

**Final  
Chemical Warfare Materiel (CWM)  
Engineering Evaluation / Cost Analysis (EE/CA)  
Fort McClellan, Alabama**



**U.S. Army Corps of Engineers  
Huntsville Center**

**Contract DACA 87-95-D-0018  
Delivery Order 0037**

**June 2002  
734643**

**NAYLOR FIELD**  
NAMED IN HONOR OF  
*Msg Lewis J. Naylor*  
SS  
KILLED IN ACTION  
SINJANG KOREA  
26 NOVEMBER 1950

*Prepared by*

**PARSONS**

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July 15, 2002

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Huntsville  
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Subject: Contract No. DACA87-95-D-0018, Delivery Order No. 0037  
Transmittal of Slip Page to Final CWM EE/CA Report for Fort McClellan,  
Alabama

Dear Mr. Copeland:

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Sincerely,

PARSONS ENGINEERING SCIENCE, INC.



Richard L. Satkin, P.G.  
Project Manager

Enclosure

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June 17, 2002

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Subject: Contract No. DACA87-95-D-0018, Delivery Order No. 0037  
Transmittal of Final CWM EE/CA Report for Fort McClellan, Alabama

Dear Ms. Holstein:

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Sincerely,

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Richard L. Satkin, P.G.  
Project Manager

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**FINAL  
CHEMICAL WARFARE MATERIEL (CWM)  
ENGINEERING EVALUATION / COST ANALYSIS (EE/CA)  
FORT MCCLELLAN, ALABAMA**

**SUBMITTED TO  
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**CONTRACT DACA 87-95-D-0018  
DELIVERY ORDER 0037**

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June 2002

*Richard L. Satkin*

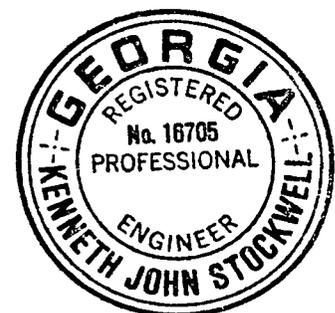
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## LIST OF ACRONYMS

ABIH	American Board of Industrial Hygiene
AC	Hydrogen Cyanide
ADEM	Alabama Department of Environmental Management
AE	Architect/Engineer
AEL	Airborne Exposure Limit
AR	Army Regulation
ARARs	Applicable or Relevant and Appropriate Requirements
ASCII	American Standard Code for Information Interchange
ASP	Ammunition Supply Point
ASR	Archives Search Report
BEC	BRAC Environmental Coordinator
BCT	BRAC Cleanup Team
BG	<u>Bacillus globigii</u>
BRAC	Base Realignment and Closure
BWM	Biological Warfare Material
BZ	3-Quinucidinyl benzilate - Incapacitating Agent – Psychoactive Compound
CADD	Computer Aided Design and Drafting
CAIS	Chemical Agent Identification Sets
CBR	Chemical, Biological, Radiological
CDTF	Chemical Decontamination Training Facility
CEHNC	U.S. Army Engineering and Support Center
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAM	USACE Mobile District
CFR	Code of Federal Regulations
CG	Phosgene (carbonyl chloride) - Choking Agent
CK	Cyanogen Chloride - Blood Agent
CO	Contracting Officer

COC	Chain of Custody
COE	U.S. Army Corps of Engineers
CLP	Contract Laboratory Program
CNB	Chloroacetophenone with Benzene and Carbon Tetrachloride-tearing agent
CS	Chemical Warfare Material Scrap
CWM	Chemical Warfare Materiel
D&I	Detection and Identification
DAAMS	Depot Area Air Monitoring System
DANC	Decontaminating Agent Non-Corrosive
DCA	1,2 – Dichloroethane
DCE	1,2 – Dichloroethene
DERA	Defense Environmental Restoration Act
DES2	Bis(2-diisopropylaminoethyl) - Byproduct Formed From the Decontamination of VX
DID	Data Item Description
DoD	Department of Defense
DOJ	Department of Justice
DOT	Department of Transportation
DS2	Decontaminate Solution #2
EBS	Environmental Baseline Survey
ECBC	Edgewood Chemical and Biological Center
EE/CA	Engineering Evaluation/Cost Analysis
EIS	Environmental Impact Statement
EM	Electromagnetics
EMT	Emergency Medical Technician
EOD	Explosive Ordnance Disposal
EODT	Explosive Ordnance Disposal Technology, Inc.
EPA	U.S. Environmental Protection Agency
ER	Engineer Regulation
ESE	Environmental Science & Engineering, Inc.

FDEM	Frequency Domain Electromagnetic
FMRRRA	Fort McClellan Reuse and Redevelopment Authority
FPD	Flame Photometric Device
FUDS	Formerly Used Defense Sites
GB	Sarin - isopropyl methylphosphonofluoridate - Nerve Agent (anti-cholinesterase compound)
GIS	Geographic Information Systems
GPS	Global Positioning System
H, HD	Mustard (Levinstein mustard – 70% bis(2-chloroethyl) sulfide and 30% polysulfides), Distilled Mustard (bis(2-chloroethyl) sulfide) – Blister Agents
HFA	Human Factor Applications
HQDA	Headquarters, Department of the Army
HTRW	Hazardous, Toxic and Radiological Wastes
HSP	Health and Safety Plan
IDW	Investigative Derived Waste
IHF	Interim Holding Facility
IT Corporation	International Technologies Corporation
JPA	Joint Powers Authority
L	Lewisite - (dichloro (2-chlorovinyl) sulfide) - Blister Agent
LRA	Local Reuse Authority
LUC	Land Use Control
LUCIP	Land Use Control Implementation Plan
MCE	Maximum Credible Event
MINICAMS	Miniature Chemical Agent Monitor System
MINIRAMS	Miniature Real-time Aerosol Monitoring System
mg/L	Milligrams per Liter
mm	Millimeter
mm Hg	Millimeters of Mercury
MP	Military Police
MSDS	Material Safety Data Sheet
MS/MSD	Matrix Spike/Matrix Spike Duplicate

NAD83	North American Datum 1983
NBC	Nuclear, Biological, and Chemical
NCP	National Contingency Plan
NFA	No Further Action
NI	Not Investigated
NIOSH	National Institute of Occupational Safety and Health
NOSE	No Significant Effects
NSCM	Non-Stockpile Chemical Materiel
OE	Ordnance and Explosives
OPFTIR	Open-Path Fourier Transform Infrared Spectroscopy
ORNL	Oak Ridge National Laboratory
OS	Ordnance Scrap
OSHA	Occupational Safety and Health Agency
Parsons	Parsons Engineering Science, Inc.
PC	Personal Computer
PDS	Personnel Decontamination Station
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PINS	Portable Isotopic Neutron Spectroscopy
PM	Project Manager
PMNSCM	Product Manager for Non-Stockpile Chemical Materiel
PPE	Personal Protective Equipment
PS	Chloropicrin
PVC	Polyvinyl Chloride
PX	Post Exchange
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RCWM	Recovered Chemical Warfare Material

RI	Remedial Investigation
RLS	Registered land Surveyor
RPD	Relative Percent Difference
S	Scrap Metal
SAIC	Science Application International Corporation
Sain	Sain Associates
SA	Arsine – Blood Agent
SARA	Superfund Amendments and Reauthorization Act
SBCCOM	U.S. Army Soldier and Biological Chemical Command
SCAITS	Simulant Chemical Agent Identification Training Set
SCBA	Self-Contained Breathing Apparatus
SDG	Sample Delivery Group
SI	Site Investigation
SM	<u>Serratia marcescens</u>
SOP	Standard Operating Procedure
SOW	Scope of Work
SS	Surface Soil
SSS	Site Safety Submission
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SSO	Site Safety Officer
STB	Super Tropical Bleach
SUXOS	Senior UXO Supervisor
TBC	To Be Considered
TCE	Trichloroethene
TDEM	Time Domain Electromagnetic
TEU	Technical Escort Unit
TF	Transition Force
TLV	Threshold Limit Values
TM	Technical Manual
TWA	Time-Weighted Average

USACE	U. S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USAMBRDL	U.S. Army Medical Bioengineering Research and Development Laboratory
USATHAMA	United States Army Toxic and Hazardous Materials Agency
USC	United States Code
USEPA	U. S. Environmental Protection Agency
UXO	Unexploded Ordnance
VX	Anti-Cholinesterase Compound - O-ethyl-S (2-diisopropylaminoethyl)methylphosphonothiolate - Nerve Agent
Weston	Roy F. Weston, Inc.
WP	White Phosphorus

## GLOSSARY

### **Action Memorandum**

Approves time-critical removal action and also concludes the engineering evaluation/cost analysis. Provides a concise, written record of the decision to select an appropriate response action. As the primary decision document, it substantiates the need for a response action, identifies the proposed action, and explains the rationale for the response action selected.

### **Anomaly**

Any item that is seen as a subsurface irregularity after geophysical investigation. This irregularity should deviate from the expected subsurface ferrous and non-ferrous material at a site (i.e., pipes, power lines, etc.).

### **Archives Search Report (ASR)**

A detailed investigation to report on past OE activities conducted on an installation. The principal purpose of the Archives Search is to assemble historical records and available field data, assess potential ordnance presence, and recommend follow-up actions at a DERP-FUDS. There are four general steps in an Archives Search: records search phase, site safety and health plan, site survey, and archives search report including risk assessment.

### **Chemical Agent**

Chemical agents, such as V- and G- series nerve agents, H- series blister agents, and lewisite, that have been used in military applications. Chemical agents are not gases, although "poison gas" is a term used to refer to them. Chemical agents produce various physiological effects on the human body. They will produce a harmful physiological or psychological reaction when applied to the body externally, when inhaled, or when taken internally.

### **Chemical Warfare Materiel (CWM)**

An item configured as a munition containing a chemical that is intended to kill, seriously injure, or incapacitate a person through its physiological effects. The term includes V- and G- series nerve agent, H- and HN- 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.

## **Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)**

CERCLA authorizes federal action to respond to the release or threatened release of hazardous substances into the environment or a release or threat of release of a pollutant or contaminant into the environment that may present an imminent or substantial danger to public health or welfare.

### **Conventional Ordnance and Explosives**

Ordnance and explosives (see definition) other than CWM, BWM and nuclear ordnance. (ER 1110-1-8153)

### **Defense Environmental Restoration Program (DERP)**

Established in 1984, DERP promotes and coordinates efforts for the evaluation and cleanup of contamination at Department of Defense installations. (10 U.S.C. 2701)

### **Depot Area Air Monitoring System (DAAMS)**

A portable air-sampling unit, designed to draw a controlled volume of air through a glass tube filled with a collection material. After a specified length of time and flow rate, the tube is removed and sent to a chemical laboratory for analysis (approximately 1 hour process time) to determine the presence, type, and quantity of agent collect in the samples. This technique will sample down to the AEL and provides low-level detection capability for GA, GB, HD, and VX.

### **Electromagnetic Method**

A method of geophysical exploration in which the magnetic and/or electrical fields associated with subsurface currents are measured. The two primary techniques applied during OE and CWM investigations are the time-domain electromagnetic (TDEM) method and the frequency-domain electromagnetic (FDEM) method. Both methods use man-made sources. In the case of TDEM, a pulsed source that is composed of many frequencies is used to generate a source field while the local ground response to that field is monitored using a receiver antenna. In the case of FDEM, the source is a constant frequency and the receiver is tuned to measure the ground response to that frequency.

### **Engineering Evaluation/Cost Analysis (EE/CA)**

A document prepared for all non-time-critical response actions as required by Section 300.415(b)(4)(i) of the NCP. The goals of the EE/CA are to identify the extent of a hazard, to identify the objectives of the response action, and to analyze the various alternatives that may be used to satisfy these objectives for cost, effectiveness, and implementability.

**Exclusion Zone**

A safety zone established around an OE work area. Only authorized project personnel are allowed within the exclusion zone. Examples of exclusion zones are safety zones around OE intrusive activities and safety zones where OE is intentionally detonated. (DDESB-KO, 27 January 1990)

**Explosive Ordnance Disposal (EOD)**

The detection, identification, field evaluation, rendering safe, recovery and final disposal of unexploded ordnance or munitions.

**Explosives Safety Submission (ESS)**

The document that serves as the specifications for conducting work activities at the project. The ESS details the scope of the project, the planned work activities, and potential hazards (including the maximum credible event) and the methods for their control.

