinner upper soil column and rapid runoff. In slightly eroded places, the surface soil is a very dark brown to very dark grayish brown gravelly loam, 6 to 9 inches thick. Severely eroded patches and shallow gullies are common. The capacity to hold moisture is low. Infiltration is very low.

3.4.3.2 **Philo and Stendal Series**
Philo and Stendal Series soils are co-associated and consist of strongly acidic, moderately well drained soils, that have developed in local and general alluvium, the parent material originating from sandstone, shale and sometimes limestone. The unit is commonly mapped around drainage systems and at the heads of small draws.

3.4.3.2.1 Philo and Stendal soils, local alluvium, 0 to 2 percent slopes, eroded (PkA)
Mapped areas are elongated and one to ten acres in size. The soils vary in texture, color and consistence. The surface soil is very dark grayish brown to dark brown fine sandy loam and the subsoil is dark brown mottled fine sandy loam. Drainage ranges from poor to moderately good. Water stands on the surface for short periods. As long as the soils are protected from excess runoff from adjacent uplands, they are productive agriculturally, but generally unsuitable for dwellings.

3.4.3.3 Jefferson Series
Jefferson Series soils are associated with and similar to Anniston and Allen soils.

3.4.3.3.1 Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded (JeB2)
Surface soils are dark grayish-brown fine sandy loam. Subsurface soils are yellowish brown fine sandy clay. Sandstone fragments occur on the surface and throughout the profile. Runoff and

infiltration are medium and permeability is moderate. The soil is suitable for a range of crops and can be developed, but erosion can be a limitation.

3.4.4 Topography

The surface topography of former Fort McClellan varies greatly over its entire area. The southwestern portion of the former installation, south of known impact ranges, is steep and rugged. Within the northwestern study area, the surface topography is less variable. Most of the surface terrain is relatively flat to gently rolling hills. Each of the six specific areas of geophysical investigation in OOU1 is on level to slightly sloping terrain. Area 3 was the only area that exhibited any evidence of surface alteration. These features are evidenced in the form of possible foxholes up to approximately three feet in depth.

3.4.5 Vegetation

The proposed eastern bypass right-of-way consists of a variably sparse to dense hardwood and pine mix with underbrush of shrubs. Some portions of the corridor contain pine groves with dense underbrush. Other portions of the site contain hardwood stands with little to no underbrush. Of the six areas investigated, only Areas 1 and 5 contain pine trees. Areas 2, 3, 4 and 6 contain hardwoods.

3.5 Previous Site Investigations

The US Army Corps of Engineers, St. Louis District, compiled an Archives Search Report (ASR) in 1996. The ASR was prepared by reviewing available records and reports documenting the history of the site. Historical information pertaining to site operations, including a listing of site investigations conducted before 1996, is contained within this document. In 1998, the US Army Corps of Engineers, St. Louis District, revised the ASR to include suspect Chemical Warfare Materiel (CWM) areas. The ASR was finalized in July 1999.

3.5.1 A ground reconnaissance of the known impact areas was conducted by the USAESCH in June 1997. This characterization precluded the need for additional inspection and sampling of these areas by ZAPATAENGINEERING. The ground reconnaissance team noted surface and possible subsurface evidence of 60mm high explosive (HE) mortars and 2.36-inch rockets within the boundaries of a designated dud impact area in OOU2. The findings of the ground reconnaissance are incorporated into the risk analysis and conclusions of this document.

3.5.2 The Archives Search Report (prepared by the US Army Corps of Engineers, St. Louis District) presented the findings of the site inspection and evaluation of potential ordnance and explosives occurrence at former Fort McClellan. Numerous areas suspected of being used for chemical warfare training or chemical warfare material storage were inspected. No indication of chemical training or chemical material storage was noted in the document to be within the boundaries of the proposed eastern bypass right-of-way.

3.5.3 Barge, Waggoner, Sumner and Cannon, Inc. prepared a Draft Environmental Assessment (EA) for the Alabama Department of Transportation (ALDOT) in 1998. This draft document identified the economic and environmental impacts of the proposed eastern bypass and evaluated right-of-way alternatives for the bypass. Threatened and endangered species were not anticipated within the proposed eastern bypass right-of-way. Isolated wetlands associated with

streams were described in three separate areas within the right-of-way, none of which is located in the six areas investigated.

3.5.4 An *Historical Aerial Photography Investigation of the Fort McClellan East By-Pass Study Area (1998)* was prepared by Oak Ridge National Laboratory for the US Army Engineering and Support Center, Huntsville. It provided an analysis of land usage over a span of more than 50 years and potential areas of OE occurrence.

3.5.5 ZAPATAENGINEERING conducted a non-intrusive ground reconnaissance in August 1998. The purpose of the ground reconnaissance was to visually identify areas of possible OE occurrence, which may not have been previously characterized within the proposed eastern bypass right-of-way. In addition, possible locations for the geophysical prove-out and subsequent sampling were identified.

3.5.6 As documented in ZAPATAENGINEERING's Ground Reconnaissance Trip Report dated September 1998, no evidence of ordnance impact areas was identified within non-impact areas of the proposed eastern bypass route. However, several areas revealed evidence of possible training activities and were identified as potential sample locations. The most notable locations were in the northern portion of the proposed eastern bypass right-of-way, near Summerall Gate. In particular, possible training areas were located north and south of Summerall Gate Road, approximately 200 to 300 yards inside the installation boundary. Refer to Appendix B-1 for Ground Reconnaissance Trip Report.

SITE CHARACTERIZATION

EASTERN BYPASS
ENGINEERING EVALUATION/COST ANALYSIS (EE/CA)
AT
FORT MCCLELLAN

FORT MCCLELLAN, ALABAMA

Prepared for:

US ARMY ENGINEERING AND SUPPORT CENTER
HUNTSVILLE

by:

ZAPATAENGINEERING, PA

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4.0 SITE CHARACTERIZATION

After reviewing the historical documents, completing the ground reconnaissance and reviewing other previous investigations, ZAPATAENGINEERING recognized that the proposed eastern bypass right-of-way was composed of three distinct areas. These areas were designated as ordnance operable units (OOUs). Figure 4-1 illustrates the areas included in each of the three OOUs. ZAPATAENGINEERING determined that each area had its own distinguishable OE/UXO characteristics. Segregation of the three different areas based on OE/UXO characteristics allows for unique, effective and cost-efficient remediation recommendations for each OOU.

4.1 Identification of Ordnance Operable Units (OOUs)

The proposed eastern bypass right-of-way was subdivided into three Ordnance Operable Units (OOUs). The OOUs include only the area inside the bypass right-of-way. These subdivisions were based primarily on historical military use, Archives Search Reports and previous site investigations. The three OOUs, illustrated on Figure 4-1, are described as follows:

- OOU1 – The northwestern portion of the proposed eastern bypass right-of-way, north of the known impact area. OOU1 is a suspected non-impact training area.

- OOU2 – The central portion of the proposed eastern bypass right-of-way. OOU2 is a known impact area.

- OOU3 – The southern portion of the proposed eastern bypass right-of-way, south of the known impact area. OOU3 is a suspected non-impact area.

4.1.1 OOU1

Preliminary investigations suggested this 103-acre area likely was used for field-training activities. South of OOU1, within the bypass right-of-way, is a known impact area. During the ground reconnaissance, no evidence of UXO was found; however, OE training items were discovered in this area, confirming the likelihood that field training occurred. Within OOU1, 8.56 acres with characteristics indicative of OE activities were selected for geophysical investigation. The project team intrusively sampled 2.41 acres.

4.1.2 OOU2

The USACE, St. Louis District (June 1996) and the USAESCH (June 1997) conducted investigations of this area. Preliminary investigations determined this 170-acre area contained significant amounts of OE and UXO. As a known impact area, ZAPATAENGINEERING conducted neither ground reconnaissance nor geophysical investigations in this OOU for preparation of the EE/CA.

4.1.2.1 Findings from the St. Louis District are documented in the Final Fort McClellan ASR, July 1999. Historical records research and ground reconnaissance performed by St. Louis indicated that range fans from a 60mm mortar range, a 2.36-inch rocket launcher range and a tank range extend into OOU2. The 60mm mortar range appeared to have been first used during World War II and was abandoned sometime between 1958 and 1967. The 2.36-inch rocket launcher range appeared on a 1950 range map and was abandoned before 1958. The tank range first appeared on the 1958 range map and was abandoned by 1967.

4.1.2.2 In June 1997, the USAESCH conducted a ground reconnaissance of the entire route of the proposed eastern bypass. The only evidence of ordnance found during the reconnaissance was within the boundaries of a designated dud impact area in OOU2, which includes the range fans of the 60mm mortar range and the 2.36-inch rocket range. The ground reconnaissance team found surface evidence of 60mm high explosive (HE) mortars and 2.36-inch rockets within the area designated as OOU2. Hand held magnetometers also indicated shallow subsurface anomalies. The results of the ground reconnaissance indicated that the ordnance density was moderate to high with the highest density occurring on the eastern slope of Iron Mountain, west of Iron Mountain Road (Clinkenbeard, V., 1999).

