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Timothy M. Deignan

Project Geophysicist

EXPERIENCE SUMMARY

Mr. Deignan has more than 12 years experience dedicated to engineering and environmental geophysics, with a special emphasis on UXO. Experience includes the design and management of integrated geophysical programs that have utilized electromagnetic, magnetic, resistivity, gravity, seismic, and borehole geophysical methods to investigate and assess ordnance end explosives (OE), geotechnical, geologic, hydrogeologic, and cultural resource features. Utilized these methodologies as part of engineering and cultural resource management programs in the United States and abroad. Specialized in the design and management of high-resolution integrated geophysical programs for OE investigations.

For the past 6 years, Mr. Deignan has been the technical manager for the Foster Wheeler Environmental UXO/ geophysics contingent, and has extensive experience with commercial and internal scientific software routines applied to the modeling, reduction, analysis, and interpretation of geophysical data for UXO projects. He has designed and continuously develops Foster Wheeler Environment's internal processing and interpretation software, mechanical platforms to integrate specific geophysical instruments and differential global positioning system technology, and multiple sensor systems for UXO applications.

Mr. Deignan has been the driving force behind substantial improvements in both effectiveness of UXO removal and in cost reduction made by Foster Wheeler Environmental, including advances in the use of computer-aided systems to collect data and present images of the area to be cleared. These systems can be used effectively to "filter out" the signals from small pieces of metal that obscure the unexploded ordnance items, allowing the UXO specialist to dig more targets that are potential UXO. Mr. Deignan is an expert in state-of-the-art passive and active sensor systems (and other geophysical sensors where radiation or signatures from nonmetallic objects are expected) coupled with internally developed processing, analysis, and visualization software to locate and identify metallic items that may be unexploded ordnance. The software produces target characteristics such as size or mass, depth, x-y location, and color coded images for special analysis.

Mr. Deignan also possesses expertise and experience in the use of the USRADS positioning system – which has been a key factor in the success of several of our UXO remediation sites. USRADS is a positioning and data acquisition system that automates the measurement and mapping of data collected for site investigations. It is especially useful in areas of obstructions, such as heavily wooded areas where current GPS technology cannot accurately locate the geophysical sensor. Utilization of USRADS in difficult survey areas ensures that position accuracy is maintained so that smaller sizes of UXO can be reliably located.

PROFESSIONAL AFFILIATIONS

Archaeological Institute of America
Denver Engineering and Mining Geophysical Society
Engineering and Environmental Geophysical Society (Founding Member)
Minerals and Geotechnical Logging Society
Near Surface Geophysical Society (Society of Exploration Geophysicists)

TRAINING

40-Hour OSHA Hazardous Waste Health and Safety Training - 1988
8-Hour OSHA Hazardous Waste Health and Safety Training - Current
NPS Geophysical Training, Instructor - 1991-1995

Ground Penetrating Radar - 1990, 1994
SAGEEP - 1993, Author
Geotech 1991 and 1992, Geophysical Session Chairman
SAGEEP - spring 1991, Author and Speaker
Borehole Geophysics - winter 1990
SAGEEP - spring 1989
Clandestine Graves - spring 1989
SAGEEP - spring 1988

EDUCATION

MS / Geophysical Engineering / Colorado School of Mines, IP
BS / Geophysical Engineering / Colorado School of Mines / 1987

REPRESENTATIVE PROJECT EXPERIENCE

Responsibilities have included work as project and technical manager as well as lead project geophysicist for numerous geophysical investigations at Department of Energy (DOE) sites, Department of Defense (DoD) sites, and EPA Superfund sites.

Naval Air Facility, Adak, AK; Technical Manager – Conducted geophysical investigation to statistically assess UXO/OEW contamination at site characterized by rough terrain and culturally noisy areas. Evaluated electromagnetic and magnetic results from this site to select optimum methodology and data acquisition parameters for survey. Managed 15+ personnel involved in data acquisition, processing, and analysis of data acquired over 1,400 acres at 1 meter line spacing (21 million data measurements). Acquisition teams used both standard and DGPS location devices for positioning. Developed processing and interpretation software to reduce processing and analysis time, as well as produce more accurate results giving a 96%+ UXO detection rate for dig teams.