**Formerly Used Defense Sites (FUDS)**

Properties previously owned, leased, or otherwise possessed by the U.S. and under the jurisdiction of the Secretary of Defense; or manufacturing facilities for which real property accountability rested with DOD but were operated by contractors (Government owned - contractor operated) and which were later legally disposed of. FUDS is a subprogram of the DERP. Restoration of military land was extended to formerly used sites in 1983 under Public Law 98-212 (DOD Appropriations Act of FY84).

**Fragmentation Distance**

The maximum distance that fragments of an ordnance item will travel when that ordnance item is detonated without the use of engineering controls.

**Geophysical Techniques**

Methods used to explore subsurface conditions using quantitative physical properties. Typical properties measured include seismic wave travel time and waveform changes, electrical potential differences, magnetic and gravitational field strength, temperature, etc. For OE and CWM investigations, electromagnetic and magnetic methods are most frequently used.

**Hot Box**

A closed, sealed container usually constructed from plywood, where items suspected of being CWM related are placed for testing. The items are placed in the container and the container is either heated from an outside source or allowed to heat by solar conduction. The vapors inside the hot box are monitored through a sampling port for indications of chemical agent.

**Intrusive Activity**

An action involving or resulting in the penetration of the ground surface at an area known or suspected to contain OE. Intrusive activities can be of an investigative or removal action nature.

**Maximum Credible Event (MCE)**

A realistic worst-case event that could occur at any time, with maximum release of a chemical agent from a munition, container, or process as a result of unintended, unplanned, or accidental occurrence. (HQDA Interim Guidance for Biological Warfare Materiel (BWM) and Non-Stockpile Chemical Warfare Materiel (CWM) Response Activities)

**Military Munitions**

All ammunition products and components produced or used by or for the U.S. DOD or the U.S. Armed Services for national defense and security, including military munitions under the control of the DOD, the US Coast Guard, the US DOE, and National Guard personnel. The term military munitions includes: confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries used by DOD components, including bulk explosives and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components thereof. Military munitions do not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components thereof. However, the term does include non-nuclear components of nuclear devices, managed under DOE's nuclear weapons program after all required sanitization operations under the Atomic Energy Act of 1954, as amended, have been completed. (40 CFR 260.10)

**Miniature Chemical Agent Monitoring System (MINICAMS)**

An automatic air monitoring system that collects compounds on a solid sorbent trap, thermally desorbs them into a capillary gas chromatography column for separation, and detects the compounds with a Flame Photometric Detector (FPD) or Halogen Specific Detector (XSD). It is a lightweight; portable, low-level detector designed to respond in less than fifteen minutes with alarm capability.

**National Oil and Hazardous Substance Pollution Contingency Plan (NCP)**

Revised in 1990, the NCP provides the regulatory framework for responses under CERCLA. The NCP designates the Department of Defense as the removal response authority for ordnance and explosives hazards.

**No Significant Effects (NOSE) distance**

Downwind distance from the MCE calculated by the U.S. Army computer program D2PC beyond which no significant effects will occur if a MCE should occur. This distance is calculated using worst-case atmospheric conditions at the site at the time of release.

**Non-Stockpile Chemical Warfare Materiel**

CWM (see definition) that is not included in the chemical stockpile. Non-stockpile CWM is divided into five categories: buried CWM, recovered chemical weapons (items recovered during range clearing operations, from chemical burial sites, and from research and development testing), former chemical weapon production facilities, binary chemical weapons, and miscellaneous CWM (unfilled munitions and devices and equipment specially designed for use directly in connection with employment of chemical weapons). (HQDA Interim Guidance for Biological Warfare Materiel (BWM) and Non-stockpile Chemical Warfare Materiel (CWM) Response Activities)

**Open-Path Fourier Transform Infrared Spectrometry (OPFTIR)**

Method for open-path air monitoring of gaseous compounds. It is a direct extension of laboratory spectroscopy systems that can identify and quantify gases based on their spectral absorption characteristics. An open-path FTIR system sends a beam of infrared laser light through open air to a reflector, which returns the beam to a spectrum analyzer. Gases present in the beam path absorb the light; measurement and analysis of the return beam's spectrum allows identification and quantification of the absorbing gas.

**Ordnance and Explosives (OE)**

Ammunition, ammunition components, chemical or biological warfare materiel or explosives that have been abandoned, 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")

**Photoionization Detector (PID)**

A portable instrument used to detect, measure, and provide a direct reading of the concentration of a variety of trace gases based on the principle of photoionization. The process involves the absorption of ultraviolet light by a gas molecule leading to ionization.

**Portable Isotopic Neutron Spectroscopy (PINS)**

A method which allows identification of elements within a closed munition without opening the munition. A neutron source placed near the item being analyzed provides neutrons that penetrate the shell of the munition and interact with the contents. A gamma ray detector monitors the energies and intensities of gamma rays emitted as a result of the

neutron interactions. The presence and relative concentration of specific chemical elements are determined based on characteristic gamma ray peaks in the energy spectrum so recorded.

### **Real Time Analytical Platform (RTAP)**

The RTAP combines a vehicle with a mounted HP 5890 dynatherm gas chromatograph with an automatic continuous environmental monitoring system that collects compounds on a solid sorbent trap, thermally desorbs them into a capillary gas chromatography column, and detects the compounds with a simultaneous phosphorus and sulfur, dual-headed flame photometric detector. The RTAP is a self-contained mobile platform that can be moved from site to site. The low level monitor mounted in the RTAP is designed to respond to low levels of agent in less than 15 minutes with alarm capability.

### **Response Action**

Action taken instead of or in addition to the removal of OE to prevent or minimize the release of OE so that it does not cause substantial danger to present or future public health or welfare or the environment. (ER 1110-1-8153)

### **Simulant**

A compound that is chemically similar to a chemical agent, but which is not as toxic. Used in training exercises to minimize exposure risks to trainees.

### **Site Safety and Health Plan (SSHP)**

Document that establishes the personnel protection standards and mandatory safety practices and procedures for work being performed. These policies and procedures are necessary to protect workers and the public from the potential hazards posed by work at the site.

### **Site Safety Submission (SSS)**

Document that serves as the specifications for conducting work activities at the project. The SSS details the scope of the project, the planned work activities, and potential hazards (including the maximum credible event) and the methods for their control. The SSS includes a Work Plan, a detailed Site Safety and Health Plan (SSHP), and support plans from supporting government agencies.

### **Stakeholder**

Federal, state, and local officials, community organizations, property owners, and others having a personal interest or involvement, or having a monetary or commercial involvement in the real property which is to undergo an OE response action.

**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)

**1X (X)**

An agent symbol with a single "X" indicates the item has been partially decontaminated of the indicated agent. Further decontamination processes are required before the item is moved or any maintenance or repair is performed without the use of chemical protective clothing and equipment. This degree generally shall be applied to the item as it stands in place after being used and subjected only to routine cleaning after use.

**3X (XXX)**

An agent symbol with three "Xs" (XXX) indicates that the item has been surface decontaminated by locally approved procedures, bagged or contained in an agent-tight barrier, of sufficient volume to permit sample air to be withdrawn without being diluted with incoming air, and/or appropriate tests/monitoring have verified that concentrations above 0.0001 mg/m<sup>3</sup> for agent GB, 0.00001 mg/m<sup>3</sup> for agent VX, 0.003 mg/m<sup>3</sup> for H or L, or 0.00003 mg/m<sup>3</sup> for agent GD (Unmasked worker AEL values for other covered chemicals) do not exist. Monitoring is not required for completely decontaminated and disassembled parts that are shaped simply (no crevices, threads, or the like) and are made of essentially impervious materials (such as simple lab glassware, and steel gears).

**5X (XXXXX)**

An agent symbol with five "Xs" (XXXXX) indicates an item has been decontaminated completely of the indicated agent and may be released for general use or sold to the general public. An item is decontaminated completely when the item has been subjected to procedures that are known to completely degrade the agent molecule, or when analyses, submitted through MACOM and DA channels for approval by the DDESB, have shown that the total quantity of agent is less than the minimal health effects dosage as determined by The Surgeon General. 5X condition must be certified by the commander or designated representative.

## EXECUTIVE SUMMARY

ES1 Fort McClellan is an 18,929-acre site located near Anniston, Calhoun County, Alabama that was used by the Department of the Army for ordnance and chemical weapons training and other military exercises. Parsons Engineering Science (Parsons) conducted an Engineering Evaluation/Cost Analysis (EE/CA) at 33 sites on Fort McClellan to evaluate potential contamination from chemical warfare materiel (CWM) related activities in the past. This CWM EE/CA was conducted to support Base Realignment and Closure activities and requirements.

ES2 Three basic types of CWM training were conducted at Fort McClellan. These activities included confidence training, round tapping and agent transfer, and decontamination and reaction training. During these training activities, small quantities of chemical agents were used and interviewees reported that excess amounts of decontamination chemicals were also routinely used.

ES3 A qualitative risk evaluation was conducted as part of this EE/CA based on the analytical results provided by Edgewood Chemical and Biological Center, in Edgewood, Maryland. The only chemicals of concern for this EE/CA investigation were chemical warfare agents and their breakdown products. Analytical results from this investigation, as well as from previous investigations, have shown that no residual agents or degradation products were detected in the sampled media. Based on the historical records and the sampling conducted it can be inferred there are no sources of chemical agent remaining in the environment at the Fort McClellan CWM EE/CA sites, and therefore the probability of current and future risk of human exposure to chemical agents is very low.

ES4 Parsons determined, based on existing historical information, an analysis of historical aerial photographs, and site visits, that sufficient information was available for 14 of the sites to demonstrate the absence of chemical agents without the need for further investigation. Based on the absence of CWM at these sites, the No Further Action alternative is indicated for these sites (Table ES-1).

ES5 Nineteen sites were investigated using geophysical methods, soil sampling and analysis, and/or excavation (Table ES-1). No residual chemical agent or agent degradation products were detected in the soils at the sites sampled. Based on the results of the investigations, the No Further Action alternative with regard to CWM is indicated for these 19 sites.

ES6 This EE/CA report outlines decisions for follow-on action related to CWM only. Although No Further Action is the CWM response alternative

recommended in this EE/CA, the Department of Army bears the responsibility for responding to, investigating, and remediating any CWM that may be discovered in the future at any sites addressed in this CWM EE/CA. The presence and extent of hazardous, toxic, and radiological wastes (HTRW) were not investigated as part of this CWM EE/CA. Similarly, the presence and extent of ordnance and explosives (OE) were not investigated with the exception of the R&S Smoke Ranges, where only OE scrap and no unexploded ordnance (UXO) was encountered. HTRW and/or OE investigations may need to be performed prior to transfer of the property to the public and will be addressed in follow-on decision documents.