4.1.3 OOU3

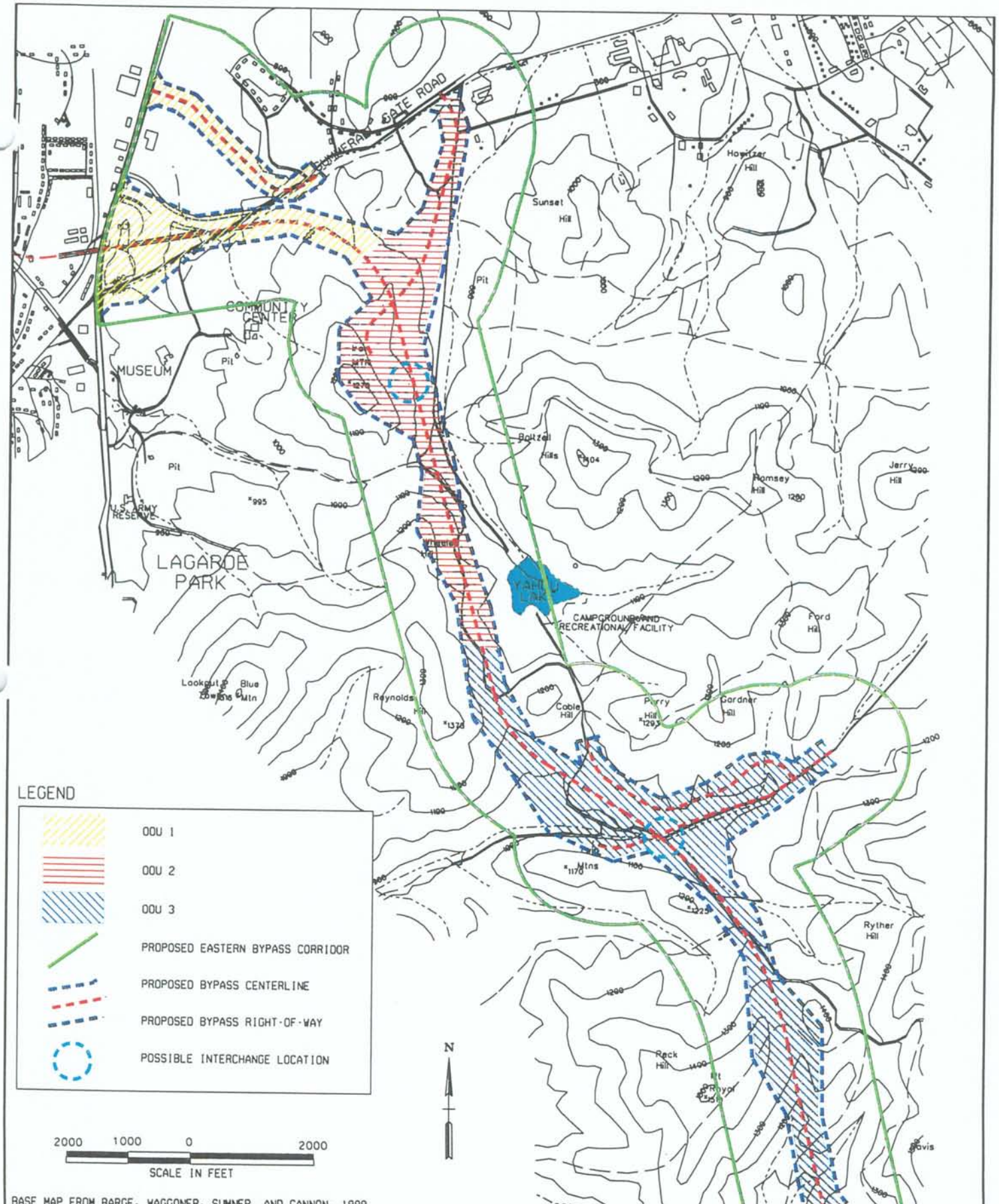
Preliminary investigations suggested this 259-acre area was not situated within a known impact area or defined range fan. During ground reconnaissance activities, one expended M18 smoke grenade and one expended simulation charge were discovered. No UXO items were discovered. Therefore, the USAESCH and ZAPATAENGINEERING concluded this area did not require further geophysical investigation.

4.2 Grid Selection and Sample Location Selection Rationale

Before conducting the geophysical investigation in OOU1, ZAPATAENGINEERING, accompanied by a representative of the USAESCH, visited several areas within OOU1 to the north and south of Summerall Gate Road. Four representative areas were selected for geophysical investigation based on evidence found during the historical document review and ground reconnaissance, as shown on Figure 4-2 of ZAPATAENGINEERING's Final Work Plans. Prior to geophysical investigation the four general areas were precisely located based on terrain, cultural and vegetation limitations and two additional areas were added. These areas were designated Area 1 through Area 6 and are shown on Figure 4-2. ZAPATAENGINEERING collaborated with a biologist and a botanist from the Fort McClellan Office of the Environment and determined the six sites to be free of endangered species and wetlands.

4.3 Source, Nature and Extent of OE Occurrence

The source, nature and extent of the possible OE occurrence were preliminarily determined for the proposed eastern bypass right-of-way prior to OOU segregation and intrusive investigation. Historically, several areas within OOU1 were used for small unit training exercises. Therefore, ZAPATAENGINEERING predicted OOU1 would contain various training items likely scattered on or near the ground surface. Areas within OOU2 had a history of use as impact ranges. ZAPATAENGINEERING predicted OOU2 would contain dense concentrations of OE items, including UXO, both on the ground surface and in the subsurface. Finally, no direct evidence suggested the possibility of past training activities within OOU3. ZAPATAENGINEERING predicted OOU3 would contain little to no training items and that any training items discovered would be scattered surface debris.



BASE MAP FROM BARGE, WAGGONER, SUMNER, AND CANNON, 1998

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PROJECT TITLE: FORMER FORT McCLELLAN PROPOSED EASTERN BYPASS
DRAWING TITLE: ORDNANCE OPERABLE UNITS

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DACA87-95-D-0026-0004	982500	PAGE: 4-3	DSW	AS SHOWN	FIGURE 4-1

4.4 Summary of Ordnance and Explosive Hazards

A variety of OE and ORS items was discovered throughout the proposed eastern bypass right-of-way. The USAESCH refers to 0.50 caliber rounds and smaller as small arms and suggests that small arms present a very low hazard or risk to the public. OOU1 contained OE/ORS items including training items and one UXO item. OOU2 contained the highest density of OE/ORS items, both training items and UXO. Based on preliminary investigations, OOU3 contained the lowest density of OE/ORS items, all of which were OE training items or ORS.

4.4.1 OOU1

OOU1 was investigated most thoroughly through the application of geophysical methodologies over 8.56 acres. This area contained OE training items and ORS. The OE/ORS items discovered included 60mm practice mortars, 2.36-inch practice rockets and expended smoke grenades. One pyrotechnic OE item classified as UXO, a mine activator, was recovered and detonated on-site. Evidence of small arms, expended .30 caliber shells, was also discovered. See Table 4-1 for a summary of the sampling results.

4.4.2 OOU2

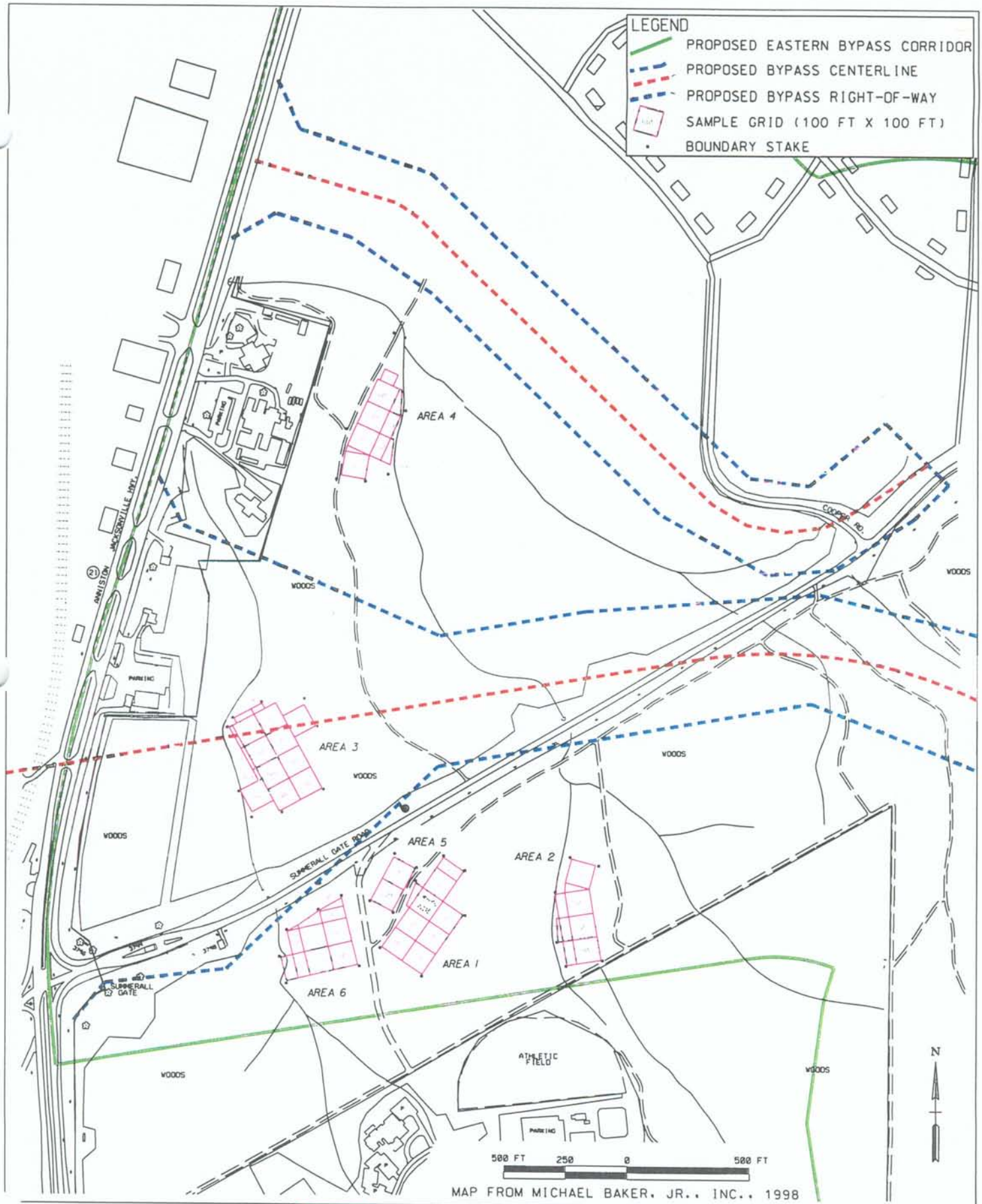
OOU2 was investigated using historical record review and ground reconnaissance. Historical records indicate that this area was used as a 60mm mortar range, a 2.36-inch rocket launcher range and a tank range. Ground reconnaissance efforts by USACE, St. Louis District, and the USAESCH indicated a moderate to high density of surface OE occurrences from 60mm (HE) mortars, 2.36-inch rockets and ORS. Hand-held magnetometers also indicated subsurface anomalies attributed to OE/ORS. Naturally occurring iron-bearing material was also detected with the magnetometers and may account for some of the subsurface anomalies. No subsurface intrusive sampling was performed during these efforts.

4.4.3 OOU3

ZAPATAENGINEERING conducted a visual inspection of OOU3. During the intensive ground reconnaissance, only one expended smoke grenade and one simulation charge were found in OOU3. No UXO items were discovered. No geophysical investigations were conducted in OOU3. Refer to Appendix B-1 for the Ground Reconnaissance Trip Report.

4.5 Geophysical Data and Interpretation

Geophysical data were collected in OOU1 using a surveyed grid system and a Geonics EM-61. No intrusive investigations were conducted in the prove-out grid. SC&A analyzed and reported the data to ZAPATAENGINEERING. ZAPATAENGINEERING and the USAESCH reviewed and interpreted the data and designated anomalies for excavation during the sampling effort. Refer to Appendix B of the EE/CA for the detailed geophysical report.