Former Camp Wellfleet, MA; Project Geophysicist – Co-managed geophysical survey to statistically assess OE contamination. Designed data acquisition program based on testing of instrumentation and analysis of spatial sample density requirements for small and large OE targets (20mm – 1000 # bombs). Several large practice bombs detected by geophysical survey at depths of 10 – 15 ft below the ground surface. Geophysical and sampling data used to define nature and extent of contamination at facility.

Fort Hancock, NJ; Morgan Depot, NJ; Savanna Depot, GA; Camp Wellfleet, MA; Technical Manager, Project Geophysicist – Involved in the design and implementation of geophysical surveys that used multiple sensors and positioning technologies for OE characterization. Primary responsibilities include data processing and evaluation of target characteristics, as well as selection of the most optimum data acquisition strategy to meet project goals. Ongoing development of software for data processing and evaluation methodologies, as well as definitive statistical parameters based on the geophysical data for risk-based analysis. Designed data acquisition program based on testing of instrumentation and analysis of spatial sample density requirements for small and large OE targets (20mm – 1000 # bombs). Several large practice bombs detected by geophysical survey at depths of 10 – 15 ft below the ground surface

Rocky Mountain Arsenal, Commerce City, CO; Technical Manager, Project Geophysicist – Lead project to provide detailed, high resolution, geophysical maps of 3,200 acres on Rocky Mountain Arsenal to permit design of subsurface structures without interference from significant anomalies. High-resolution magnetic data was collected using precision magnetometers and differential GPS. The data was analyzed and stored in a GIS capable of producing detailed maps for use in designing projects.

UXO-related tasks at Rocky Mountain Arsenal included identification of ferrous anomalies at the Arsenal and integration of this information with a site-wide GIS to assess potential UXO impacts on future construction activities, use of an innovative approach that utilizes time domain electromagnetic induction (TDEMI) technology to characterize subsurface anomalies in the precise region the slurry wall was to be constructed, preparation of design drawings and specifications to remove ordnance debris and soil that has failed the TCLP test from 5 burial trenches and 8 munitions testing sites, excavation, transportation to an approved site and detonation or, if deemed unstable, in place explosion of UXO, and screening of excavated soils for potential agent-contamination by headspace sampling.

U.S. Department of Energy; Idaho National Engineering Laboratory, Airborne Geophysics, Idaho Falls, ID; Technical Manager; 04/90-06/92 – Technical manager for an innovative airborne geophysical survey at the Idaho National Engineering Laboratory. More than 120 line miles of magnetic, electromagnetic (EM), and spectroscopy data were collected at four complexes to locate and characterize buried waste. Responsible for the acquisition, analysis, and interpretation of the data as well as interacting with the client and DOE staff on a daily basis. Based on the success of the airborne geophysical survey, a ground-based geophysical survey was completed in the spring of 1992. As the technical manager for this project, organized the acquisition, analysis, and interpretation of more than 100,000 magnetic and electromagnetic data stations.

U.S. Department of Energy; Rocky Flats Plant, Rocky Flats Seismic Program, Golden, CO; Lead Project Geophysicist/Technical Manager; 05/90-05/93 – Lead project geophysicist for the DOE Rocky Flats Plant (RFP) geophysical investigation, including 20,000 linear feet of high-resolution seismic data acquisition, analysis, and interpretation. Additionally, was the technical manager for an EM and ground penetrating radar survey to determine vadose zone characteristics in several drainages at the RFP. He was the technical manager and processor for the RFP borehole geophysics and vertical seismic profile program, which utilized an extensive suite of borehole logging and seismic methods to provide information on lithologic, hydrologic, and geologic properties of the subsurface. Analyzed more than 8,000 feet of geophysical logs at the RFP and interpreted the logs in conjunction with hydrogeologists to generate estimates of hydrogeologic properties.

Raymark Industries Superfund Site; Geophysical Program, Stratford, CT; Technical Manager – Technical manager for the geophysics program, which plays a vital role in the $50 million remediation of the Raymark Industries site. A comprehensive geophysical survey is currently being performed with time and frequency domain electromagnetics, ground penetrating radar, and downhole geophysics to provide a wide range of geotechnical, geologic, and hydrogeologic information to engineers and geologists characterizing the site. More than 35 line miles of high-resolution geophysical data have been collected as of the end of 1995. Responsible for the acquisition, analysis, and interpretation of the data, as well as managing a staff of ten field personnel. Also responsible for interacting with Foster Wheeler engineers and scientists, as well as those of the clients (USEPA, USACE, and CT-DEP).