**Table ES-1  
CWM EE/CA Investigations Summary  
Fort McClellan, Alabama**

Site Name and CERFA Parcel No. <sup>(1)</sup>	Land Use		Investigations During This EE/CA			Recommendation <sup>(3)</sup>
	Interim Land Use	Proposed Land Use <sup>(2)</sup>	Geophysics	Excavation	Soil Sampling	
1 - Training Area 31 [184(7)/185(7)]	Training/Education	Recreational	X	X	X	NFA
2 - T-38 (Reservoir Ridge) [186(6)]	Training/Education	Recreational	X	X	X	NFA
3 - Smoke Ranges R and S [no CERFA no.]	Training/Education	Recreational	X	X	--	NFA
4 - T-4 Biological Warfare Area [181(7)]	Commercial	Recreational/Transportation	X	--	--	NFA
5/20 - Old Chemical Weapons Demo Area/South Gate Toxic Gas Yards[194(7)]	Remediation Reserve	Recreational/Transportation	--	--	--	NFA
6 - Agent ID Area [509(7)]	Business/Industrial	Commercial/Mixed Use	X	X	X	NFA
7 - Sandell Field [97(7)]	Remediation Reserve/Open Space/Recreation	Recreational	--	--	--	NFA
8 - Cane Creek Training Area [510(7)]	Training/Education	Mixed Use	X	X	X	NFA
9 - Naylor Field [183(6)]	Remediation Reserve	Recreational	X	X	X	NFA
10/11 - Blacktop Training Area [511(7)] /Fenced Yard In Blacktop Area [512(7)]	Remediation Reserve	Recreational/Mixed Use	--	--	X	NFA
12 - Dog Training Area [513(7)]	Remediation Reserve	Development Reserve	--	--	X	NFA
13 - Dog Kennel Area [516(7)]	Remediation Reserve	Development Reserve	--	--	--	NFA
14 - Reaction Area T-5 [182(7)]	Remediation Reserve	Recreational/Development Reserve	--	--	--	NFA
15 - D and I Area [180(7)]	Remediation Reserve	Mixed Use	--	--	--	NFA
16 - Old Burn Pit [514(7)]	Remediation Reserve	Mixed Use	--	X	--	NFA
17 - Field Personnel Decontamination Area [515(7)]	Remediation Reserve	Mixed Use	--	--	X	NFA
18 - Decontamination Building 3185 [179(7)]	Remediation Reserve	Mixed Use	--	--	--	NFA
19 - CBR Proficiency Area [517(7)]	Training/Education	Institutional	--	--	--	NFA
21 - Sunset Hill Area [no CERFA no.]	Remediation Reserve/Commercial	Recreational/Development Reserve/Transportation	--	--	--	NFA
22 - Old Toxic Training Area [188(7)]	Training/Education	Mixed Use	--	--	X	NFA
23 - Training Area 24A [187(7)]	Remediation Reserve	Recreational	X	X	X	NFA
Mustard Spill Areas						
24 - Powers Site [191(7)]	Residential	Commercial	--	--	X	NFA
25 - Native Site [189(7)]	Open Space/Recreation	Recreational	--	--	X	NFA
26 - 3182 Site [193(7)]	Training/Education	Mixed Use	--	--	X	NFA
27 - PX Site [190(7)]	Commercial/Training/Education	Commercial	--	--	X	NFA
31 - Rucker Site [192(7)]	Training/Education	Institutional	--	--	X	NFA
Goat Yards						
28 - Rucker St. [no CERFA no.]	Training /Education	Institutional	--	--	--	NFA
29 - ASP [no CERFA no.]	Training /Education	Recreational	--	--	--	NFA
30 - Howitzer Hill [no CERFA no.]	Remediation Reserve	Recreational	--	--	--	NFA
32 - Building 4415 (Igloo 13) [199(7)]	Training /Education	Recreational	--	--	--	NFA
33 - Building 4416 (Igloo 14) [199(7)]	Training /Education	Recreational	--	--	--	NFA

(1) Number refers to site location on Figure 2.2

(2) Proposed land use as outlined in the 1997 Comprehensive Reuse Plan.

(3) NFA = No Further Action (with regard to CWM)

ES-3

## SECTION 1 INTRODUCTION

### 1.1 BACKGROUND

#### 1.1.1 Project Authorization

Parsons Engineering Science, Inc. (Parsons) received Contract No. DACA87-95-D-0018, Delivery Order No. 0037, from the U.S. Army Engineering and Support Center, Huntsville (USAESCH). The objective of this order was to conduct an Engineering Evaluation/Cost Analysis (EE/CA) for Chemical Warfare Materiel (CWM) training sites at Fort McClellan, Alabama.

#### 1.1.2 Purpose and Scope

1.1.2.1 Since 1988, Congress has enacted legislation providing for the closure of military bases/facilities and the realignment of others. The principal mechanism for implementing the policies has been the Base Realignment and Closure (BRAC) Commission. This Commission met in 1988, 1991, 1993, and 1995. Fort McClellan was among the installations recommended for closure. This installation was closed in September 1999 under BRAC 1995. The EE/CA process will support the BRAC Cleanup Team (BCT) decision-making activities for land reutilization under this closure. The Fort McClellan BCT includes the U.S. Environmental Protection Agency (USEPA), the Alabama Department of Environmental Management (ADEM), and the U.S. Army, with support from the USAESCH and their contractors.

1.1.2.2 This EE/CA report outlines decisions for follow-on action related to CWM only and does not recommend further conventional ordnance and explosives (OE) (except Smoke Ranges R&S) or hazardous, toxic, and radiological waste (HTRW) investigations that may be necessary at a particular site. These decisions will be included in follow-on decision documents for OE and HTRW prior to transfer of the property to the public.

1.1.2.3 The purpose of this EE/CA was to establish and characterize the presence of any CWM contamination at sites used historically on the Main Post of Fort McClellan, Alabama for CWM training, and to a lesser extent characterize the presence of OE detected during the investigation of the CWM sites, to facilitate closure activities. The scope of the EE/CA included review of existing site data, site characterization efforts involving intrusive excavation, sampling, and data collection to determine or classify those portions of the site that are contaminated or potentially contaminated with CWM, and to estimate the type and amount of CWM contamination. Included in the effort was an evaluation of a range of strategies for risk abatement and recommendations for preferred alternative(s) for these sites.

1.1.2.4 This EE/CA is being conducted as a non-time-critical removal action in a manner consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP). A non-time-critical removal action is an action that has a planning period of more than 6 months.

1.1.2.5 The objectives of further site investigation were to confirm, if possible, the location of past activities related to CWM or, in the case of Smoke Ranges R&S, the presence of OE, and to assess whether chemical constituents related to CWM still remain and potentially pose a risk to any follow-on HTRW investigations or to the public under future land use scenarios. Therefore, the scope of work for each of the sites was to collect geophysical and historical data to identify high probability areas of disposal, intrusively investigate anomalous areas identified, and collect soil samples for analysis of remnant agent and/or breakdown products.

## **1.2 REPORT ORGANIZATION**

This report was organized to first present general discussions of the background and purpose of the work performed, as well as the common approaches and procedures used to characterize the sites (Sections 1 to 3). Section 4 discusses why applicable or relevant and appropriate requirements and response alternatives were not evaluated, and briefly describes the risk evaluation. Section 5 addresses sites which were initially determined to have had adequate previous studies for characterization, or for which the historic records did not indicate further characterization was necessary. Finally, each of the remaining sites for which further site investigation was conducted under the EE/CA are completely addressed separately in Sections 6 through 19. Supporting information, results, and procedures are provided in appendices.

## **1.3 PROJECT TEAM**

Several organizations were directly involved in the Fort McClellan CWM EE/CA. The roles of these team members are described below. A detailed description of the project team members can be found in Section 1 of the approved project Work Plan (Parsons ES, 2000).

### **1.3.1 U.S. Army Engineer District, Mobile**

The United States Army Corps of Engineers (USACE) Mobile District, (CESAM) was the Life Cycle Project Manager for this project. CESAM responsibilities included review of project plans and documents, working with the news media and the public, and coordinating with State and local regulatory agencies on issues pertaining to protection of ecological and cultural resources.

### **1.3.2 U.S. Army Engineering and Support Center, Huntsville**

USAESCH was the implementing agency for execution of this project and provided technical expertise for CWM and OE activities. USAESCH responsibilities included procurement of EE/CA contractor services (Parsons), oversight of project implementation, and coordination of document reviews.

### **1.3.3 U.S. Army Soldier and Biological Chemical Command (SBCCOM)**

SBCCOM supported USAESCH in conducting intrusive investigations through the support of the Edgewood Chemical and Biological Center (ECBC) for on-site monitoring and analysis, and the Technical Escort Unit (TEU) for assessment, handling, and storage of suspect CWM.

### **1.3.4 Product Manager for Non-Stockpile Chemical Materiel (PMNSCM)**

PMNSCM provided support to USAESCH for planning the implementation of temporary storage, shipment and final disposition of recovered CWM.

### **1.3.5 Parsons Engineering Science, Inc. (Parsons)**

Parsons, as the prime contractor to USAESCH, prepared the Work Plan submittal and provided overall engineering support and services for implementation of the EE/CA. Parsons was responsible for performance of the activities detailed in the Scope of Work (SOW) (Appendix A). Parsons was also responsible for control of the schedule and budget.

### **1.3.6 Subcontractors**

1.3.6.1 Human Factors Applications, Inc., under contract to Parsons, provided Unexploded Ordnance (UXO)-qualified escort services needed to conduct the field investigation, conducted surface clearance of the sampling areas and access routes, cleared brush for access, and conducted the intrusive investigations. They were responsible for all conventional UXO operations, including handling, detonating, and disposing of conventional OE, if needed.

1.3.6.2 Sain Associates of Birmingham, Alabama, provided surveying services to locate the geophysical grids, soil borings, and trenches and pits.

1.3.6.3 Anniston Emergency Medical Services provided an onsite ambulance and paramedics trained to handle potential exposure of personnel to chemical agents during intrusive investigations. The paramedics also monitored site workers for signs of stress (body temperature, heart rate, etc.), in accordance with the approved Work Plan (Parsons ES, 2000).

## SECTION 2 SITE DESCRIPTION AND HISTORY

### 2.1 PROJECT LOCATION

2.1.1 This EE/CA addresses specific CWM training-related sites located on Fort McClellan, Alabama. Fort McClellan is located just to the northeast of the City of Anniston, Alabama in Calhoun County (Figure 2.1). Fort McClellan (Main Post) consists of 18,929 acres (Environmental Science and Engineering, Inc. [ESE], 1998), the majority of which includes range areas used historically for artillery or small arms training. The Choccolocco Mountains provide a backdrop on the east part of the property.

2.1.2 Within the Main Post, the Archives Search Report (USACE, 1999) identified one range at which smoke training and related activities were conducted, twenty-two chemical training areas, four mustard spill sites and three goat yards for further evaluation. A possible fifth mustard spill site, near Commandants Drive (formerly Kaiser Circle), was added to this investigation based on information from the Environmental Baseline Survey (EBS) (ESE, 1998). Reference has also been made that two buildings within the Ammunition Supply Point (ASP) have been used for CWM storage. Not all of these sites required additional fieldwork under this study, but all thirty-three sites are addressed by this EE/CA Report. The locations of these sites are depicted on Figure 2.2.

### 2.2 PHYSICAL DESCRIPTION

#### 2.2.1 Geology

Fort McClellan lies within the Appalachian fold and thrust belt where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. Geologic contacts in this region generally strike parallel to the faults and vertical repetition of lithologic units is common. The Cambrian Weisner Formation, consisting of interlayered shale, siltstone, sandstone, quartzite and conglomerate, underlies a large part of Fort McClellan, forming most of the higher elevations to the south and east of the developed area. Ordovician-age limestones and shales (Little Oak Limestone/Athens Shale/Lenoir Limestone/Newala Limestone/Longview Limestone) underlie much of the cantonment area. Soils developed from the lithologic units tend to be acidic to strongly acidic, with pH values between 4.5 and 5.5 standard units.

#### 2.2.2 Topography

The majority of Fort McClellan lies within the Valley and Ridge Province of the Appalachian Highlands. Local relief across the Main Post is in excess of 1,320 feet (Figure 2.2). The cantonment area of Fort McClellan is within valleys. The area east of the cantonment area is characterized by rounded hills with incised V-shaped valleys.

### 2.2.3 Climate

Fort McClellan is situated in a temperate, humid climate. Summers are hot and long, whereas winters are generally short and mild to moderately cold. The average annual temperature is 63° F. Rainfall averages 53 inches per year, and it is fairly well distributed throughout the year.

## 2.3 DEMOGRAPHICS

Two major municipalities are located near Fort McClellan. The city of Anniston (population 24,276) adjoins the main installation on the south and west. The city of Gadsden (population 38,978) is located 28 miles to the north. The city of Weaver (population 2,619) is located less than one mile northwest of the Main Post. The city of Oxford (population 14,592) is located immediately south of the city of Anniston. The city of Jacksonville (population 8,404) is located approximately four miles north-northeast of the Main Post. Smaller municipalities, including Pelham Heights, Sherman Heights and Anniston Beach, are located immediately west or north of the Main Post. Population figures are based on 2000 U.S. Census figures as provided by the Alabama Department of Archives and History.

## 2.4 SITE HISTORY

2.4.1 Use of the Fort McClellan area for ordnance training activities may have begun as early as the Spanish American War (1898-1899), when the Fourth Alabama Artillery used the Choccolocco Mountains as their backdrop for firing (USACE 1999). Starting in 1912 and for the next four years, the War Department began using the area for training of National Guardsmen in artillery. In late 1915, 1,160 acres of land were designated as the Anniston Field Artillery Range. Starting in World War I, the land area was expanded to nearly 19,000 acres, with about 16,000 acres used as artillery ranges. The cantonment camp was constructed starting in 1917. The facility was made a permanent Army post in 1929 and designated as Fort McClellan. A variety of artillery, mortar, rocket, machine gun, and small arms training was conducted at this fort from World War I through 1999.