MAP FROM MICHAEL BAKER, JR., INC., 1998

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PROJECT TITLE: FORMER FORT McCLELLAN PROPOSED EASTERN BYPASS

DRAWING TITLE: OOU1 SAMPLE AREAS

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Table 4-1 Sampling Results Summary

Grid	Acres	Anomalies Investigated	Holes Investigated	Total Items Removed	OE/ORS			Other					
					Non-brass	UXO	Total	Brass	Horseshoe or	Nail	Wire	Rock	Misc.
A1G1	0.11	8	11	13	1	0	1	0	0	0	3	7	2
A1G2	0.23	1	1	1	1	0	1	0	0	0	0	0	0
A1G4	0.23	14	16	16	1	0	1	0	0	0	12	2	1
A3G5	0.23	44	53	72	0	0	0	0	21	42	2	0	7
A4G1	0.23	8	8	8	1	0	1	1	0	0	3	0	3
A4G3	0.23	11	16	51	7	0	7	28	2	3	4	0	7
A4G4	0.23	21	22	16	0	0	0	5	2	1	2	5	1
A4G5	0.23	16	19	18	3	0	3	1	3	4	2	0	5
A4G10	0.11	4	10	24	4	0	4	15	1	0	4	0	0
A4G11	0.11	11	13	13	2	0	2	0	2	0	3	2	4
A5G4	0.23	1	5	5	0	1	1	0	0	0	1	1	2
A5G5	0.23	22	30	34	4	0	4	0	2	14	0	8	6
Totals:	2.41	161	204	271	24	1	25	50	33	64	36	25	38

Misc. items include: metal clamps, rusted cans, a jeep mirror, metal pieces and iron rods

STREAMLINED RISK EVALUATION

EASTERN BYPASS
ENGINEERING EVALUATION/COST ANALYSIS (EE/CA)
AT
FORT MCCLELLAN

FORT MCCLELLAN, ALABAMA

Prepared for:

US ARMY ENGINEERING AND SUPPORT CENTER
HUNTSVILLE

by:

ZAPATAENGINEERING, PA

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5.0 STREAMLINED RISK EVALUATION

The risk associated with encountering OE, specifically UXO, within the proposed eastern bypass right-of-way, was determined based upon the results of the ground reconnaissance and the geophysical investigations conducted by ZAPATAENGINEERING and the USAESCH. OE and UXO items were found within the proposed eastern bypass right-of-way and were found to present a real risk to human health. The following items were encountered during the ground reconnaissance:

- Expended smoke dispenser spheres and illumination signal (slap flare) ORS were found in OOU1 and OOU3. These training items are filled with a pyrotechnic mixture when live and are usually expended with no remaining hazard. Any live items encountered would present a low risk of accidental initiation unless someone purposely attempted to tamper with them.

- A M20 practice mine with expended M604 training fuse and a M1 practice activator in the secondary fuse well was found in OOU1. These mines were used to train personnel how to position and remove mines. The fuse is approximately 314 milligrams and is designed to provide a noise and smoke return when run over by a vehicle or tank. The M1 activator performs the same function (noise and smoke return) for booby trapping a mine. A live practice mine presents a low risk unless it is disassembled and then purposely tampered with by trying to activate the fuse or M1 activator. Encounters with these practice mines should be extremely rare as they were training items to be reused and, therefore, accountable in the military supply system.

- Unexpended and expended blank small arms ammunition (5.56mm). Small arms ammunition is not considered OE and presents no hazard unless purposely tampered with (i.e., placing in a fire or striking the primer with a sharp object). Thus, blank small arms are even less of a hazard than small arms ammunition.

Based on the evidence found during the ground reconnaissance and the associated risks, OOU1 was intrusively sampled. The ground reconnaissance of OOU2 provided evidence of many OE items that contain high inherent risks. The USAESCH concluded the associated risk for OOU2 was so high that it must be cleared prior to construction efforts. OOU3 contained so few OE items with such low associated risk that ZAPATAENGINEERING and the USAESCH concluded no further sampling was necessary. The following items were encountered during the intrusive sampling effort.

- OE items encountered in OOU1 include 60mm practice mortars, 2.36-inch practice rockets and expended smoke grenades. Practice mortars normally contain a small pyrotechnic spotting charge in the fuse and presents a minor hazard if not discharged. The fuse is not particularly sensitive and does not pose a significant threat unless mishandled. Fired 2.36-inch practice rockets do not contain a spotting charge and are totally inert. The major concern is that practice mortars and rockets were normally used in areas where HE items were also fired. The items encountered may have been found near the extreme limits of the former range fan. Mechanical and human error causes some items to extend beyond designated range fan boundaries.

Based on the evidence collected for OOU1 and OOU2, these areas will require removal of surface and subsurface items prior to construction of the bypass. OE removal is not expected to be necessary in OOU3 prior to construction based on the lack of OE/ORS evidence.

The findings of this EE/CA are relevant only to the area within the proposed bypass right-of-way. Therefore, the recommended risk reduction alternatives are focused, first on the protection of highway construction personnel and second on future bypass users. Surface and subsurface removal of OE items in OOU1 and OOU2 will greatly reduce the risk of possible OE encounters for bypass construction workers. To augment the safety of construction personnel, on-site meetings will be conducted to discuss the appropriate response in the event suspect items are encountered. Additionally, informative brochures will be developed and distributed to all construction managers and personnel prior to construction activities. Implementation of these risk reduction alternatives should greatly reduce possible risk to constructions workers associated with OE before and during construction of the proposed bypass (see Section 7.0).

Construction of the bypass should all but eliminate remaining risk to future bypass users.

RISK REDUCTION OBJECTIVES

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6.0 RISK REDUCTION OBJECTIVES

The specific objectives of risk reduction at the former Fort McClellan include the following:

- minimize risk to on-site construction personnel;
- detect and dispose of OE/ORS items where threats exist to the public or to site workers;
- minimize environmental damage during risk reduction;
- identify and implement appropriate technologies for maximum risk reduction; and
- use appropriate informed personnel and implement safety measures to reduce the risk of OE/ORS exposure.

6.1 Identification of Technologies

Potential technologies for the detection, recovery and disposal of OE/ORS at the former Fort McClellan are identified in the following sections. A UXO supervisor should be included in each of the activities described in the following sections.

6.1.1 Detection

Several geophysical instruments and methods are available in today's market and are commonly used to detect buried ordnance. These instruments and methods are generally classified based on their detection methodology (i.e., physical, electrical or chemical). Buried ordnance detection methodologies include ground penetrating radar (GPR), electromagnetic induction, magnetometers and chemical sniffers. Two specific instruments, the Geonics EM-61 electromagnetic induction sensor and the Geometrics G-858 cesium vapor magnetometer, were selected for EE/CA sampling at the former Fort McClellan. Selection of these specific instruments was based upon direct relevant experience on similar OE detection, location and characterization operations. Currently, these sensors represent some of the best performing devices for OE detection as determined at the US Army Jefferson Proving Ground (JPG) in tests conducted over the last four years. Refer to the Geophysical Report in Appendix B for additional information.

6.1.2 Recovery

During the EE/CA sampling, anomaly target locations were located relative to the wooden hubs installed at each individual grid corner. GPS location proved difficult and unreliable because of the dense tree canopy. OE/ORS items recovered from the sampled grids in OOU1 were excavated manually using shovels and trowels and identified for the appropriate disposal method. Use of a miniature open-front barricade (MOFB) was necessary because of the proximity of civilian structures to the sampling sites. This method was efficient and cost effective for the sampling efforts conducted in OOU1.

6.1.3 Disposal

Once the OE is recovered and identified, it may be disposed of by the following methods:

- in-situ detonation (i.e., blow-in-place),
- off-site detonation, or
- incineration.

6.1.3.1 In-situ detonation is the destruction of OE prior to removal from the ground. The item is located, identified and detonated in place. This is necessary when the item in question is deemed unsafe to transport.

6.1.3.2 Off-site detonation requires that the item be removed from the excavation site and transported to an approved disposal area for detonation.

6.1.3.3 Incineration also requires removal of the item from the excavation site and transportation to an approved incineration facility where the item undergoes destruction through combustion.

6.1.3.4 In-situ detonation was the only disposal option approved for OE recovered at the former Fort McClellan as described in the Work Plans and directed by the US Army Engineering and Support Center, Huntsville.

6.2 Identification of Technical Limits on Removal Actions

Two main technical limitations on removal actions can be identified in today's modern OE technology and both relate to data collection and analysis capabilities. Accurate data collection is a function of detection technology, instrument sensitivity and location accuracy. The EE/CA process showed that at the former Fort McClellan location accuracy may be the greatest technical limitation. During the spring, the tree canopy is too dense to allow for the use of Global Positioning System (GPS), real-time or differential. The instrument's tick-wheel may be used in place of GPS. The tick-wheel method of location may be inaccurate on rough terrain like that found at former Fort McClellan.

6.3 Determination of Removal Action Scope and Schedule

A removal action in the proposed eastern bypass right-of-way should include site preparation, OE/ORS detection, excavation and disposal. Site preparation should involve extensive brush clearing throughout much of the former installation. Manual excavation of OE/ORS items may require the use of engineering controls such as a barricade to protect the public when their location is within the fragmentation zone. On-site detonation should be managed in accordance with site protocols and, in most cases, will be blow-in-place (BIP) at the end of each day. The removal action schedule will be coordinated with construction of the proposed eastern bypass.

6.4 Analysis of Alternatives

This section provides an analysis of risk reduction alternatives for areas containing ordnance and explosives. Effectiveness, implementation capability and cost represent the primary criteria the analysis considers for each alternative presented. Each criterion is further divided into specific factors for a complete analysis of the alternatives, as discussed in the following paragraphs.

6.4.1 Effectiveness

This criterion refers to the ability of an alternative to reduce risk to the public and the environment. The following factors are considered during the effectiveness analysis:

6.4.1.1 Overall Protection of Public Health and the Environment

This evaluation criterion assesses the effectiveness of an alternative and its ability to meet the objective within the scope of the proposed alternative. It is discussed in terms of protectiveness of public health and the environment.

6.4.1.2 Long-Term Effectiveness and Permanence

This evaluation criterion addresses the effectiveness of an alternative in terms of the risk remaining at the site after the risk reduction objectives have been met. The following components are considered for each alternative:

1. the magnitude of risk remaining due to untreated waste or treatment residuals following the completion of the alternative, and

2. the adequacy and reliability of the controls that are used to manage untreated wastes or residuals remaining at the site.

6.4.1.3 Reduction of Mobility, Toxicity, or Volume (MTV)

This evaluation criterion assesses the level to which the alternative reduces risk by reducing the total mass and volume of potential OE/ORS items, reducing the toxicity of potential OE/ORS items and/or irreversibly reducing the mobility of the potential OE/ORS items. This criterion is not applicable to ordnance items in the environment.

6.4.1.4 Short-Term Effectiveness

This evaluation criterion addresses the effects of the risk reduction alternative during implementation, with respect to the effects on human health and the environment following implementation. The following factors are addressed, as appropriate, for each alternative:

1. the potential risk to the community and to construction workers;

2. the potential risk to workers implementing the risk reduction alternatives;

3. the potential for adverse impacts to the environment;

4. the time required to meet risk reduction alternatives.

6.4.1.5 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

This evaluation criterion serves as a final check to assess whether each alternative meets all the potential federal and state ARARs as identified in the EE/CA process. ARARs are "those cleanup standards, standards of control and other substantive environmental protection

requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site" (40 CFR 300.5).

6.4.1.5.1 Selection of an ARAR is dependent upon the hazardous substances present at the site, site characteristics and location and action selected for remediation. Chemical-specific ARARs are health- or risk-based concentration limits for specific hazardous substances. Location-specific ARARs address circumstances such as the presence of endangered species on the site or location of the site in a 100-year floodplain. Action-specific ARARs control or restrict specific types of actions selected as alternatives for site cleanup.

6.4.1.5.2 No chemical-specific ARARs exist for remediation of sites containing chemical warfare materiel or ordnance and explosives.

6.4.2 Implementation Capability

This criterion refers to the technical and administrative feasibility of implementing the alternative and the availability of materials and services required for implementation. The following factors must be considered during the implementation analysis:

6.4.2.1 Technical Feasibility

The following items should be considered relative to the practicality of completing the alternative considering physical constraints and the previous use of established technologies:

1. The ability to construct and operate the alternative;

2. the reliability or ability of a technology to meet specified performance goals;

3. the ability to undertake possible future risk reduction actions; and,

4. the ability to monitor the effectiveness of the alternative.

6.4.2.2 Administrative Feasibility

This factor evaluates the activities required to coordinate with multiple offices and agencies (e.g., obtaining permits for off-site activities, right-of-way or alignment agreements, compliance with statutory limits) and private property owners.

6.4.2.3 Availability of Services and Materials

This factor evaluates the availability of technologies (materials and services) required to implement the alternative. The following items should be considered:

1. The availability and capacity of off-site treatment, storage and disposal;

2. the availability of personnel and technology to implement the alternative;

3. the availability of prospective technologies; and,

4. the availability of services and materials.

6.4.2.4 Regulatory Acceptance

This factor evaluates the concerns and issues that the US Environmental Protection Agency, the State of Alabama and local government agencies may have regarding the alternative. Regulatory acceptance will be a factor in the final selection of the alternative(s) presented in the EE/CA Action Memorandum.

6.4.2.5 Community Acceptance

This factor evaluates the concerns and issues the public may have regarding the alternative. Community acceptance will be a factor in the final selection of the alternative(s) presented in the EE/CA Action Memorandum.

6.4.3 Cost

The total estimated costs include direct and indirect costs. Estimated costs for each alternative are provided in Section 8.0 with each associated alternative analysis. Additional information on the cost estimates is provided in Appendix D.

IDENTIFICATION AND ANALYSIS OF RISK REDUCTION ALTERNATIVES

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7.0 IDENTIFICATION AND ANALYSIS OF RISK REDUCTION ALTERNATIVES

ZAPATAENGINEERING has identified several risk reduction alternatives for discussion in this report based on the nature, extent and analysis of OE occurrence, intended land uses and, ultimately, risk reduction goals. In this section, each alternative is discussed in detail and evaluated with respect to the requisite criteria. Available alternatives to address OE occurrence may be categorized as non-removal and removal alternatives. Non-removal alternatives include no DoD action indicated (NDAI) and implementation of institutional controls. Removal alternatives include surface clearance, clearance (surface and subsurface) for intended land use and construction support.

7.1 Alternative 1 – Institutional Controls

Institutional controls utilize education and land use restrictions to minimize exposure of bypass construction personnel to OE. Institutional controls rely on behavior modification and site access control strategies to eliminate or minimize risk. Institutional control strategies, including education and/or physical site access controls, are appropriate where risk to the public has been documented as low and can be managed without the removal of OE. With the exception of digging for sign post installation, no intrusive activity will be associated with this alternative. Such controls can be implemented with low capital cost and low subsequent annual operating costs.

7.1.1 Institutional controls applicable to the proposed eastern bypass through former Fort McClellan consist of:

- educating Alabama Department of Transportation (ALDOT) and construction contractor personnel of the potential hazards associated with the construction of the proposed eastern bypass and

- posting signs along the bypass warning individuals not to dig unless designated officials are notified.

7.1.2 Sign posting will involve designing and installing signs at strategic locations frequented by the public or land developers, informing them of the potential dangers of coming into contact with ordnance. Signage will prevent or discourage either entry into, or intrusive activities within areas suspected of containing ordnance and explosives.

7.1.3 Effectiveness

7.1.3.1 Overall Protection of Public Health and the Environment

Institutional controls will not remove or destroy OE and, therefore, cannot be seen as providing absolute protection to public health and the environment. However, to the extent that the controls are effective, the threat to public health and the environment will be reduced. The level of protection will be greater than provided by Alternative 4, No DoD Action Indicated, because informing the public and construction personnel of the dangers related to ordnance and restricting access into areas containing OE will reduce the likelihood of accidental exposure to OE. However, the OE will remain in place, thus, posing a threat to the environment and a potential risk to the public.

7.1.3.2 Long-Term Effectiveness and Permanence

Institutional controls will restrict future construction activities and reduce the possibility of exposure to OE. The opportunity for accidental exposure will increase if the signs are removed or deteriorated or if persons are allowed to enter the areas. Public education will require follow-up to achieve long-term effectiveness as new developers move into Calhoun County seeking opportunities for land development. Signs, as permanent structures, should require minimal maintenance.

7.1.3.3 Short-Term Effectiveness

Safety concerns during the implementation period will be associated with the potential for workers to be exposed to OE during sign installation. OE avoidance procedures will be employed and minimal soil excavation will be required to install the signs. There should be no risk to the affected community and no adverse environmental impacts from implementing this alternative.

7.1.3.4 Compliance with Applicable or Relevant & Appropriate Requirements (ARARs)

No chemical-specific ARAR is associated with OE. Action-specific ARARs potentially applicable to this alternative include excavation and worker safety. Location-specific actions that jeopardize critical habitats or threatened or endangered species will be avoided during site activities.

7.1.4 Implementation Capability

7.1.4.1 Technical Feasibility

The technology associated with implementing this alternative (i.e., sign posting and advertising) is reliable, readily accessible and easily implemented. It is common and has been used at similar sites. The services of unexploded ordnance (UXO)-qualified personnel are not required except to clear sign locations.

7.1.4.2 Administrative Feasibility

Posting of signs should be administratively feasible in most areas. However, they will require coordination with the Alabama Department of Transportation and the Anniston-Calhoun County-Fort McClellan Joint Powers Authority (JPA). No permits or waivers are anticipated to implement this alternative and the need for additional right-of-way agreements beyond the proposed eastern bypass right-of-way is not expected. Implementation of the public education component of this alternative should require no right-of-way or zoning variances.

7.1.4.3 Availability of Services and Materials

Public education will not require special materials or equipment. Required services are readily available. The sign posting installation alternative will be easily implemented, as no special equipment and/or operators are required. While conventional construction equipment and techniques are usually adequate, UXO-trained personnel must clear the area prior to installation and ensure that proper safety precautions are implemented to prevent untrained personnel from handling OE.

7.1.4.4 Regulatory Acceptance

No state or local permits are anticipated with this alternative. EPA, ADEM and local government acceptance is anticipated with this alternative.

7.1.4.5 Community Acceptance

It is expected that the local community will accept education and sign posting alternatives. The community may express concerns because this alternative does not remove the OE and, therefore, may not be viewed as a permanent solution.

7.1.5 Cost

The estimated cost for this alternative is presented in Section 8.0. The estimated cost is dependent upon several factors including the length of the proposed bypass, the spacing of the signs and the effort involved to educate the construction personnel.

7.2 Alternative 2 – Surface Removal of OE

Surface clearance involves utilizing UXO specialists who are trained to recognize, handle and dispose of ordnance, to perform a visual inspection of the entire surface of each OOU and to remove OE from the ground surface to a depth of no greater than six inches. The UXO specialists will then ensure the proper disposal of the recovered material. This alternative is effective in minimizing the risk of incidental contact with OE in areas where non-intrusive activities are not likely.

7.2.1 In order to perform a visual survey, site preparation activities will be required including the removal of brush, shrubs and surface debris and conducting limited geophysical surveys. The geophysical investigation is usually conducted using a magnetometer. Probing of the near-surface soils to a depth of approximately six inches may be performed to investigate magnetic anomalies and identify near-surface metallic debris not visibly apparent. The efforts associated with implementing this alternative will vary throughout the proposed eastern bypass right-of-way, depending upon topography and vegetative cover.

7.2.2 Surface clearance is appropriate where surface OE is confirmed, or where surface inspections have not been performed. OE surveys and surface removal activities have occurred throughout the proposed eastern bypass right-of-way.

7.2.3 Effectiveness

7.2.3.1 Overall Protection of Public Health and the Environment

Surface clearance is effective in the removal of OE items most likely to be encountered by the public and will greatly reduce the risk of an accidental encounter with ordnance. Surface clearance will not remove all OE, particularly that present in the subsurface, thereby providing only limited protection for intrusive activities.

7.2.3.1.1 The extent to which surface clearance increases overall protection during construction is strongly related to the quantity of OE that is on or near the surface. In areas where surface OE is common, implementation of this alternative can greatly reduce the level of risk.

7.2.3.2 Long-Term Effectiveness and Permanence

Surface clearance is a reliable means of reducing exposure to individuals who are engaged in non-intrusive activities and will reduce direct contact with ordnance and explosives at the surface. The possibility of exposure during intrusive activities remains; therefore, removal of risk associated with OE (surface and subsurface) will not be fully achieved. Erosion, wetting and drying and/or frost heave may potentially allow buried items to migrate to the surface. Implementing this alternative may not ensure complete removal of OE items; therefore, there will continue to be a potential risk of OE exposure to the public.

7.2.3.3 Short-Term Effectiveness

Safety concerns during the implementation period will be associated with the potential for UXO workers to be exposed to OE during the surface clearance. Adherence to the requisite safety procedures and associated Site Safety and Health Plans will significantly limit the risk to site workers. There should be no risk to the affected community and minimal adverse environmental impacts from implementing this alternative.

7.2.3.4 Compliance with ARARs

No chemical-specific ARAR is associated with OE. Action-specific ARARs potentially applicable to this alternative include excavation, protection of critical habitat and endangered species, and worker safety. Location-specific actions that jeopardize critical habitats or threatened or endangered species will be avoided during site activities.

7.2.4 Implementation Capability

7.2.4.1 Technical Feasibility

The surface clearance alternative is technically feasible for all OOUs. Efforts associated with implementing this alternative will vary based on the topography, terrain and vegetative cover in each area. UXO-qualified personnel must be used during implementation of all aspects of this alternative. Public education is also an integral part of the surface clearance alternative.

7.2.4.2 Administrative Feasibility

Surface clearance activities should be administratively feasible in most areas. Activities associated with this alternative will need to be coordinated with the USAESCH, the ALDOT and the JPA. No permits or waivers are anticipated to implement this alternative, and the need for additional alignments or right-of-way agreements beyond the proposed eastern bypass right-of-way is not expected. Permits and/or approvals may be required if it becomes necessary to transport OE offsite for disposal. Implementation of the education component of this alternative should not require right-of-way or zoning variances.