2.4.2 Chemical warfare training activities at Fort McClellan started around 1917 with the construction of two wood gas instruction houses. A Chemical Warfare Officer of the Corps assessed the area in 1922 for suitability in storing chemical items and for conducting training. Later that same year, the facility received smoke, tear gas and white phosphorus items. Additional items were sent from Edgewood Arsenal in 1925 and more items were reportedly received up until World War II. Prior to and during World War II, schools for gas officers and non-commissioned officers were held on the facility, with gas chambers existing on site in 1945.

2.4.3 Fort McClellan was activated in 1951 for operation of the Chemical Corps School and as a replacement center for the Chemical Corps. In that same year, the Army Chemical Training Center was established, which later in the year became the Chemical Corps Training Command. In 1952, this command picked up the responsibility for chemical, biological and radiological (CBR) warfare as well. In 1953, Edgewood Arsenal sent fifty 4.2-inch mortar rounds filled with the nerve agent tabun (GA) to the Fort, and mustard-filled bombs were sent to the Fort from Tooele, Utah. Biological warfare material arrived from Anniston Air Force Base later that same year. Confidence training on distilled mustard (HD) was conducted during the 1950's as

well as training in chemical decontamination procedures and chemical filling operations, demonstrations using various agents such as phosgene (CG), cyanogen chloride (CK), Sarin (GB), the nerve agent O-ethyl-S(diisopropylaminoethyl)methylphosphonothiolate (VX), and flame and smoke training.

2.4.4 In the early 1960's, the U.S. Army Combat Developments Command Chemical Biological-Radiological Agency moved to Fort McClellan. The U.S. Army Chemical Corps School name was changed to the U.S. Army Chemical Center and School in 1967. In late 1968, all of the GB and VX nerve agents were moved from the Toxic Agent Yard on Reservoir Ridge to Igloo 13 in the Ammunition Supply Point. Troops may have tapped rounds and transferred vials of mustard and nerve agent for training (apparently in the Toxic Agent Yard). The pit at the Toxic Agent Yard reportedly received left over agent or operational material and decontamination solutions. References to the Toxic Agent Yard have been interpreted to be Training Area 38.

2.4.5 In 1973, the Chemical School departed Fort McClellan. Decontamination was reportedly conducted on all of the school's training sites and the agents were removed to Edgewood Arsenal or Anniston Army Depot. By 1979, a decision was made to return the school to Fort McClellan.

2.4.6 Construction on the Chemical Decontamination Training Facility (CDTF) was started in 1983 near Reservoir Ridge. The facility was opened in 1987 for training in the detection, identification and decontamination of chemical agents. In 1988, 1989 and 1990 containers of the nerve agents GB and VX were brought to the CDTF from the Anniston Army Depot.

2.4.7 Fort McClellan was recommended for closure by the Base Closure and Realignment Commission in 1995. The closure of Fort McClellan became effective on September 30, 1999 (Headquarters, Department of the Army, 1999).

## 2.5 TYPICAL CWM TRAINING ACTIVITIES

2.5.1 Three basic types of CWM training were conducted at Fort McClellan. These activities include confidence training, round tapping and agent transfer, and decontamination and reaction training. Although smoke and flame training has also been conducted at some of the sites, these activities are not considered to be CWM-related (USACE, 2000).

2.5.2 CWM is an item configured as a munition containing a chemical substance that is intended to kill, seriously injure or incapacitate a person through physiological effects. CWM also includes use of chemical agents in other-than-munition configurations, as well as chemical agent identification sets (CAIS). Smoke and flame producing items (e.g. flame throwers, napalm, phosphorus) were once also classified as CWM; however, these items are no longer considered CWM, as toxicity is not their primary effect (USACE, 2000).

2.5.3 Confidence training involved use of live agent on a soldier or animal to demonstrate the effects of the agent. Only H (mustard) or HD was used on human trainees. A drop of HD would be placed on the trainee's skin to demonstrate the blistering effect, and to show the protection given by the protective ointment. Testing on animals (goats or rabbits)

involved placing a drop of agent on the nose of the animal, observing the effects, then reviving and decontaminating the animal. If the animal expired, it was wrapped in an old tarp and buried in a landfill located south of the old airstrip.

2.5.4 Round tapping and agent transfer activities at the Fort McClellan sites involved drilling a hole into an agent-filled round using a hand drill. These rounds did not contain explosives. Rounds used, and the agent they contained, were 105 mm (GB), 155mm (HD) and 4.2-inch mortar rounds (CG). After drilling into the round, the agent was transferred to vials. The extractions were done to obtain agent to contaminate an area, to completely decontaminate a round, or to obtain agent for another training exercise.

2.5.5 Decontamination or reaction training activities were conducted to teach trainees to identify the agent present, then plan and carry out the steps necessary to neutralize the hazards presented by agent contamination. A 1969 Standard Operating Procedure for reaction exercises using live agent indicated that if more than 25 milliliters of nerve or blister agent was used at a site, it was to be applied to more than one munition such that less than 25 ml was present on any one munition (USACE, 1999). Interviewees indicated that vials containing only 20 ml or 40 ml of agent were used at these sites. Exercises may also have included use of identification kits to identify the agent present. These kits contained only small amounts of agent or dilute agent.

2.5.6 Historical records and interviews document that excess amounts of decontaminating chemicals were used. USATHMA (1984) states, Standard Operating Procedures (SOPs) at Fort McClellan called for the use of excess quantities of Super Tropical Bleach (STB) or Decontaminate Solution #2 (DS-2) to ensure complete decontamination of chemical agents.

## **2.6 CURRENT AND FUTURE SITE USE**

2.6.1 In 1996, the local community leaders established a Local Reuse Authority (LRA) for the expressed purpose of overseeing the redevelopment and reuse of the former military installation. This started with the Fort McClellan Reuse and Redevelopment Authority (FMRRRA), which evolved into the Fort McClellan Redevelopment Commission (FMDC). The FMDC developed the Fort McClellan Comprehensive Reuse Plan in 1997 (EDAW, 1997). In March 1999, the FMDC became the Anniston-Calhoun County Fort McClellan Joint Powers Authority (JPA), which adopted the FMDC-approved reuse plan. These three organizations have been actively engaged in planning for and implementing all elements related to property transfer and conveyance from the federal government. The primary goal of the JPA is to manage the planned, orderly growth and redevelopment of Fort McClellan according to a long-term vision for the property and its significance to new job creation and economic contribution for the local community.

2.6.2 The Army transferred the ownership deed for 1,298 acres of land and 239 facilities to the JPA on December 12, 2000 as the first phase of property transfer. This transfer included most of the former base residential housing, the Child Development Center, the WAC Museum and other smaller facilities. Additional acreage and structures will be deeded to JPA as environmental studies and remediation activities are completed. An additional 302 acres and 186 facilities have been deeded to the JPA subsequent to the December 12, 2000 transfer. Acreage

associated with the sites being investigated by this EE/CA remains under the control of the U.S. Army, pending results of all environmental studies.

2.6.3 Current tenants at Fort McClellan include the Alabama National Guard, the Department of Justice National Center for Domestic Preparedness, a publishing company, several small engineering/construction firms and a Catholic school. Jacksonville State University is renovating some facilities for instructional use and for a childcare facility. Auburn University is renovating facilities and land for training dogs associated with the federal government's biological detection program. This facility will include a veterinary clinic, kennels and office space.

2.6.4 Proposed future uses of the remaining Fort McClellan property are outlined in the JPA's Comprehensive Reuse Plan. This outlines the development of a mixed-use community, with the majority of residential areas south of Cane Creek and the majority of the working areas to the north of Cane Creek. The existing rail line will be upgraded to provide access to proposed industrial areas. A 7,000 to 14,000 acre wildlife refuge is also proposed within the Choccolocco Mountains.

2.6.5 Current, interim, and proposed future land uses for the 33 sites considered in this EE/CA (as identified in the Master Use Plan) are summarized in Table 2.1. The proposed land uses by the year 2020 for the Main Post of Fort McClellan are also outlined on Figure 2.3. These proposed uses are detailed in the Master Use Plan. Sites with a listed interim use of remedial reserve will not be developed until all environmental investigations are completed and any contamination removed.

## 2.7 ANALYSIS OF HISTORICAL RECORDS

The St. Louis District of the USACE evaluated historical records, and summarized the findings in the Archives Search Report (ASR) (USACE, 1999). Oak Ridge National Laboratories conducted an assessment of historic aerial photographs of each of the sites. Several contractors have conducted environmental investigations throughout Fort McClellan. Results of these investigations are summarized in the following section.

## 2.8 PREVIOUS INVESTIGATIONS

A number of previous investigations have been conducted on all or some of the sites addressed by this EE/CA. These investigations have included record searches, interviews, subsurface assessments and media sampling. Some of the major investigations are summarized below.

### 2.8.1 1977 Installation Assessment of Fort McClellan, Records Evaluation

In 1977, the Department of the Army, Office of the Project Manager for Chemical Demilitarization and Installation Restoration (Aberdeen) conducted a records search to *"determine the degree of contamination at the installation by chemical, biological and radiological material, and to assess the possibility of contaminant migration beyond the*

**Table 2.1**  
**Current and Proposed Land Use by Site**  
**Fort McClellan, Alabama**

<b>Site Name and CERFA Parcel No. <sup>(1)</sup></b>	<b>Current Land Use</b>	<b>Interim Land Use</b>	<b>Proposed Land Use <sup>(2)</sup></b>
1 - Training Area 31 [184(7)/185(7)]	Military/Government	Training/Education	Recreational
2 - T-38 (Reservoir Ridge) [186(6)]	Military/Government	Training/Education	Recreational
3 - Smoke Ranges R and S [no CERFA no.]	Military/Government	Training/Education	Recreational
4 - T-4 Biological Warfare Area [181(7)]	Military/Government	Commercial	Recreational/Transportation
5/20 - Old Chemical Weapons Demo Area/ South Gate Toxic Gas Yards [194(7)]	Military/Government	Remediation Reserve	Recreational/Transportation
6 - Agent ID Area [509(7)]	Military/Government	Business/Industrial	Commercial/Mixed Use
7 - Sandell Field [97(7)]	Military/Government	Remediation Reserve/Open Space/Recreation	Recreational
8 - Cane Creek Training Area [510(7)]	Military/Government	Training/Education	Mixed Use
9 - Naylor Field [183(6)]	Military/Government	Remediation Reserve	Recreational
10/11 - Blacktop Training Area [511(7)]/Fenced Yard In Blacktop Area [512(7)]	Military/Government	Remediation Reserve	Recreational/Mixed Use
12 - Dog Training Area [513(7)]	Military/Government	Remediation Reserve	Development Reserve
13 - Dog Kennel Area [516(7)]	Military/Government	Remediation Reserve	Development Reserve
14 - Reaction Area T-5 [182(7)]	Military/Government	Remediation Reserve	Recreational/Development Reserve
15 - D and I Area [180(7)]	Military/Government	Remediation Reserve	Mixed Use
16 - Old Burn Pit [514(7)]	Military/Government	Remediation Reserve	Mixed Use
17 - Field Personnel Decontamination Area [515(7)]	Military/Government	Remediation Reserve	Mixed Use
18 - Decontamination Building 3185 [179(7)]	Military/Government	Remediation Reserve	Mixed Use
19 - CBR Proficiency Area [517(7)]	Military/Government	Training/Education	Institutional
21 - Sunset Hill Area [no CERFA no.]	Military/Government	Remediation Reserve/ Commercial	Recreational/Development Reserve/Transportation
22 - Old Toxic Training Area [188(7)]	Military/Government	Training/Education	Mixed Use
23 - Training Area 24A [187(7)]	Military/Government	Remediation Reserve	Recreational
Mustard Spill Areas			
24 - Powers Site [191(7)]	Military/Government	Residential	Commercial
25 - Native Site [189(7)]	Military/Government	Open Space/Recreation	Recreational
26 - 3182 Site [193(7)]	Military/Government	Training/Education	Mixed Use
27 - PX Site [190(7)]	Military/Government	Commercial/Training/ Education	Commercial
31 - Rucker Site [192(7)]	Military/Government	Training/Education	Institutional
Goat Yards			
28 - Rucker St. [no CERFA no.]	Military/Government	Training /Education	Institutional
29 - ASP [no CERFA no.]	Military/Government	Training /Education	Recreational
30 - Howitzer Hill [no CERFA no.]	Military/Government	Remediation Reserve	Recreational
32 - Building 4415 (Igloo 13) [199(7)]	Military/Government	Training /Education	Recreational
33 - Building 4416 (Igloo 14) [199(7)]	Military/Government	Training /Education	Recreational

(1) Number refers to site location on Figure 2.2

(2) Proposed land use as outlined in the 1997 Comprehensive Reuse Plan.