7.2.4.3 Availability of Services and Materials

The special equipment, skills, personnel and technologies associated with this alternative include geophysical investigation, land clearing and UXO training. Proper safety precautions must be implemented to prevent untrained individuals from handling OE.

7.2.4.4 Regulatory Acceptance

No state or local permits are anticipated with this alternative. EPA, ADEM and local government acceptance is anticipated with this alternative.

7.2.4.5 Community Acceptance

The community may express concerns because this alternative does not remove all OE items and, therefore, may not be viewed as a permanent solution. The public may prefer more complete clearance of areas within the bypass right-of-way that are intended for extensive reuse. This alternative will be viewed as preferable to Alternative 1, Institutional Controls, Alternative 4, No DoD Action Indicated or Alternative 5, Construction Support. A positive community relations program will be warranted to support implementation of this alternative.

7.2.5 Cost

The estimated cost to perform surface clearance along the proposed eastern bypass right-of-way varies with topography, vegetative cover and site access. The items included in the cost estimate (Section 8.0) are site preparation and clearing, surveying, quality control, visual inspection of cleared areas, limited geophysical investigation, removal and disposal of OE, mobilization and demobilization and posting signs. The signs will be posted to advise the public that there is a potential for encountering OE in the area, particularly if they engage in intrusive activities.

7.2.5.1 The cost to implement the surface removal alternative is based on the estimated density of surface OE within each OOU. This density is based on the information available from the EE/CA investigation and results of sampling conducted by ZAPATAENGINEERING (OOU1 and OOU3) and the USAESCH (OOU2). The estimated costs are based on ZAPATAENGINEERING's experience in completing similar projects, discussions with UXO-trained personnel and knowledge of the site. As the topography and vegetative cover vary across the site, the unit costs are assigned based on average conditions across the entire OOU.

7.2.5.2 The educational program described in Alternative 1 is applicable to the entire project. These costs are in addition to costs developed for implementing this alternative in each OOU (see Section 8.0).

7.3 Alternative 3 – OE Clearance for Intended Land Use

This alternative involves 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. Activities may potentially include vegetation clearance as necessary to conduct geophysical surveys, completion of geophysical investigations, excavation of anomalies and destruction of OE. Technologies that may be used for this alternative include magnetic and/or electromagnetic geophysical investigative methods and management/disposal of OE (including detonation of UXO). This alternative includes surface clearance over the entire site and excavation and clearance in known impacted areas. The removal depth may be determined by using site-specific information, including the nature of the site, types of ordnance expected, the depths at which ordnance most likely will be found and anticipated future land use.

7.3.1 Department of Defense Explosives Safety Board (DDESB) guidelines state that the depth of UXO clearance depends upon the projected end use of the land and the extent of possible OE

exposure to humans. For planning purposes, the DDESB suggests different clearance depths for different land uses such as undefined use, invasive use, unrestricted use and construction use. Actual clearance depths may be modified based on actual depths at which ordnance is consistently found.

7.3.2 As with Alternative 2, the effort associated with implementing Alternative 3 will vary within and between OOUs, depending upon topography, vegetation and site access. As previously discussed, the education component of Alternative 1 should be included with the implementation of this alternative.

7.3.3 Effectiveness

7.3.3.1 Overall Protection of Public Health and the Environment

In two of the three OOUs, implementing this alternative will significantly reduce the potential for direct contact with OE. This alternative will provide a more effective overall protection of public health and the environment than Alternatives 1, 2, 4 or 5.

7.3.3.2 Long-Term Effectiveness and Permanence

The potential for exposure to OE will be greatly reduced through implementation of this alternative. This alternative will be an effective and permanent solution for reducing risk of exposure at specified depths. This alternative will not require that annual operation and maintenance be considered; that issue would be addressed only if additional intrusive activities were to be initiated below the depth cleared.

7.3.3.3 Short-Term Effectiveness

The potential for OE exposure to UXO workers during clearance and removal activities may be significant. Strict adherence to the USAESCH safety procedure manuals and the Site Safety and Health Plan is required. The anticipated risk to the public resulting from implementation of this alternative is considered minimal. In the event that OE is discovered and detonation is the preferred disposal option, the area may be affected by noise and ground shock. Environmental impacts from clearance for use should be minimal.

7.3.3.4 Compliance with ARARs

No chemical-specific ARAR is associated with OE. Action-specific ARARs potentially applicable to this alternative include excavation, protection of critical habitat and endangered species and worker safety. Location-specific actions that jeopardize critical habitats or threatened or endangered species will be avoided during site activities.

7.3.4 Implementation Capability

7.3.4.1 Technical Feasibility

Alternative 3 is technically feasible for all OOUs. Efforts associated with implementing this alternative will vary based on topography, terrain and vegetative cover in each area. UXO-qualified personnel must be used during implementation of all aspects of this alternative. Education is also an integral part of the clearance-for-use alternative.

7.3.4.2 Administrative Feasibility

Clearance-for-use activities should be administratively feasible in most areas. Activities associated with this alternative will need to be coordinated with the USAESCH, the ALDOT and the JPA. No permits or waivers are anticipated to implement this alternative and the need for additional alignments or right-of-way agreements beyond the proposed eastern bypass corridor is not expected. Permits and/or approvals may be required if it becomes necessary to transport OE offsite for disposal. Implementation of the public education component of this alternative should not require alignments, right-of-way, or zoning variances.

7.3.4.3 Availability of Services and Materials

The special equipment, skills, personnel and technologies associated with the clearance-for-use alternative include geophysical investigation, land clearing and UXO training. Proper safety precautions must be implemented to prevent untrained individuals from handling OE.

7.3.4.4 Regulatory Acceptance

No state or local permits are anticipated with this alternative. EPA, ADEM and local government acceptance is anticipated with this alternative.

7.3.4.5 Community Acceptance

The clearance-for-use alternative should be well received by the community, as it represents the highest level of OE removal, resulting in the greatest overall protection to the public. Some individuals may be concerned that the alternative will disrupt routine activities in the area and potentially destroy property and/or habitat by excavation and detonation in-place. A positive community relations program will be warranted to support implementation of this alternative to ensure the public that appropriate measures will be taken to minimize inconveniences and prevent damage to local property or habitat.

7.3.5 Cost

The estimated cost to perform clearance-for-use along the proposed eastern bypass right-of-way depends on topography, vegetative cover and site access. The items included in the cost estimates are site preparation and clearing, surveying, quality control, visual inspection of cleared areas, geophysical investigation, removal and disposal of OE, mobilization/demobilization and sign posting. Signs will be posted to advise the public that there is a potential for encountering OE in the area, particularly if they engage in intrusive activities (see Section 8.0).

7.3.5.1 The cost to implement this alternative is based on the estimated density of surface OE within each OOU. This density is based on the information available from the EE/CA investigation and sampling results conducted by ZAPATAENGINEERING (OOU1 and OOU3) and the USAESCH (OOU2). The estimated costs are based on ZAPATAENGINEERING's experience in completing similar projects, discussions with UXO-trained personnel and knowledge of the site. As the topography and vegetative cover vary across the site, the unit costs are assigned as the average costs across the entire OOU.

7.3.5.2 The educational program described in Alternative 1 is applicable to the entire project. These costs are in addition to the costs developed for implementing this alternative in each OOU.

7.4 Alternative 4 – No DoD Action Indicated

This no-action alternative is included to provide a baseline comparison with other risk reduction alternatives. No technology is associated with this alternative. No risk reduction measure resulting in the treatment, containment, removal of or limited exposure to OE will be implemented. Therefore, potential OE will not be removed and no restriction will be placed on access to the site. The No DoD Action Indicated alternative is appropriate for sites where no OE has been found, where there is no documented evidence of OE usage, or where the nature and extent of the OE occurrence (e.g., small arms ammunition) poses minimal threat to those who may encounter it.

7.4.1 Effectiveness

7.4.1.1 Overall Protection of Public Health and the Environment

This alternative implements no risk reduction. Since the potential OE will remain in place, there will be no reduction of risk to the public from exposure to ordnance.

7.4.1.2 Long-Term Effectiveness and Permanence

With this alternative, OE will remain in place and there will be no long-term change to site conditions. The magnitude of the risk will remain undiminished and will contribute nothing towards future remedial objectives.

7.4.1.3 Short-Term Effectiveness

Implementing the no-action alternative will result in no short-term risk to the surrounding community. No adverse environmental impacts from implementing this alternative will occur.

7.4.1.4 Compliance with ARARs

Because no actions will be implemented, no location-specific, action-specific, or chemical-specific ARAR is applicable. No ARAR is identified for ordnance-related activities.

7.4.2 Implementation Capability

7.4.2.1 Technical Feasibility

This alternative involves no action; therefore, technical feasibility is not applicable to this alternative.

7.4.2.2 Administrative Feasibility

This alternative is administratively feasible.

7.4.2.3 Availability of Services and Materials

No services or materials will be required to implement this alternative.

7.4.2.4 Regulatory Acceptance

No state or local permits are anticipated with this alternative. EPA, ADEM and local government acceptance is not anticipated with this alternative.

7.4.2.5 Community Acceptance

The community may express concerns regarding this no-action alternative, because evidence of OE occurrence exists for the proposed eastern bypass right-of-way. This alternative is generally not recommended for sites with known or suspected OE.

7.4.3 Cost

There is no estimated cost associated with this alternative.

7.5 Alternative 5 – Construction Support

Construction support involves utilizing two UXO technicians who are trained to recognize, handle and dispose of ordnance for on-site monitoring for the duration of bypass construction. Specific responsibilities include visually inspecting the construction surface of each OOU and responding to any discovered OE during construction. The UXO technicians will then ensure the proper disposal of the recovered material. This alternative is effective in minimizing the risk of incidental contact with OE to construction workers.

7.5.1 In order to effectively support construction activities, UXO technician will be required to be on site during all construction activities. Geophysical investigations are usually conducted using a magnetometer. Probing of the near-surface soils to a depth of approximately six inches may be performed to investigate suspected near-surface metallic debris discovered by construction workers. The efforts associated with implementing this alternative will vary throughout the proposed eastern bypass right-of-way, depending upon specific construction activities.

7.5.2 Construction support is appropriate on construction sites where past OE occurrence is confirmed, particularly when surface inspections have not been performed.

7.5.3 Effectiveness

7.5.3.1 Overall Protection of Public Health and the Environment

Construction support is effective in the removal of OE items most likely to be encountered by the construction workers and will greatly reduce the risk of an accidental encounter with ordnance. Construction support may not prevent all OE encounters, particularly when OE is present in the subsurface, but provides for a rapid response once a suspected item is identified.

7.5.3.1.1 The extent to which construction support increases overall protection during construction is strongly related to the quantity of OE that is on or near the surface. In areas where surface OE is common, implementation of this alternative can greatly reduce the level of risk.