*installation's boundaries.*" The report, dated April 1977, provided a brief summary of activities believed to have been conducted on some of the sites to be addressed by this EE/CA (USATHAMA, 1977). The sites mentioned in this report included Training Area 31 and T-38 (Reservoir Ridge), Naylor Field, Reaction Area T-5, and the D&I Area, the Old Toxic Training Area and Range 24A (Table 2.2). This report also contained a figure depicting the locations of Training Area 31, four mustard spill sites, and three goat yards. This report also implied that Igloo 13, where agents were stored, was located at Training Area 31.

### **2.8.2 1984 Reassessment of Fort McClellan, Records Evaluation**

The assessment described in Section 2.8.1 was reassessed by Environmental Science and Engineering, Inc. (ESE) in January 1984 (ESE, 1984). The objective of this study and report was to reevaluate the findings of USATHAMA prepared in 1977 with respect to any new information. Only aspects of the 1977 report related to chemical, biological and radiological issues were reassessed. No site visit was included in this effort. This report included a summary of the characteristics of distilled mustard (HD), nerve agent (VX), and sarin (GB), and referenced studies conducted by the U.S. Army Medical Bioengineering Research and Development Laboratory (USAMBRDL) on the persistence of subsurface contamination in soils for HD, VX and GB and their byproducts. The conclusion of this report was that the only compounds likely to persist in the subsurface soils are HD and bis (2-diisopropylaminoethyl) (DES2), a byproduct formed from the decontamination of VX (ESE, 1984). However, this reassessment report went on to conclude that residual pockets of agent could persist in the subsurface from spills of agent during training. Sites discussed in the report are indicated on Table 2.2.

### **2.8.3 1990 Enhanced Preliminary Assessment**

In 1990, Roy F. Weston, Inc. (Weston) conducted a preliminary assessment of sites on Fort McClellan under contract to United States Army Toxic and Hazardous Materials Agency (USATHAMA) for the U.S. Army Installation Restoration Program (Weston, 1990). This effort included visual inspections, review of files and other documents, and interviews with then current employees of the Fort. The purpose was to document existing conditions of areas included under the Base Closure Program, and make recommendations for follow-on characterization. Many of the sites addressed by this EE/CA were included in this assessment, as indicated in Table 2.2.

### **2.8.4 1993 Site Investigation (SI)**

A SI was conducted by Science Applications International Corporation (SAIC) on 17 sites located on Fort McClellan (SAIC, 1993). This work included limited geophysical surveys at two of the sites under assessment in this EE/CA (Sites T-38 and Training Area 24A) as well as soil, sediment and surface water sampling at seven sites (Table 2.2). In addition to reporting on the results of the investigations, the report included recommendations for further characterization.

### **2.8.5 1998 Environmental Baseline Survey (EBS)**

ESE conducted an EBS and Community Environmental Response Facilitation Act (CERFA) investigation at Fort McClellan in 1997 (ESE, 1998). This study was designed to document the current environmental condition of the properties and included primarily records

**Table 2.2**  
**Fort McClellan Investigation/Reports**  
**Fort McClellan, Alabama**

	Site Name	CERFA Parcel No.	Installation Assessment, Records Evaluation, 1977 - USATHAMA	Reassessment of Fort McClellan, 1984 - ESE	Enhanced Preliminary Assessment, 1990 - Weston	Site Investigation Report, 1993 - SAIC	Environmental Baseline Survey, 1998 - ESE	Archive Search Reports, 1998 - USACE	Remedial Investigation Report, 1999 - SAIC
1	Training Area 31	184(7)/185(7)	X	X	X	X	X	X	
2	T-38 (Reservoir Ridge)	186(6)	X	X	X	X	X	X	X
3	Smoke Ranges R&S	-					X	X	
4	T-4 Biological Warfare Area	181(7)	X		X		X	X	X
5	Old Chemical Weapons Demo Area(1)	194(7)						X	
6	Agent ID Area	509(7)						X	
7	Sandell Field	97(7)						X	
8	Cane Creek Training Area	510(7)						X	
9	Naylor Field (T-6)	183(6)	X	X	X	X	X	X	
10	Blacktop Training Area (2)	511(7)						X	
11	Fenced Yard in Blacktop Area (2)	512(7)						X	
12	Dog Training Area	513(7)						X	
13	Dog Kennel Area	516(7)						X	
14	Reaction Area T-5	182(7)	X	X	X	X	X	X	X
15	D&I Area	180(7)	X	X	X	X	X	X	X
16	Old Burn Pit	514(7)						X	
17	Field Personnel Decontamination Area	515(7)						X	
18	Decontamination Building 3185	179(7)						X	
19	CBR Proficiency Area	517(7)						X	
20	South Gate Toxic Gas Yard (1)	-						X	
21	Sunset Hill Area	-						X	
22	Old Toxic Training Area	188(7)	X	X	X	X	X	X	
23	Training Area 24A	187(7)	X	X	X	X	X	X	X
24	Mustard Spill - Powers Site	191(7)	X	X			X	X	
25	Mustard Spill - Native Site	189(7)	X	X			X	X	
26	Mustard Spill - 3182 Site	193(7)	X	X			X	X	
27	Mustard Spill - PX Site	190(7)	X	X			X	X	
28	Goat Yard - On current site of MP School	-	X					X	
29	Goat Yard - Inside the ASP	-	X					X	
30	Goat Yard - Northwest of Range 18 (Howitzer Hill Fenced Area)	-	X					X	
31	Mustard Spill - Rucker Site	192(7)					X		
32	Building 4415 (Igloo 13)	199(7)							
33	Building 4416 (Igloo 14)	199(7)						X	

(1) Sites combined for investigation.

(2) Sites combined for investigation.

review activities and on-site surveys. No sampling was conducted. Based on the review activities, the properties were grouped into standardized CERFA parcel categories. The sites addressed by the EBS included nine of the CWM training sites and the five mustard spill areas addressed in this EE/CA (Table 2.2). These sites were designated as CERFA Disqualified Parcels because of the history of ordnance or CWM.

### **2.8.6 1998 Environmental Impact Statement for Disposal and Reuse**

Parsons Harland Bartholomew & Associates (now Parsons) under contract with the U.S. Army Corps of Engineers, Mobile District, prepared the environmental impact statement (EIS) for the disposal and reuse of Fort McClellan (USACE 1998). This draft final document addresses background information, environmental setting information, and general issues of reuse related to the sites addressed by this EE/CA, but does not add specific background information on those sites.

### **2.8.7 1998 Archives Search Report**

In 1998, the USACE, St. Louis District conducted a site inspection and archives search related to the chemical warfare materiel sites associated with Fort McClellan. The final reports, dated April 1999, outlined the site histories, site descriptions, results of visual site inspections and interviews, and evaluation of potential CWM and ordnance contamination based on site information and archives searches (USACE, 1999). The sites addressed by these reports included all of those addressed by this EE/CA, with the exception of the mustard spill site near Commandants Drive.

### **2.8.8 1998 Site Visits and Record Search/Review**

2.8.8.1 On September 10, 1998 a project meeting and site visit was conducted at Fort McClellan, Alabama. The meeting objectives were to review roles and responsibilities of participants in the EE/CA planning process, discuss information about the sites at Fort McClellan that were addressed by the current scope of work, and to visit the sites to familiarize the teams with the site conditions and locations.

2.8.8.2 A number of documents addressing past studies on Fort McClellan were provided to Parsons for review. These documents are included within the references and provided much of the background information used to assess the locations and activities at the sites addressed by this EE/CA.

### **2.8.9 1999 Remedial Investigation**

In 1999, a remedial investigation (RI) was completed by SAIC addressing nine sites located on Fort McClellan (SAIC, 1999). Only five of the nine sites were related to CWM or biological training. These five sites (T-4 Biological Warfare Area, Reaction Area T-5, Training Area T-24A, T-38, and the Detection and Identification Area (D&I) Area) are being addressed by this EE/CA (Table 2.2). The field investigation included geophysical surveys, excavation of pits, soil, sediment, surface water and groundwater sampling. None of the five CWM-related sites had detections of agent or breakdown products in the sampling results. Recommendations were made in the report relative to HTRW issues.

### **2.8.10 1999 Historic Aerial Photography Review and Ground Reconnaissance**

2.8.10.1 Oak Ridge National Laboratories was commissioned to conduct an assessment of historic aerial photographs for each of the sites to be addressed by the EE/CA, with the exception of the mustard spill sites. The assessment, completed in February 1999, included a review of photography dating from the 1930's through 1994. This review focused on physical changes within the site areas noted from year to year. Although this assessment did not result in the identification of specific training areas within the sites, it did allow a better understanding to be developed as to where activities may have occurred on the ground based on the clearing of roads, trails and open areas.

2.8.10.2 A follow-up ground reconnaissance was conducted by Parsons in February 1999 for each of the sites. This reconnaissance was conducted using some of the historic aerial photographs as well as information from previous site investigations. The purpose of this visit was to finalize the approach to site investigations.

## **2.9 ONGOING INVESTIGATIONS**

Foster Wheeler Corporation is currently conducting an OE clearance investigation at several sites across Fort McClellan. IT Corporation is conducting a site-wide HTRW investigation, which will further address 15 of the sites considered under this EE/CA.

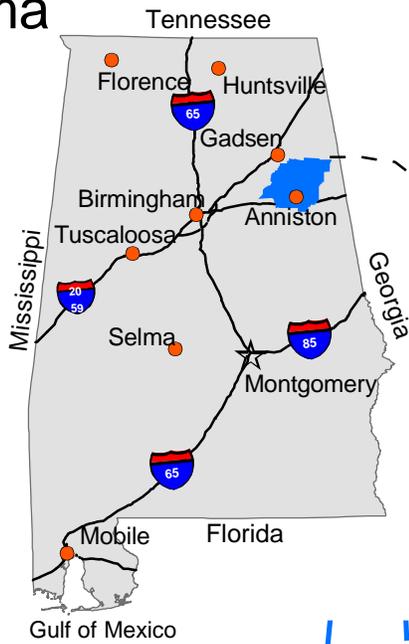
## **2.10 SITE DESCRIPTIONS**

The ASR (USACE, 1999) identified thirty sites for further consideration as potential CWM sites. References within the ASR and other documents lead to the inclusion of three additional potential sites. All thirty-three sites are listed on Table 2.2, and are shown on Figure 2.2. Each of these sites was evaluated to determine the need for additional field investigation under this EE/CA using the decision tree presented in Figure 2.4. Of these 33 sites, 27 were considered to be locations at which chemical agents were potentially used or stored and have been assigned CERFA parcel numbers as shown on Table 2.2.

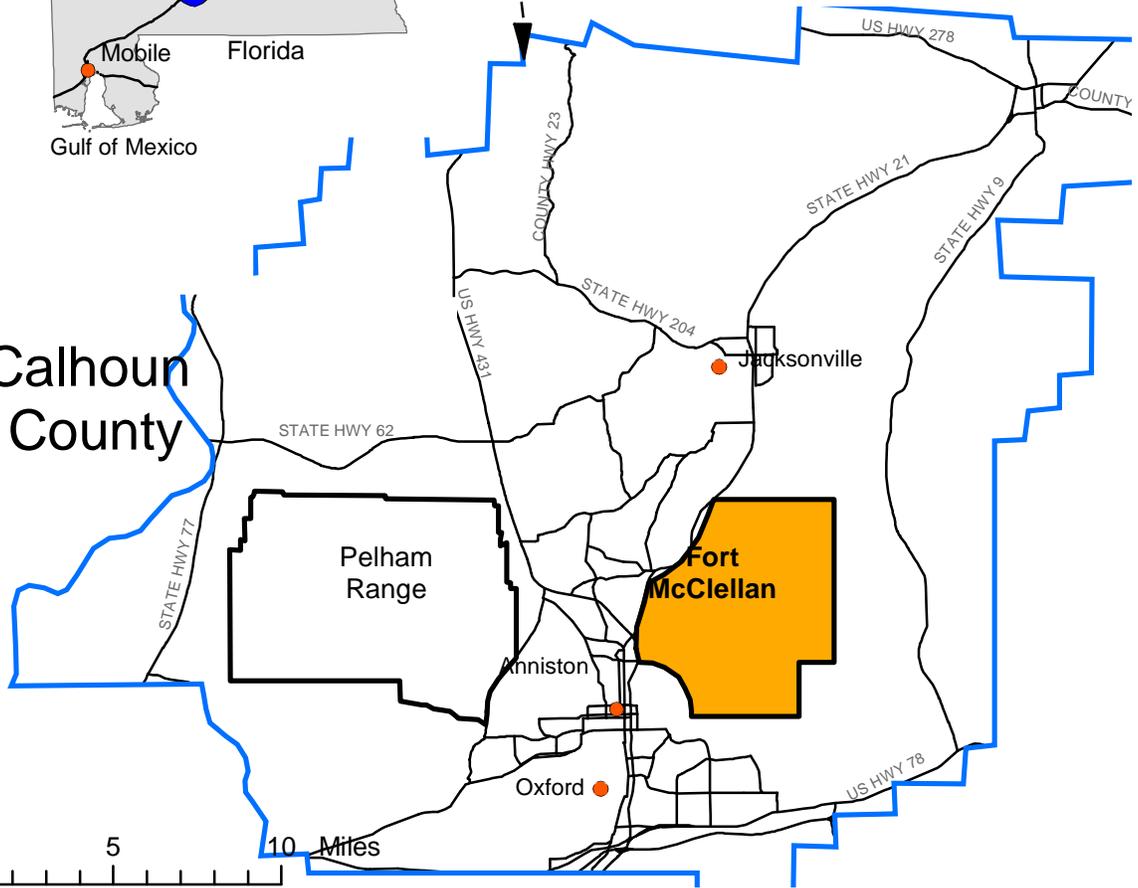
## **2.11 PREVIOUS REMOVAL ACTIONS**

In 2001, Explosive Ordnance Disposal Technology, Inc. (EODT) completed a one-foot OE clearance within the eastern bypass right-of way, located along the western boundary of Fort McClellan (Figure 2.3), and, in 2000, Foster Wheeler Environmental Corporation completed a clearance to depth of the M2 Parcel. No other formal removal actions, aside from responses by explosive ordnance disposal (EOD) personnel to individual OE recoveries, have been completed.

# Alabama



## Calhoun County



**Figure 2.1**

### **Fort McClellan Site Location Map**

**Legend**

- Major City
- County Boundary
- Major Road/Highway

PARSONS ENGINEERING SCIENCE, INC.		U.S. ARMY CORPS OF ENGINEERS HUNTSVILLE CENTER	
DESIGNED BY: RED	FORT McCLELLAN ANNISTON, ALABAMA CALHOUN COUNTY		
DRAWN BY: RED	SCALE:	PROJECT NUMBER: 734643	
CHECKED BY: RLS	DATE: May 2002	PAGE NUMBER:	
SUBMITTED BY: RLS	FILE: X:\g15\734643\Maps\Locator2_1.mxd	2-11	

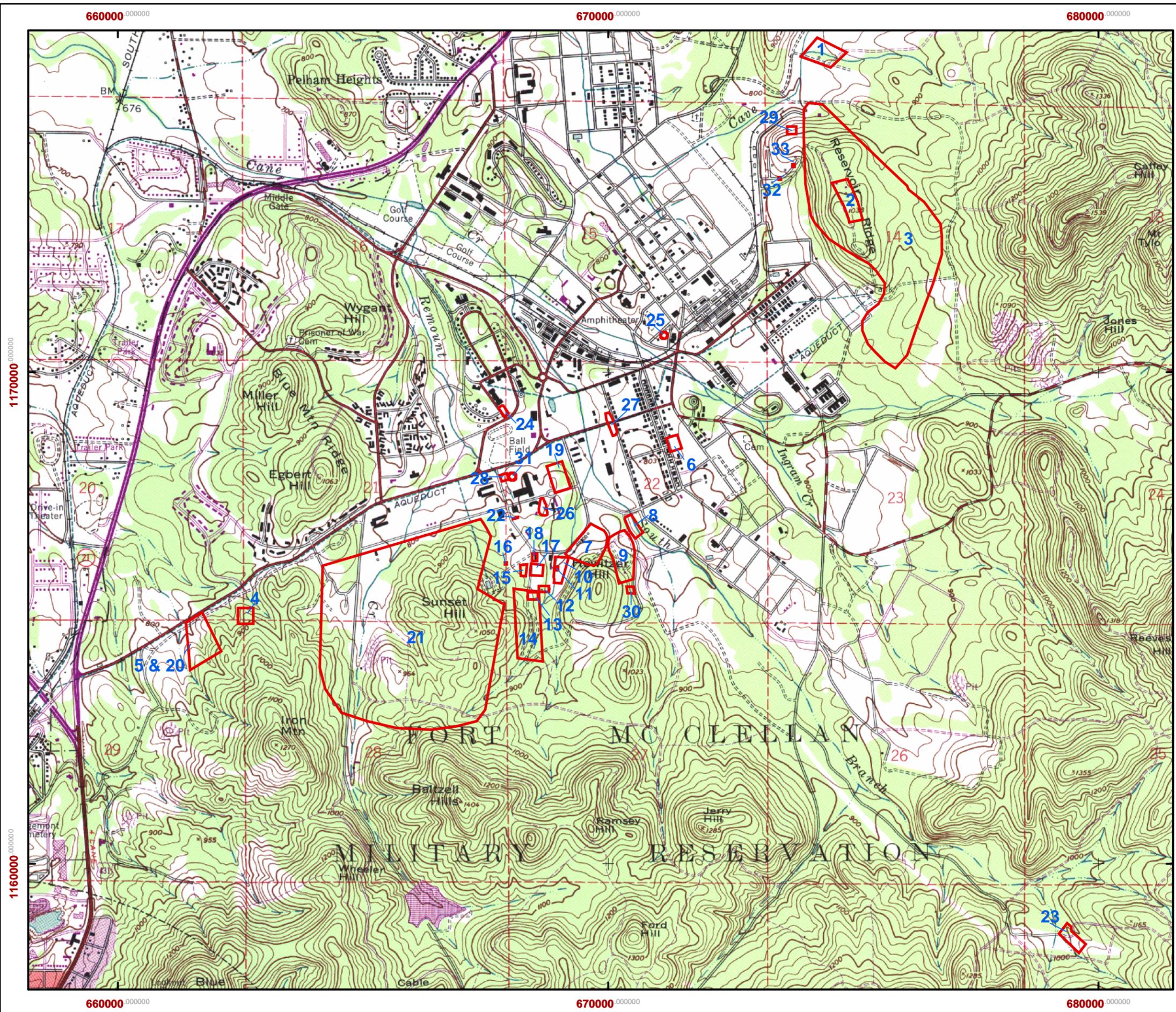


Figure 2.2

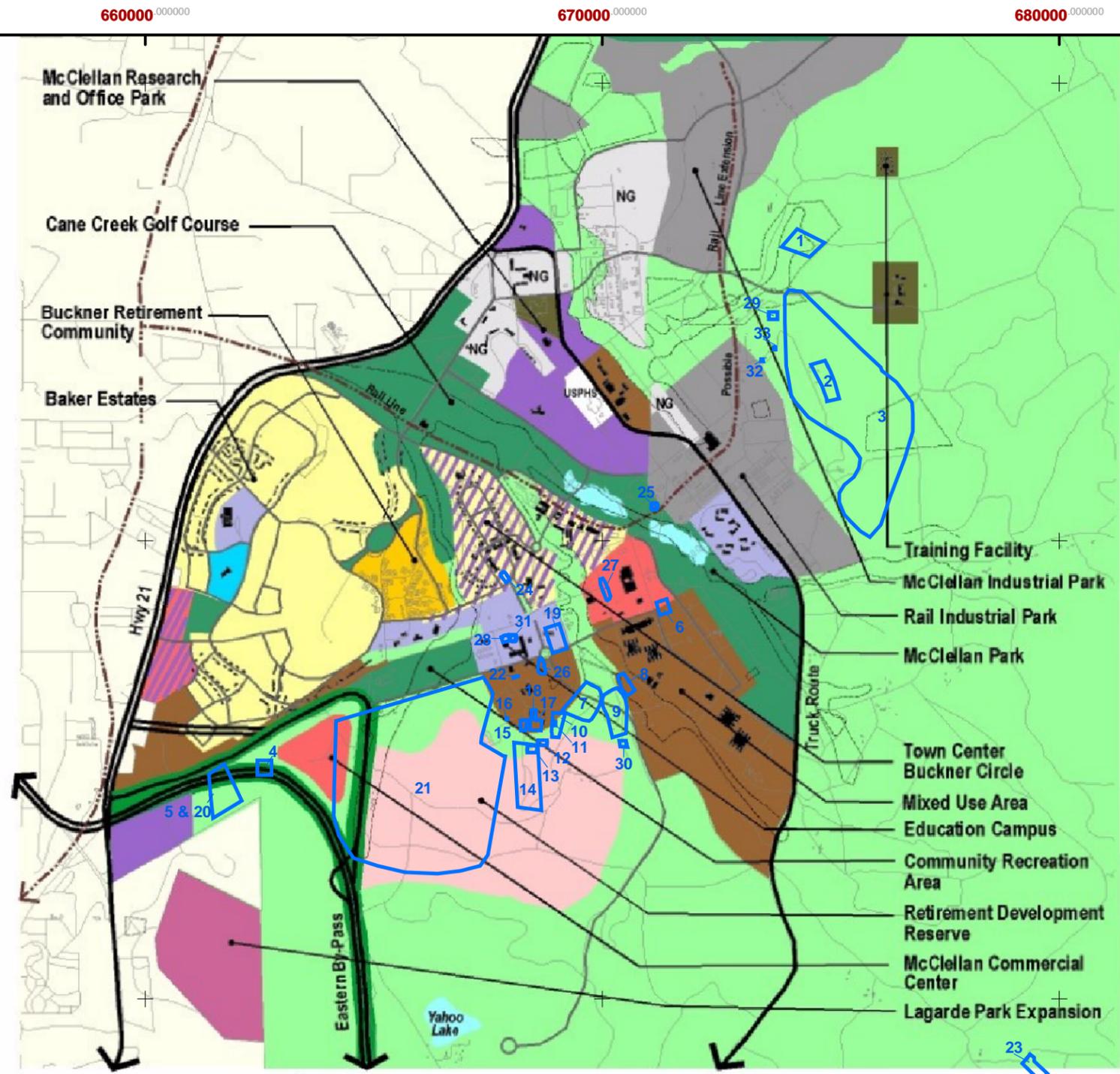
# CWM EE/CA SITE LOCATION MAP

- | No.                | Site ID                              |
|--------------------|--------------------------------------|
| 1                  | Training Area 31                     |
| 2                  | T-38 (Reservoir Ridge)               |
| 3                  | Smoke Ranges R & S                   |
| 4                  | T-4 Biological Warfare Area          |
| 5                  | Old Chemical Weapons Demo Area       |
| 6                  | Agent ID Area                        |
| 7                  | Sandell Field                        |
| 8                  | Cane Creek Training Area             |
| 9                  | Naylor Field                         |
| 10                 | Blacktop Training Area               |
| 11                 | Fenced Yard in Blacktop Area         |
| 12                 | Dog Training Area                    |
| 13                 | Dog Kennel Area                      |
| 14                 | Reaction Area T-5                    |
| 15                 | D & I Area                           |
| 16                 | Old Burn Pit                         |
| 17                 | Field Personnel Decontamination Area |
| 18                 | Decontamination Building 3185        |
| 19                 | CBR Proficiency Area                 |
| 20                 | South Gate Toxic Gas Yard            |
| 21                 | Sunset Hill Area                     |
| 22                 | Old Toxic Training Area              |
| 23                 | Training Area 24A                    |
| 24, 25, 26, 27, 31 | Mustard Spills                       |
| 28, 29, 30         | Goat Yards                           |
| 32                 | Building 4415 (Igloo13)              |
| 33                 | Building 4416 (Igloo 14)             |
| [Red Box]          | Site Boundary                        |

Source: US Geological Survey Topographic Map  
Anniston 1972



PARSONS ENGINEERING SCIENCE, INC.		U.S. ARMY CORPS OF ENGINEERS HUNTSVILLE CENTER	
DESIGNED BY: MAD	FORT McCLELLAN ANNISTON, ALABAMA CALHOUN COUNTY		
DRAWN BY: MAD	SCALE: 1 inch equals 2,000 feet	PROJECT NUMBER: 734643	
CHECKED BY: JC/JU	DATE: May 2002	PAGE NUMBER: 2-12	
SUBMITTED BY: JC/JU	FILE: x:\gis\734643\Maps\Eeca_maps(revised2)\figure2_2.mxd		