7.5.3.2 Long-Term Effectiveness and Permanence

Construction support is a reliable means of reducing exposure to workers who are engaged in non-intrusive activities and will reduce direct contact with ordnance and explosives at the surface. The possibility of exposure during intrusive construction activities remains; therefore, removal of risk associated with OE (particularly subsurface) will not be fully achieved. Various construction activities may potentially unearth buried OE items. Implementing this alternative

will not ensure complete removal of OE items; therefore, there will continue to be a potential risk of OE exposure to the construction workers.

7.5.3.3 Short-Term Effectiveness

Safety concerns during the implementation period will be associated with the potential for UXO workers to be exposed to OE during response efforts. Adherence to the requisite safety procedures and associated Site Safety and Health Plans will significantly limit the risk to site workers. There should be no risk to the affected community and minimal adverse environmental impacts from implementing this alternative.

7.5.3.4 Compliance with ARARs

No chemical-specific ARAR is associated with OE. Action-specific ARARs potentially applicable to this alternative include excavation, protection of critical habitat and endangered species, and worker safety. Location-specific actions that jeopardize critical habitats or threatened or endangered species will be avoided during site activities.

7.5.4 Implementation Capability

7.5.4.1 Technical Feasibility

The construction support alternative is technically feasible for all OOUs. UXO-qualified personnel must be integrated with construction activities during implementation of all aspects of this alternative. Construction worker education is also an integral part of the construction support alternative.

7.5.4.2 Administrative Feasibility

Construction support activities should be administratively feasible in most areas. Activities associated with this alternative will need to be coordinated with the USAESCH, the ALDOT, the JPA and construction contractors. No permits or are anticipated to implement this alternative, and the need for additional alignments or right-of-way agreements beyond the proposed eastern bypass right-of-way is not expected. Permits and/or approvals may be required if it becomes necessary to transport OE offsite for disposal. Implementation of the education component of this alternative should not require right-of-way or zoning variances.

7.5.4.3 Availability of Services and Materials

The special equipment, skills, personnel and technologies associated with this alternative include geophysical investigation, land clearing and UXO training. Proper safety precautions must be implemented to prevent untrained individuals from handling OE.

7.5.4.4 Regulatory Acceptance

No state or local permits are anticipated with this alternative. EPA, ADEM and local government acceptance is anticipated with this alternative.

7.5.4.5 Community Acceptance

The community may express concerns because this alternative does not remove all OE items and, therefore, may not be viewed as a permanent solution. The public may prefer more

complete clearance of areas within the bypass right-of-way that are intended for extensive reuse. This alternative will be viewed as preferable to Alternative 1, Institutional Controls, or Alternative 4, No DoD Action Indicated. A positive community relations program will be warranted to support implementation of this alternative.

7.5.5 Cost

The estimated cost to provide construction support along the proposed eastern bypass right-of-way depends on construction activities and duration. The assumptions included in the cost estimate (Section 8.0) are construction support over a three year period from two UXO technicians. The estimated costs are based on USAESCH's experience in providing UXO support on similar projects.

7.5.5.1 The educational program described in Alternative 1 is applicable to the entire project. These costs are in addition to costs developed for implementing this alternative in each OOU (see Section 8.0).

COMPARATIVE ANALYSIS OF RISK REDUCTION ALTERNATIVES

EASTERN BYPASS
ENGINEERING EVALUATION/COST ANALYSIS (EE/CA)
AT
FORT MCCLELLAN

FORT MCCLELLAN, ALABAMA

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8.0 COMPARATIVE ANALYSIS OF RISK REDUCTION ALTERNATIVES

The previous section of this document presented and evaluated five alternatives for addressing OE-related risks associated with the proposed eastern bypass right-of-way through the former Fort McClellan. This section presents a comparative analysis of the alternatives for OOU1, OOU2 and OOU3.

The costs provided in this EE/CA represent estimates made by ZAPATAENGINEERING and the USAESCH using their best professional judgement and experience. The costs were estimated from information collected in the bypass. Removal action cost estimates were restricted to the area within the proposed bypass right-of-way for each OOU.

Removal costs provide for a Senior UXO Supervisor (SUXOS) and two UXO technicians to be on-site during these activities. Additional crews may be necessary from a time and cost management perspective, depending upon the actual number of anomalies within the proposed portion of the right-of-way. For cost estimating purposes, it is assumed that the removal team will use either the "mag and flag" method or geophysical survey techniques to locate and remove all anomalies during surface clearance. For Clearance for Intended Land Use, an initial OE clearance will be followed by brush clearing, geophysical surveys, a second OE clearance effort, tree and stump removal, geophysical surveys of the disturbed stump areas and a final OE clearance to the maximum depth OE items are encountered. Refer to Appendix D for additional information regarding the cost estimates. It is assumed that a sampling barricade is not necessary and will not be used during removal efforts since proximity to the public in these areas is anticipated to be greater than the applicable exclusion zone (between 1,250 and 2,800 feet).

8.1 Risk-Reduction Analysis – OOU1

OOU1 stretches from Alabama Highway 21, east toward Iron Mountain Road. Sampling results show evidence of training in OOU1 with the recovery of OE/ORS and one pyrotechnic item, classified as UXO. Bypass construction workers should be prepared to deal with OE training items and ORS.

8.1.1 Effectiveness

8.1.1.1 Overall Protection of Public Health and the Environment

8.1.1.1.1 Alternative 1, Institutional Controls, will minimize the likelihood that individuals will be exposed to OE that might be observed. Education can be accomplished by presenting safety briefings to construction supervisors and personnel and providing written material to construction personnel. The education process will be most effective if implemented for the entire bypass, rather than by individual OOUs. Sign posting at specific areas will reinforce warnings about the risk of exposure to OE.

8.1.1.1.2 The protection level Alternative 1 provides is higher than that of Alternative 4, No DoD Action Indicated, because of the educational components and signage limit access within the bypass right-of-way.

8.1.1.1.3 Alternative 2, Surface Clearance, will be effective in removing OE items that will most likely be encountered. Surface clearance, however, will not remove all OE that may potentially be present. Subsurface anomalies will remain. As such, limited protection will be provided for intrusive activities that may occur in this area.

8.1.1.1.4 Alternative 2 will increase the protection provided to the public, as compared to Alternatives 1, 4 and 5, because a selective removal action will be implemented. Within OOU1, implementation of this alternative will only provide minimal protection for crews constructing the proposed eastern bypass.

8.1.1.1.5 Alternative 3, Clearance for Intended Land Use, will reduce the risk of direct contact with OE. OE will be cleared to the depth that items are found. Alternative 3 will provide the most effective overall protection to safely allow construction of the proposed eastern bypass.

8.1.1.1.6 Alternative 4, No DoD Action Indicated, provides no additional risk reduction, as the OE remains in place.

8.1.1.1.7 Alternative 5, Construction Support, will be effective in mitigating OE items encountered during construction, thereby reducing risk. Thus, Alternative 5 will increase the protection provided to construction workers, as compared to Alternatives 1 and 4 however, subsurface OE may remain.

8.1.1.2 Long-Term Effectiveness and Permanence

8.1.1.2.1 Alternative 1, Institutional Controls, will reduce the possibility of exposure to OE and will be effective if it is maintained through periodic evaluation. The liability and risk, however, will persist because the potential OE will remain in place. In OOU1, the long-term effectiveness will depend on the extent to which the educational program influences appropriate behavior when development occurs in this area.

8.1.1.2.2 Alternative 2, Surface Clearance, will be an effective means of reducing exposure to OE when engaged in non-intrusive activities. In OOU1, this will provide limited protection for activities such as roadway and building construction, but will have no permanent effect on buried ordnance.

8.1.1.2.3 Alternative 3, Clearance for Intended Land Use, will provide an effective and permanent means of reducing the potential for exposure to OE.

8.1.1.2.4 Significant quantities of OE/ORS were detected in OOU1 during the EE/CA sampling effort. OE and ordnance-related scrap were removed from the surface and subsurface of the grids investigated, excluding the prove-out grid. However, areas within grids not invasively investigated, as well as other areas within OOU1 that were not investigated, may also contain significant quantities of OE. The long-term effectiveness of Alternative 3 will be a function of future land use.

8.1.1.2.5 Alternative 4, No DoD Action Indicated, will offer no reduction in the potential for future OE exposure. Through erosional processes, OE items once buried may eventually become surface hazards.

8.1.1.2.6 Alternative 5, Construction Support, will reduce the possibility of exposure to OE when engaging in non-intrusive activities. In OOU1, this will provide limited protection to construction workers and future users, as subsurface, undisturbed OE will remain.

8.1.1.3 Short-Term Effect During Implementation

8.1.1.3.1 Alternative 1, Institutional Controls, has minimal safety concerns associated with the potential for exposure of UXO workers while posting signs. No risk to the community is expected and no adverse environmental impacts should result from this alternative.

8.1.1.3.2 Alternative 2, Surface Clearance, safety concerns will primarily be associated with the potential exposure of UXO workers to OE during clearance operations. The degree of exposure risk will vary within each OOU, depending upon the clearing and inspection activities. Little risk to the community is expected.

8.1.1.3.3 Alternative 3, Clearance for Intended Land Use, has the greatest potential for ordnance exposure during UXO removal and clearance activities. Exposure will be limited to individuals who have been trained in handling and disposing of OE. There will be the potential that the community may be affected by noise during implementation of this alternative.

8.1.1.3.4 For Alternative 4, No DoD Action Indicated, no action will be implemented; therefore, there will be no risk to OE workers.

8.1.1.3.5 For Alternative 5, Construction Support, safety concerns will primarily be associated with the potential exposure of UXO workers to OE during clearance operations. The degree of exposure risk will vary within each OOU, depending upon the clearing and inspection activities. Alternative 5 will reduce the risk to construction workers if safety guidelines are followed. Little risk to the community is expected.

8.1.1.4 Compliance with ARARs

For all alternatives, no chemical-specific ARAR is associated with OE. Action-specific ARARs potentially applicable to Alternatives 1, 2, 3 and 5 include excavation, protection of endangered species and worker safety. Location-specific ARARs potentially applicable to OOU1 will be complied with during implementation of any alternative.

8.1.2 Implementation Capability

8.1.2.1 Technical Feasibility

8.1.2.1.1 Alternative 1, Institutional Controls, will be technically feasible. The education and informational components will be easily instituted. Sign posting will also be technically feasible.

8.1.2.1.2 Alternative 2, Surface Clearance, will be technically feasible. UXO-trained personnel will be required during implementation of this alternative.

8.1.2.1.3 Alternative 3, Clearance for Intended Land Use, will be technically feasible. UXO-trained personnel must be utilized during all phases of the clearance-for-use alternative.

8.1.2.1.4 Alternative 4, No DoD Action Indicated, involves no action at this site.

8.1.2.1.5 Alternative 5, Construction Support, will be technically feasible. UXO-trained personnel will be required during implementation of this alternative.

8.1.2.2 Administrative Feasibility

8.1.2.2.1 Alternative 1, Institutional Controls, education, public information and selective sign posting, will be administratively feasible.

8.1.2.2.2 Alternative 2, Surface Clearance, will be administratively feasible. However, the public may receive clearing of vegetation with reluctance.