**LAND USE PLAN • 2020**

**FORT MCCLELLAN REUSE PLAN**

<b>LEGEND</b>	Retail/Office	Industrial	Passive Recreation	Mixed Business Use
	DOJ	Education/Training	Cultural	Town Center
	Retail	Public Use	National Guard	Lake
	Office	Retirement	Active Recreation	Development Reserve

Prepared by:  
 EDAW, Inc  
 Atlanta, GA and Huntsville, TN  
 Katak Raek  
 Huntsville, TN  
 KPS Group, Inc.  
 Birmingham, AL  
 WB Bishop & Associates  
 Columbus, FL  
 Hansen Siler George  
 Silver Spring, MD  
 ECG  
 Andalus, AL and Havana, FL

FORT MCCLELLAN REUSE AND REDEVELOPMENT AUTHORITY

Figure 2.3  
**CWM EE/CA SITES  
 FUTURE LANDUSE**

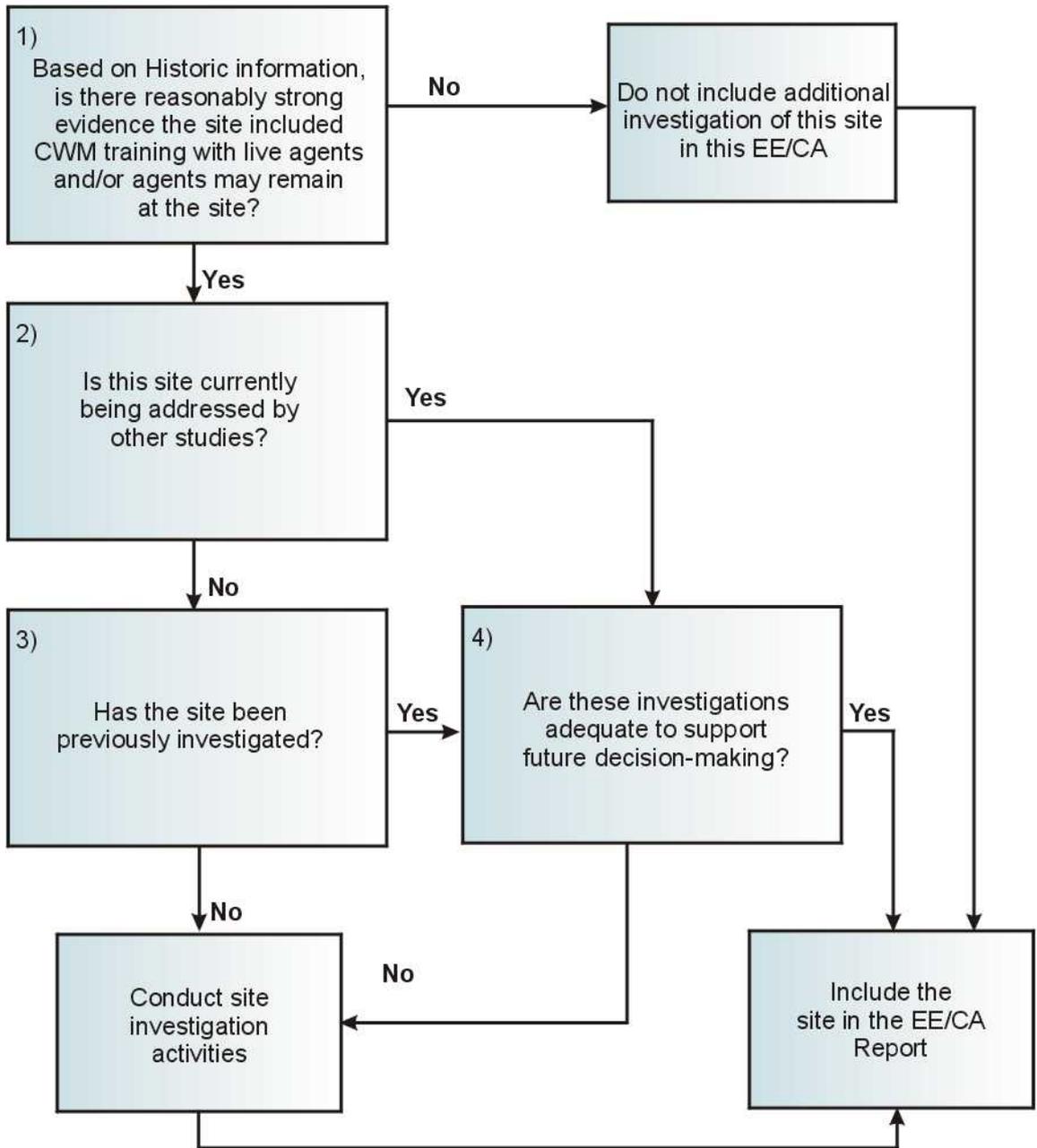
No.	Site ID
1	Training Area 31
2	T-38 (Reservoir Ridge)
3	Smoke Ranges R & S
4	T-4 Biological Warfare Area
5	Old Chemical Weapons Demo Area
6	Agent ID Area
7	Sandell Field
8	Cane Creek Training Area
9	Naylor Field
10	Blacktop Training Area
11	Fenced Yard in Blacktop Area
12	Dog Training Area
13	Dog Kennel Area
14	Reaction Area T-5
15	D & I Area
16	Old Burn Pit
17	Field Personnel Decontamination Area
18	Decontamination Building 3185
19	CBR Proficiency Area
20	South Gate Toxic Gas Yard
21	Sunset Hill Area
22	Old Toxic Training Area
23	Training Area 24A
24, 25, 26, 27, 31	Mustard Spills
28, 29, 30	Goat Yards
32	Building 4415 (Igloo 13)
33	Building 4416 (Igloo 14)
	Site Boundary

Note: Modified from Comprehensive Reuse Plan (EDAW, 1997)



PARSONS ENGINEERING SCIENCE, INC.		U.S. ARMY CORPS OF ENGINEERS HUNTSVILLE CENTER	
DESIGNED BY: MAD	FORT MCCLELLAN ANNISTON, ALABAMA CALHOUN COUNTY		
DRAWN BY: MAD	SCALE: 1 inch equals 3,000 feet	PROJECT NUMBER: 734643	
CHECKED BY: JC/JU	DATE: May 2002	PAGE NUMBER: 2-13	
SUBMITTED BY: JC/JU	FILE: x:\gis\734643\Maps\Eeca_maps(revised2)\figure2_3.mxd		

**Figure 2.4**  
**Investigation Decision Tree**



## **SECTION 3 SITE CHARACTERIZATION**

### **3.1 SITE INVESTIGATION**

Site investigations in support of this EE/CA included geophysical surveys, single anomaly, trench and pit excavations, air monitoring, soil sampling and analysis, and surveying of grid boundaries, anomaly locations, and soil boring locations. Where necessary, brush clearing was also conducted. These activities are described in the following subsections.

### **3.2 SITE SURVEYS AND BRUSH CLEARANCE**

Sites that were to be surveyed using geophysical instruments were divided into grids prior to beginning the surveys. The sizes of the grids depended upon site topography and surface features. Most grids had dimensions of 100 ft by 100 ft but others were varied in order to adequately cover and define a point of interest. Personnel from Sain Associates (Sain) conducted land surveys to record the corners of each grid, referenced to the Alabama State Plane coordinate system. Each area was electronically swept for ordnance avoidance prior to driving survey stakes into the ground. After the grids were land surveyed, the sites were cleared of brush as necessary for conducting the geophysics.

### **3.3 GEOPHYSICAL SURVEY**

#### **3.3.1 Introduction**

3.3.1.1 Geophysical surveys to detect buried metal objects were performed at eight of the sites as part of the EE/CA investigation. Data collected from an existing prove-out grid were used to determine the appropriate geophysical technique(s) to use at Fort McClellan. The prove-out grid was the practice grid used as part of the Field Demonstration conducted in July 1999. The grid is located south of the cantonment area next to Range 16. The EM61 was selected as the most appropriate geophysical instrument for the geophysical surveys. Sites T-4 and T-24A were also surveyed using the EM31 to identify possible buried trenches. Table 3.1 summarizes the geophysical surveys by site.

3.3.1.2 The geophysical team surveyed each grid by recording data along survey transects spaced three feet apart for the EM61, and ten feet apart for the EM31. The instruments were operated with an automatic data logger to collect electromagnetic data along the survey transects in each grid. Approximately twice each day, data collected in the data loggers were downloaded to a laptop computer using the Geonics DAT61 or DAT31 software. At the end of the day or the following day, the data were processed and

**Table 3.1  
Parsons Investigation Summary  
Fort McClellan, Alabama**

<b>Site Name and CERFA Parcel No.</b>	<b>Geophysical</b>	<b>Excavation</b>	<b>Soil Sampling</b>
Training Area 31 [184(7)/185(7)]	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
T-38 (Reservoir Ridge) [186(7)]	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Smoke Ranges R&S [no CERFA no.]	<b>Yes</b>	<b>Yes</b>	No
T-4 Biological Warfare Area [181(7)]	<b>Yes</b>	No	No
Old Chemical Weapons Demo Area [194(7)]	No	No	No
Agent ID Area [509(7)]	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Sandell Field [97(7)]	No	No	No
Cane Creek Training Area [510(7)]	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Naylor Field [183(6)]	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Blacktop Training Area/Fenced Area in Blacktop Area [511(7)/512(7)]	No	No	<b>Yes</b>
Dog Training Area [513(7)]	No	No	<b>Yes</b>
Dog Kennel Area [516(7)]	No	No	No
Reaction Area T-5 [182(7)]	No	No	No
D&I Area [180(7)]	No	No	No
Old Burn Pit [514(7)]	No	<b>Yes</b>	No
Field Personnel Decon Area [515(7)]	No	No	<b>Yes</b>
Decontamination Building 3185 [179(7)]	No	No	No
CBR Proficiency Area [517(7)]	No	No	No
South Gate Toxic Gas Yard [no CERFA no.]	No	No	No
Sunset Hill [no CERFA no.]	No	No	No
Old Toxic Training Area [188(7)]	No	No	<b>Yes</b>
Training Area 24A [187(7)]	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Mustard Spill Sites [191(7), 189(7), 193(7), 190(7), 192(7)]	No	No	<b>Yes</b>
Goat Yards (3 sites) [no CERFA no.]	No	No	No
Building 4415 (Igloo 13) [199(7)]	No	No	No
Building 4416 (Igloo 14) [199(7)]	No	No	No

reviewed. Processing was performed to insure that survey lines were correctly recorded with respect to their survey direction, distance, and grid coordinates. After processing and data checking were complete, the geophysical data were processed into ASCII delimited files. The data were then input into Geosoft and the locations and magnitudes of the geophysical signals plotted on plan-view maps.

### **3.3.2 Instrumentation**

3.3.2.1 The initial geophysical survey effort was conducted using the Geonics EM61 time domain metal detector and the Geonics EM31 frequency domain conductivity meter. Anomaly reacquisition was done using a Schonstedt magnetic locator and the EM61.

3.3.2.2 The EM61 metal detector generates an electromagnetic signal that induces eddy currents in the subsurface. When the signal is shut off, the eddy currents decay and induce a secondary magnetic field that is monitored by a receiving coil and recorded by an attached data logger. The system receives the signal in two receiving coils at two separate heights above the ground surface. A distance of 40 centimeters separates the lower and upper coils. The coils were 1.0 meter by 1.0 meter with the long axis perpendicular to the direction of travel. The EM61 data logger collects data at automatic time intervals determined by the user or at a pre-programmed distance interval measured by an attached set of wheels with all-terrain tires.

3.3.2.3 The EM31 terrain conductivity meter uses a fixed-frequency transmitting antenna to generate an electromagnetic field. A receiving antenna measures the response of the instrument's surroundings to the electromagnetic field. Two components of the responding signal are recorded: the out-of-phase response and the in-phase response. The out-of-phase response is tuned proportional to the apparent conductivity. The in-phase response tends to respond strongly to local changes in magnetic susceptibility. The instrument is about 12 feet long and is carried over the shoulder. A digital data recorder is used to gather the data at about a one second interval. The slow sample rate and large sample volume of the EM31 make it suitable for locating large burial sites and unsuitable for detecting and resolving small items, such as buried OE.