8.1.2.2.3 Alternative 3, Clearance for Intended Land Use, will be administratively feasible. Excessive clearing of vegetation may be received with reluctance.

8.1.2.2.4 Alternative 4, No DoD Action Indicated, involves no action at this site; therefore, it is administratively feasible.

8.1.2.2.5 Alternative 5, Construction Support, will be administratively feasible. It will require close coordination between construction contractors and the UXO support team.

8.1.2.3 Availability of Services and Materials

8.1.2.3.1 The services and materials required for implementation of Alternative 1, Institutional Controls, are readily available. During signpost installation, UXO-trained personnel will be required to clear the area.

8.1.2.3.2 Alternatives 2, 3 and 5 will require special equipment, tools, personnel and technologies including geophysical investigations, land clearing and UXO training.

8.1.2.3.3 For Alternatives 1, 2, 3 and 5, special skills, equipment and personnel will be needed if buried OE is discovered and, thus, requires disposal or detonation. Proper safety precautions will be implemented to prevent untrained personnel from handling these materials.

8.1.2.3.4 Alternative 4, No DoD Action Indicated, will not require materials or services.

8.1.2.4 Regulatory Acceptance

8.1.2.4.1 No state permits are anticipated to be required for implementation of Alternative 1, Institutional Controls.

8.1.2.4.2 For Alternatives 2, 3 and 5, no state or local permits are anticipated. Close coordination with the appropriate agencies will be necessary if endangered species or archaeologically significant items are encountered. No threatened or endangered species are anticipated to be within the proposed eastern bypass right-of-way. Scattered archeological sites within the right-of-way will be avoided to the maximum extent possible. Intrusive investigations will be conducted, as necessary, to minimize impact to wetlands present along the bypass right-of-way.

8.1.2.4.3 The need for local government acceptance is not anticipated for Alternative 4.

8.1.2.5 Community Acceptance

8.1.2.5.1 For Alternative 1, it is anticipated that the community will accept education and sign posting at OOU1 and other locations along the proposed eastern bypass.

8.1.2.5.2 The immediate community may receive Alternatives 2 and 3 with some resistance, as they will require excessive clearing of vegetation. However, the community should respond favorably to the risk reduction attained through implementation of these alternatives.

8.1.2.5.3 The community may be hesitant to accept Alternative 4 as it would provide no protection for bypass construction personnel.

8.1.2.5.4 The community will likely accept Alternative 5, Construction Support, favorably as it will reduce risk of OE exposure to construction workers.

8.1.3 Cost

Alternatives 1, 2, 5 and 3 incur progressively increasing costs. Alternative 4, incurring no cost, is the least expensive alternative. Data collected in OOU1 were statistically analyzed and used to evaluate the potential number of anomalies in this area. Of the potential 15,823 anomalies projected to be present within the right-of-way, approximately 25 percent are suspected to be on the surface. It is assumed that approximately 30 surface anomalies could be investigated in three man-hours.

8.1.3.1 The estimated cost to implement institutional controls is $9,991. No annual maintenance costs are required.

8.1.3.2 The total estimated cost to implement Alternative 2 is $187,975.

8.1.3.3 The total estimated cost to implement Alternative 3 is $1,431,700.

8.1.3.4 The total estimated cost to implement Alternative 4 is $0.00.

8.1.3.5 The total estimated cost to implement Alternative 5 is $75,000.

8.2 Risk-Reduction Analysis – OOU2

OOU2 stretches from Summerall Gate Road, south along Iron Mountain Road, within the known impact range fans. Sampling results show evidence of training in OOU2.

8.2.1 Effectiveness

8.2.1.1 Overall Protection of Public Health and the Environment

8.2.1.1.1 Alternative 1, Institutional Controls, will reduce the likelihood that individuals will handle OE that might be discovered. Education can be accomplished by presenting on-site safety briefings to construction supervisors and personnel and by providing written materials instructing them to notify the on-site safety specialist if OE/ORS items are discovered. The education process will be most effective if implemented for the entire bypass right-of-way rather than for individual OOUs. Sign posting at specific areas will effectively reinforce warnings about the risk of exposure to OE.

8.2.1.1.2 The protection level that Alternative 1 provides is higher than Alternative 4 because the educational components and signage limit access within the bypass right-of-way.

8.2.1.1.3 Alternative 2, Surface Clearance, will be effective in removing OE items that will most likely be encountered by construction personnel. Surface clearance, however, will not remove all OE that may potentially be present. Subsurface anomalies will remain. As such, limited protection will be provided for intrusive activities that may occur in this area.

8.2.1.1.4 Alternative 2 will increase the protection provided to construction personnel, as compared to Alternatives 1, 4 and 5, because a selective removal action will be implemented. Within OOU2, implementation of this alternative will only provide minimal protection to crews constructing the proposed eastern bypass.

8.2.1.1.5 Alternative 3, Clearance for Intended Land Use, will reduce the risk of direct contact with OE. Alternative 3 will provide the most effective overall protection to safely allow future construction of the bypass.

8.2.1.1.6 Alternative 4, No DoD Action Indicated, provides no additional risk reduction, as the OE will remain in place.

8.2.1.1.7 Alternative 5, Construction Support, will be effective in mitigating OE items encountered during construction, thereby reducing. Thus Alternative 5 will increase the protection provided to construction workers, as compared to Alternatives 1 and 4, however subsurface OE may remain.

8.2.1.2 Long-Term Effectiveness and Permanence

8.2.1.2.1 Alternative 1, Institutional Controls, will reduce the possibility of exposure to OE and will be effective if it is maintained through periodic evaluation. The liability and risk, however, will persist because the potential OE will remain in place. In OOU2, the long-term effectiveness will depend upon the extent to which the educational program influences appropriate behavior of the public when conducting activities in this area.

8.2.1.2.2 Alternative 2, Surface Clearance, will be an effective means of reducing exposure to OE for those engaged in non-intrusive activities. In area OOU2, this will provide limited protection for activities such as roadway and building construction because it does not address buried ordnance.

8.2.1.2.3 Alternative 3, Clearance for Intended Land Use, will provide an effective and permanent means of reducing the potential for exposure to OE.

8.2.1.2.4 OOU2 is situated within the known impact area and contains extensive OE. Implementation of Alternative 3 will provide substantial protection for construction and related activities occurring no deeper than clearance depth.

8.2.1.2.5 Alternative 4, No DoD Action Indicated, will offer no reduction in the potential for future OE exposure. Through erosional processes, OE items once buried may eventually become surface hazards.

8.2.1.2.6 Alternative 5, Construction Support, will reduce the possibility of exposure to OE when engaging in non-intrusive activities. In OOU1, this will provide limited protection to construction workers and future users, as subsurface, undisturbed OE will remain.

8.2.1.3 Short-Term Effect During Implementation

8.2.1.3.1 Alternative 1, Institutional Controls, minimal safety concerns will be associated with the potential for exposure of UXO workers while posting signs. No risk to the community is expected and no adverse environmental impacts should result from this alternative.

8.2.1.3.2 Alternative 2, Surface Clearance, safety concerns will be primarily associated with the potential exposure of UXO workers to OE during clearance operations. Little risk to the community is expected.

8.2.1.3.3 Alternative 3, Clearance for Intended Land Use, has the greatest potential for ordnance exposure during UXO removal and clearance activities. This exposure will be limited to individuals who have been trained in handling and disposing of OE. There will be the potential that the community may be affected by noise during implementation of this alternative.

8.2.1.3.4 Alternative 4, No DoD Action Indicated, as no actions will be implemented under this alternative, there will be no risks associated with the safety of site workers.

8.2.1.3.5 For Alternative 5, Construction Support, safety concerns will primarily be associated with the potential exposure of UXO workers to OE during clearance operations. The degree of exposure risk will vary within each OOU, depending upon the clearing and inspection activities. Alternative 5 will reduce the risk to construction workers if safety guidelines are followed. Little risk to the community is expected.

8.2.1.4 Compliance with ARARs

For all alternatives, no chemical-specific ARAR is associated with OE. Action-specific ARARs potentially applicable to Alternatives 1, 2, 3 and 5 include excavation, protection of endangered species and worker safety. Location-specific ARARs potentially applicable to OOU2 will be complied with during implementation of any alternative.

8.2.2 Implementation Capability

8.2.2.1 Technical Feasibility

8.2.2.1.1 Alternative 1, Institutional Controls, will be technically feasible and implemented. The education and public information components will be easily instituted. Sign posting will also be technically feasible.

8.2.2.1 Alternative 2, Surface Clearance, will be technically feasible. UXO-trained personnel will be required during implementation of this alternative.

8.2.2.1.2 Alternative 3, Clearance for Intended Land Use, will be technically feasible. UXO-trained personnel must be utilized during all phases of the clearance-for-use alternative.

8.2.2.1.3 Alternative 4, No DoD Action Indicated, involves no action at this site.

8.2.2.1.4 Alternative 5, Construction Support, will be technically feasible. UXO-trained personnel will be required during implementation of this alternative.

8.2.2.2 Administrative Feasibility

8.2.2.2.1 Alternative 1, Institutional Controls, education, dissemination of information and selective sign posting will be administratively feasible.

8.2.2.2.2 Alternative 2, Surface Clearance, will be administratively feasible. However, the public may receive clearing of vegetation with reluctance.

8.2.2.2.3 Alternative 3, Clearance for Intended Land Use, will be administratively feasible. However, the public may receive excessive clearing of vegetation with reluctance.

8.2.2.2.4 Alternative 4, No DoD Action Indicated, involves no action at this site; therefore, it is administratively feasible.

8.2.2.2.5 Alternative 5, Construction Support, will be administratively feasible. It will require close coordination between construction contractors and the UXO support team.

8.2.2.3 Availability of Services and Materials

8.2.2.3.1 The services and materials required for implementing Alternative 1, Institutional Controls are readily available. During sign post installation, UXO-trained personnel will be required to clear the area.

8.2.2.3.2 Alternatives 2, 3 and 5 require special equipment, tools, personnel and technologies, including geophysical investigations, land clearing and UXO training.

8.2.2.3.3 For Alternatives 1, 2, 3 and 5, special skills, equipment and personnel will be needed if buried OE is discovered and, thus, requires disposal or detonation. Proper safety precautions will be implemented to prevent untrained personnel from handling these materials.

8.2.2.3.4 Alternative 4, No DoD Action Indicated, will require no materials or services.

8.2.2.4 Regulatory Acceptance

8.2.2.4.1 No state permits are anticipated as necessary to implement Alternative 1, Institutional Controls or Alternative 4, No DOD Action Indicated.

8.2.2.4.2 For Alternatives 2, 3 and 5, no state or local permits are anticipated. However, close coordination with the appropriate agencies will be necessary if endangered species or archaeologically significant items are encountered.

8.2.2.4.3 The need for local government acceptance is not anticipated for Alternative 1.

8.2.2.4.4 Regulatory acceptance of Alternative 4 in OOU2 is unlikely as it provides no protection to construction personnel.