3.3.2.4 The GA-52Cx magnetic locator, manufactured by Schonstedt Instrument Company, uses a flux-gate magnetometer system to detect the magnetic fields of iron and steel objects and energized power lines. The Schonstedt uses an audio output that increases in frequency near ferrous objects. The audio tone is adjustable so that it either nulls or produces a constant tone in areas of background magnetic fields. In practice, the Schonstedt is swept side to side during a transect.

### **3.3.3 Instrument Check**

Prior to beginning each day's work, the geophysical survey teams checked the EM61 instruments against a baseline to ensure that the equipment was operating properly. The EM61 was pulled over the field demonstration prove-out grid each day. The data were recorded in the geophysical survey logbooks and compared to initial responses (standard

responses) established for each instrument. Instruments were rechecked multiple times throughout each day. All instrument checks were within project tolerances during the field effort and therefore no replacements were required.

### **3.3.4 EM61 Downloading and Processing**

Survey data files were downloaded from the EM61 data logger into a computer using the Geonics® DAT61 software (version 1.70). The data for each survey were then backed up and preprocessed by adjusting start, end and fiducial marker points entered by the geophysical operator during the survey. This process adjusted the positions of data points to compensate for variations in the operator's walking pace. The preprocessed data files from the EM61 surveys were then exported from the DAT61 into ASCII-format (XYZ) files. Geosoft's Oasis Montaj was used to process and prepare color maps showing the EM61 data. Anomalies representing suspected buried items were selected by the Project Geophysicist from the maps generated using the software.

### **3.3.5 EM31 Downloading and Processing**

Survey data files were downloaded from the EM31 data logger into a computer using the Geonics® DAT31 software (version 1.34). The data for each survey were then backed up and preprocessed by adjusting start, end and fiducial marker points entered by the geophysical operator during the survey. This process adjusted the positions of data points to compensate for variations in the operator's walking pace. The preprocessed data files from the EM31 surveys were then exported from the DAT31 into ASCII-format (XYZ) files. Oasis Montaj was used to process and prepare color maps showing the EM31 data. Anomalies representing the suspected buried items were selected by the Project Geophysicist from the maps generated using the software.

### **3.3.6 Anomaly Identification**

Once the geophysical data were formatted and processed, anomalies were selected by the Project Geophysicist from the data based on the site history, observations from site visits, observations made during data acquisition, and project objectives. At most sites, large anomalies capable of being burial sites were selected for further investigation. At Smoke Ranges R&S, all anomalies (large and small) were selected. At Training Area 24A, all of the largest anomalies, and a sampling of the medium and smaller anomalies were selected for further investigation. Parsons presented the selected anomalies to the USAESCH lead geophysicist for concurrence and approval in January 2000. The anomaly locations are indicated in the accompanying figures in this report. The instrument response in millivolts (mV) is indicated by a color level plot in the legend where higher values (at the upper end of the legend color bar) represent the presence of metal and low values (near 0 mV on the color bar) indicate readings near background.

### **3.3.7 Anomaly Reacquisition**

The anomalies selected for investigation by the Project Geophysicist were uniquely numbered and entered onto Anomaly Dig Sheets for intrusive investigation. In late February 2001, anomalies were relocated based on the coordinates, as well as by

confirming the position of the anomalies using the Schonstedt GA-52Cx. If the anomaly could not be located using the Schonstedt, the EM61 was used. During re-acquisition, only the audio output and digital readout of the EM61 were used to detect anomalies. In a few instances, the anomaly marking stakes were damaged or removed as part of the site preparation and remarking of anomalies was conducted using a Schonstedt GA-52Cx just prior to excavation.

### **3.4 INTRUSIVE EXCAVATION INTO SUSPECT CWM BURIAL SITES**

3.4.1 Intrusive sampling, including hand-tool excavation, backhoe trenching, and hand-auger soil borings, were conducted at 17 of the sites (Table 3.1) to evaluate the presence of CWM chemical constituents and/or buried OE. Locations for hand-tool excavation and trenching were based primarily on results of the geophysical surveys. Excavations at the Old Burn Pit, the drum disposal area near T-38, and the horseshoe-shaped area at Naylor Field were based on observations made during the geophysical investigation and information provided by an interviewee. Intrusive operations were conducted by the Technical Escort Unit (TEU) and Human Factors Applications (HFA) personnel using a backhoe and hand tools.

3.4.2 The intent of the intrusive excavation was to assess the individual anomaly or characterize the contents of a pit. For individual anomalies, once an item was encountered and removed, the bottom of the excavation was swept with a magnetometer to evaluate if the anomaly had been cleared by removing the item. If the magnetometer still indicated a subsurface anomaly, the excavation was continued. All non-CWM scrap was returned to the excavation. All suspect CWM was hot-boxed and drummed as 3X waste as described in Section 3.6. For large pits, the intrusive excavation consisted of trenching across the anomaly and removing those items that were specifically encountered. A characterization was made of large pits based on those items specifically encountered and area air and soil sampling.

3.4.3 Edgewood Chemical and Biological Center (ECBC) personnel ran continuous monitoring of down-range air quality for agents during excavation activities using a Miniature Chemical Agent Monitoring System (MINICAMS<sup>®</sup>) and Depot Area Air Monitoring System (DAAMS) tubes. The MINICAMS<sup>®</sup> point-source monitoring method was supplemented using an Open-path Fourier Transform Infrared Spectrometer (OPFTIR) due to its wide beam path. Measurements collected by these methods were compared with the 8-hour time weighted average airborne exposure limits (AELs) for agents.

3.4.4 An HNu Photoionization Detector (PID) was used by HFA to monitor the breathing area versus the down hole area of the excavation for the presence of volatile organic compounds during the initial excavation of an anomaly. Draeger tubes were used as necessary to verify PID detections from the breathing area and to delineate the presence of benzene or trichloroethene.

3.4.5 Other air monitoring equipment included the MINI-RAM dust monitoring instrument. This instrument was kept on site to monitor any problems with dust levels during the intrusive investigation.

3.4.6 Subsurface soil samples collected from the excavations for laboratory analysis were selected from beneath and/or within excavated drums or OE, or based on appearance (e.g. discoloration or texture contrast differentiating them from surrounding soil). Excavation activities were documented in the downrange logbook.

3.4.7 Hand augering was conducted at 15 sites to evaluate the presence of chemical agent and degradation products in soils at non-burial sites. Soil samples at most of the sites were collected at depths of 0.5 to 1 foot and 3.5 to 4 feet. Soil samples at four of the five mustard spill sites were collected from a depth of 4 feet. Soil sample depths at the Post Exchange (PX) mustard spill site ranged from 2 feet to 4 feet due to subsurface rock layers.

### 3.5 SOIL SAMPLING AND ANALYSIS

3.5.1 All sampling equipment was decontaminated prior to each use. Decontaminated sampling equipment was wrapped in aluminum foil if it was not to be used immediately after decontamination and drying. Each sample was collected using a stainless steel spoon, either by removing the soil directly from the auger bucket or by scooping the soil from the ground. The sample was transferred immediately into a 2-ounce glass jar with Teflon-sealed screw caps, leaving approximately one inch of headspace above the soil. The containers were labeled and placed inside a zip-lock bag at the sample location. The outside of the zip-lock bag containing the sample bottle was decontaminated and then placed inside a second zip-lock bag prior to moving it to the support zone. The samples were then relinquished under chain-of-custody procedures to ECBC for headspace screening.

3.5.2 Headspace screening on the double zip-lock bag sample for site-specific chemical agents was conducted on-site using a MINICAMS<sup>®</sup> unit. The jar of soil sample was placed in a hot box, and heated to a minimum temperature of 70° F. The evolved vapors were collected through Teflon tubing attached to the hot box and introduced directly into the MINCAMS<sup>®</sup> unit. The results of the analysis were logged by ECBC personnel and provided to Parsons.

3.5.3 Samples cleared by ECBC were relinquished back by chain-of-custody to Parsons. The sample jars were placed into a cooler filled with bagged ice to keep the temperature of the samples at or below 4 degrees Celsius. The samples were then shipped to the ECBC in Aberdeen, Maryland for analysis for chemical agents of concern and breakdown products. Specific agents and breakdown products analyzed for included HD, 1,4-thioxane, 1,4-dithiane, Lewisite (L), GB, and VX. The target compounds were selected based on past site activities. Soil analytical reports and copies of the chain-of-custody records are included in Appendix B.

3.5.4 Parsons conducted a quality control data evaluation of all soil analytical test results. The quality control data evaluation summary report is contained in Appendix C.

### **3.6 IDW DISPOSAL**

3.6.1 Investigative Derived Waste (IDW) included materials and items removed during excavation activities. Materials suspected to be CWM-related were drummed as XXX (3X) waste. Ten drums of waste were generated. 3X indicates that an item suspected to be CWM-related has been surface-decontaminated by approved procedures, bagged or contained, and that appropriate tests or monitoring have verified that vapor concentrations above the AEL or time weighted average (TWA) limits for the specific agent(s) do not exist. All items were tested for the presence of chemical agents, and were found to be negative. The drums were then handled by Onyx Environmental Services for thermal treatment. All 3X scrap is to be treated at a minimum temperature of 1000° F for a minimum of 15 minutes in order to convert it to XXXXX (5X) scrap prior to release for other reuse. 5X indicates that an item has been decontaminated completely of the indicated agent and may be released for general use or sold to the public in accordance with all applicable federal, state, and local regulations. Copies of the Uniform Hazardous Waste Manifest and certificates of destruction are included in Appendix B.

3.6.2 Equipment decontamination fluids and personnel decontamination waters from the decon line were collected in drums. Five drums of decontamination waters were generated. Each drum was analyzed on-site for total chlorine using a chlorine meter provided by the Anniston Wastewater Department. Chlorine concentrations ranged from 0.3 milligrams per liter (mg/L) to 2.2 mg/L. Based on all the copies of the analytical results from ECBC's lab of the soils and the chlorine concentrations, the Anniston Wastewater Department authorized the release of the 250 gallons of decon water to the sanitary sewer line located on International Technologies (IT) compound, in accordance with the site-wide sampling and analysis plan (IT, 1998).

3.6.3 In the event that a CWM item containing agent was identified, it would have been sealed in a multiple round container (MRC) and transported to the Interim Holding Facility (IHF) for storage until final disposition could be arranged. The IHF was located within the fenced compound at T-38. No items of this nature were found during the investigation for CWM.

### **3.7 SOURCE, NATURE, AND EXTENT OF CWM/OE**

Fort McClellan has been used since the early 1900s for artillery and chemical warfare training. Chemical training involved the use of small amounts of various agents, such as HD, GB, CG, CK, and VX. Training activities often entailed contaminating an ordnance item with agent, then decontaminating the item, or rendering a chemical agent-filled ordnance item inert. CWM activities were conducted at specific areas on the Post, as described in the following sections.

**3.8 UPDATE OF ARCHIVES SEARCH REPORT**

No update of the ASR is recommended.

## SECTION 4

### RESPONSE ACTION EVALUATION PROCESS

4.1 An integral part of the EE/CA process is the identification of Applicable or Relevant and Appropriate Requirements (ARARs), and the identification and evaluation of response action objectives and alternatives. ARARs and response action alternatives are evaluated only if remedial actions are necessary to protect human health and the environment.

4.2 The CWM findings for each of the 33 CWM EE/CA sites at Fort McClellan were evaluated to determine the overall endangerment posed to public safety and the environment. As indicated in Sections 5 through 19, the risk to human health due to CWM at the sites investigated is considered remote. Because these sites presented no unacceptable risk, no actions are required to meet the CERCLA criterion of protectiveness, and therefore ARARs do not need to be identified under CERCLA. Additionally, because there is no basis for CERCLA remedial actions at these sites, there is no need to evaluate alternatives for such actions. Therefore, the development of ARARs and identification and evaluation of response action alternatives is not addressed in this document. However, the Department of Army bears the responsibility for responding to, investigating, and remediating any chemical warfare materiel that may be discovered in the future at any sites addressed in this CWM EE/CA.

4.3 A qualitative risk evaluation was conducted at all sites. No chemical agents were found at any of the sites investigated and therefore the risk of exposure to chemical agents is considered highly unlikely. A further risk analysis was conducted at sites T-38 and T-24A because of the potential need for follow-on activities to address OE or HTRW issues and the presence of remaining 3X scrap at these sites. This evaluation was performed to determine whether these follow-on activities could be conducted by the Department of Army as if the sites were non-CWM sites. The details of the additional risk analysis are discussed in Sections 7.5 and 18.5.