8.2.2.5 Community Acceptance

8.2.2.5.1 For Alternative 1, it is anticipated that the community will accept education and sign posting at OOU2 and other locations along the proposed eastern bypass.

8.2.2.5.2 The immediate community may receive Alternatives 2 and 3 with some resistance, as they will require excessive clearing of vegetation. However, the community should respond favorably toward the risk reduction attained through implementation of these alternatives.

8.2.2.5.3 The community may be hesitant to accept Alternative 4 as it would provide no protection for bypass construction personnel.

8.2.2.5.4 The community will likely accept Alternative 5, Construction Support, favorably as it will reduce risk of OE exposure to construction workers.

8.2.3 Cost

Alternatives 1, 2, 5 and 3 incur progressively increasing costs. Alternative 4, incurring no cost, is the least expensive alternative. The USAESCH estimated the amount of potential OE/ORS and ZAPATAENGINEERING estimated the costs expected for implementation of the Clearance for Intended Land Use alternative for the OOU2 right-of-way and beyond based on data from USAESCH. These costs were estimated based on ground reconnaissance of areas within the proposed OOU2 right-of-way and subsequent estimations of surface OE (Clinkenbeard, V. 19 July 1999). ZAPATAENGINEERING estimated costs for surface clearance using clearance for use cost estimate information from the USAESCH.

8.2.3.1 The estimated cost to implement institutional controls is $16,490. No annual maintenance costs are required.

8.2.3.2 The total estimated cost to implement Alternative 2 is $310,250.

8.2.3.3 The total estimated cost to implement Alternative 3 is $2,363,000.

8.2.3.4 The total estimated cost to implement Alternative 4 is $0.00.

8.2.3.5 The total estimated cost to implement Alternative 5 is $125,000.

8.3 Risk-Reduction Analysis – OOU3

OOU3 stretches from the impact range fans, south along Iron Mountain Road to the former installation boundary. Sampling results show little evidence of training in OOU3.

8.3.1 Effectiveness

8.3.1.1 Overall Protection of Public Health and the Environment

8.3.1.1.1 Alternative 1, Institutional Controls, will minimize the likelihood that individuals will handle OE that might be observed. Education can be accomplished by providing on-site safety briefings to construction supervisors and personnel and by presenting written materials instructing them to notify the on-site safety specialist if OE/ORS items are discovered. The education process will be most effective if implemented for the entire bypass rather than for individual OOUs. Sign posting at specific areas will reinforce warnings about the risk of exposure to OE.

8.3.1.1.2 The protection level that Alternative 1 provides is higher than Alternative 4 because the educational components and signage limit access within the bypass right-of-way.

8.3.1.1.3 Alternative 2, Surface Clearance, will be effective in removing OE items that will most likely be encountered by the public. Surface clearance, however, will not remove all OE that may potentially be present. Subsurface anomalies will remain. As such, limited protection will be provided for intrusive activities that may occur in this area.

8.3.1.1.4 Alternative 2 will increase the protection provided to construction personnel, as compared to Alternatives 1, 4 and 5, because a selective removal action will be implemented.

8.3.1.1.5 Alternative 3, Clearance for Intended Land Use, will reduce the risk of direct contact with OE. Alternative 3 will provide the most effective overall protection to safely allow future construction of the proposed eastern bypass.

8.3.1.1.6 Alternative 4, No DoD Action Indicated, provides no additional risk reduction, as the OE will remain in place.

8.3.1.1.7 Alternative 5, Construction Support, will be effective in mitigating OE items encountered during construction, thereby reducing risk. Thus Alternative 5 will increase the protection provided to construction workers, as compared to Alternatives 1 and 4, however subsurface OE may remain.

8.3.1.2 Long-Term Effectiveness and Permanence

8.3.1.2.1 Alternative 1, Institutional Controls, will reduce the possibility of exposure to OE and will be effective if it is maintained through periodic evaluation. The liability and risk, however, will persist because the potential OE will remain in place. In OOU3, the long-term effectiveness will depend upon the extent to which that the educational program influences appropriate behavior of construction personnel when conducting activities in this area.

8.3.1.2.2 Alternative 2, Surface Clearance, will be an effective means of reducing exposure to OE for those engaged in non-intrusive activities. In area OOU3, this will provide limited protection for activities such as roadway and building construction, because it does not address buried ordnance.

8.3.1.2.3 Alternative 3, Clearance for Intended Land Use, will provide an effective and permanent means of reducing the potential for exposure to OE.

8.3.1.2.4 Very little evidence of OE/ORS was found in OOU3 during the ground reconnaissance. Therefore, sample grids were not placed along this extension of the bypass. The long-term effectiveness of Alternative 3 will be a function of the future intended land use.

8.3.1.2.5 Alternative 4, No DoD Action Indicated, will offer no reduction in the potential for future OE exposure. Through erosional processes, OE items once buried may eventually become surface hazards.

8.3.1.2.6 Alternative 5, Construction Support, will reduce the possibility of exposure to OE when engaging in non-intrusive activities. In OOU1, this will provide limited protection to construction workers and future, as subsurface, undisturbed OE will remain.

8.3.1.3 Short-Term Effect During Implementation

8.3.1.3.1 For Alternative 1, Institutional Controls, minimal safety concerns will be associated with the potential for exposure of UXO workers while posting signs. No risk to the community will be expected and no adverse environmental impacts should result from this alternative.

8.3.1.3.2 Alternative 2, Surface Clearance, safety concerns will be primarily associated with the potential exposure of UXO workers to OE during clearance operations. Little risk to the community is expected.

8.3.1.3.3 Alternative 3, Clearance for Intended Land Use, has the greatest potential for ordnance exposure during UXO removal and clearance activities. This exposure will be limited to individuals who have been trained in handling and disposing of OE. There will be the potential that the community may be affected by noise during implementation of this alternative.

8.3.1.3.4 For Alternative 4, No DoD Action Indicated, no action will be implemented. Therefore, there will be no risk to site OE workers.

8.3.1.3.5 For Alternative 5, Construction Support, safety concerns will primarily be associated with the potential exposure of UXO workers to OE during clearance operations. The degree of exposure risk will vary within each OOU, depending upon the clearing and inspection activities. Alternative 5 will reduce the risk to construction workers if safety guidelines are followed. Little risk to the community is expected.

8.3.1.4 Compliance with ARARs

For all alternatives, no chemical-specific ARAR is associated with OE. Action-specific ARARs potentially applicable to Alternatives 1, 2, 3 and 5 include excavation, protection of endangered species and worker safety. Location-specific ARARs potentially applicable to OOU3 will be complied with during implementation of any alternative.

8.3.2 Implementation Capability

8.3.2.1 Technical Feasibility

8.3.2.1.1 Alternative 1, Institutional Controls, will be technically feasible and implemented. The educational and informational components will be easily instituted. Sign posting will also be technically feasible.

8.3.2.1.2 Alternative 2, Surface Clearance, will be technically feasible. UXO-trained personnel will be required during implementation of this alternative.

8.3.2.1.3 Alternative 3, Clearance for Intended Land Use, will be technically feasible. UXO-trained personnel must be utilized during all phases of the clearance-for-use alternative.

8.3.2.1.4 Alternative 4, No DoD Action Indicated, involves no action at this site.

8.3.2.1.5 Alternative 5, Construction Support, will be technically feasible. UXO-trained personnel will be required during implementation of this alternative.

8.3.2.2 Administrative Feasibility

8.3.2.2.1 Alternative 1, Institutional Controls, education and selective sign posting will be administratively feasible. Feasibility will relate directly to the intended land use adjacent to the bypass through OOU3.

8.3.2.2.2 Alternative 2, Surface Clearance, will be administratively feasible. However, the public may receive clearing of vegetation with reluctance.

8.3.2.2.3 Alternative 3, Clearance for Intended Land Use, will be administratively feasible. However, the public may receive excessive clearing of vegetation with reluctance.

8.3.2.2.4 Alternative 4, No DoD Action Indicated, involves no action at this site, therefore, it is administratively feasible.

8.3.2.2.5 Alternative 5, Construction Support, will be administratively feasible . It will require close coordination between construction contractors and the UXO support team.

8.3.2.3 Availability of Services and Materials

8.3.2.3.1 The services and materials required for implementation of Alternative 1, Institutional Controls, are readily available. During sign post installation, UXO-trained personnel will be required to clear the area.

8.3.2.3.2 For Alternatives 2, 3 and 5, special equipment, tools, personnel and technologies, including geophysical investigation, land clearing and UXO training, are required.

8.3.2.3.3 For Alternatives 1, 2, 3 and 5, special skills, equipment and personnel will be needed if buried OE is discovered and, thus, requires disposal or detonation. Proper safety precautions will be implemented to prevent untrained personnel from handling these materials.

8.3.2.3.4 Alternative 4, No DoD Action Indicated, will require no materials or services.

8.3.2.4 Regulatory Acceptance

8.3.2.4.1 No state permits are anticipated as necessary to implement Alternative 1, Institutional Controls or Alternative 4, No DOD Action Indicated.

8.3.2.4.2 For Alternatives 2, 3 and 5, no state or local permits are anticipated. Close coordination with the appropriate agencies will be necessary if endangered species or archaeologically significant items are encountered.

8.3.2.4.3 The need for local government acceptance is not anticipated for Alternative 1.

8.3.2.4.4 Acceptance of Alternative 4, No DoD Action Indicated, by the regulators may be met with some resistance.

8.3.2.5 Community Acceptance

8.3.2.5.1 For Alternative 1, it is anticipated that the community will accept education and sign posting at OOU3 and other locations along the proposed eastern bypass.

8.3.2.5.2 Alternatives 2 and 3 may be received with some resistance by the immediate community as they will require excessive clearing of vegetation. However, the community should respond favorably towards the risk reduction attained through implementation of these alternatives.

8.3.2.5.3 The community may be hesitant to accept Alternative 4 as no effort will be made to protect bypass construction personnel.

8.3.2.5.4 The community will likely accept Alternative 5, Construction Support, favorably as it will reduce risk of OE exposure to construction workers.

8.3.3 Cost

Alternatives 1, 2, 5 and 3 each incur progressively increasing costs. Alternative 4, incurring no cost, is the least expensive alternative. ZAPATAENGINEERING estimated costs for clearance of OOU3 to be minimal as no OE items were discovered in this area. Minimal clearance costs include the generation of any report associated with future risk reduction work conducted in OOU3 such as the implementation of institutional controls. Real costs associated with this OOU are for implementation of institutional controls.

8.3.3.1 The estimated cost to implement institutional controls is $25,123. No annual maintenance costs are required.

8.3.3.2 The total estimated cost to implement Alternative 2 is $472,675.

8.3.3.3 The total estimated cost to implement Alternative 3 is $3,600,100.

8.3.3.4 The total estimated cost to implement Alternative 4 is $0.00.

8.3.3.5 The total estimated cost to implement Alternative 5 is $187,500.