PRIOR EXPERIENCE

Battelle
Denver, CO
08/87-05/88

Project Geophysicist – Project leader conducting magnetic and ground penetrating radar measurements to locate and assess 400 abandoned underground storage tank sites. Implemented ground penetrating radar

computer modeling to simulate anticipated subsurface characteristics. Conducted terrain conductivity (electromagnetic) measurements at abandoned landfill sites to delineate landfill boundaries, contaminant plumes, and transportation mechanisms affecting groundwater flow. Also investigated a 4-acre probable drum storage trench with magnetics and ground penetrating radar.

Contract Geological
Denver, CO
06/87-08/87

Geoscientist – Employed on a reverse-circulation drill rig as a well log geoscientist. Characterized mineralogy and subsurface structure from drill cuttings. Additional responsibilities included geologic field mapping, surveying, and microscopy.

Colorado School of Mines
Golden, CO
05/87-06/87

Student Geophysicist – Co-supervisor for an integrated geophysical survey comprised of gravity, magnetic, seismic, and electrical methods. Involved in management of data acquisition, reduction, and interpretation to acquire relevant information on the San Juan Volcanic Series in Colorado. Also responsible for quality control and technical presentation of data.

PUBLICATIONS

Deignan, T.D. Interpreting the Results of Geophysical Test Programs to Detect UXO, In Process, (2000), Accepted to be presented at the UXO Demining Forum, May 2000.

Deignan, T.D. Statistical Evaluation of EM61 Responses for Ordnance Surveys. 1999

DeVore, S.L. w\ multiple authors. Remote Sensing/Geophysical Techniques for Cultural Resource Management. 1992-1997.

Deignan, T.D., Geophysical Survey of Fort Douglas Cemetery (Fort Carson, CO Internal Report), 1996.

Deignan, T.D., et. al. Remote Sensing on the South Side of Ferry Street (Washington on the Brazos State Historical Site). 1995.

Deignan, T.D., et. al. High Resolution Airborne and Ground-Based Geophysics Applied to Hazardous Waste Site Investigations, 15th Annual DOE Conference on Low-Level Radioactive Waste Management. 1993.

Carpenter, G. and Deignan, T.D. Large Scale, High Resolution Survey for Burial Pit and Trench Mapping, SAGEEP Proceedings. 1993.

Deignan, T.D., et. al. Geophysical Investigations at Twelve Mile House, Southwestern Lore. 1992.

Deignan, T.D., et. al. Seismic Source Analysis on a PC, Geotech Proceedings. 1991.

Deignan, T.D. Low and High Frequency Electromagnetics in Landfill Investigations, SAGEEP Proceedings. 1991.

Deignan, T.D. A Cost-Effective Approach for Borehole Data Reduction and Interpretation, Geotech Proceedings. 1989.

LOCATION

Company: Foster Wheeler Environmental Corporation; 08/16/1988 - Present
Years w/Other Firms: 1
Present Location: Denver, CO
Daytime Phone: 303-980-3587

SKILL SET

GEOSCIENCES

Borings and Wells - Geotechnical Borings
Borings and Wells - Soil Classification / Logging
Dense Non Aqueous Phase Liquids (DNAPL)
Exploration - Mineralogy
Exploration - Mining
Geophysics - Borehole
Geophysics - Electromagnetics
Geophysics - Gravity
Geophysics - Ground Penetrating Radar
Geophysics - Neutron / Gamma
Geophysics- Other
Geophysics - Resistivity
Geostatistics
Hydrogeology - Pump Test Performance
Hydrogeology - Water Quality
Karst Terrain
Light Non Aqueous Phase Liquids (LNAPL)
Marine Geology - Oceanography
Radioactive Waste / Mixed Waste
RCRA / CERCLA
Underground Storage Tanks / Refineries

DISCIPLINE(S) (Y = Primary Indicator; N = Secondary Indicator)

Geologists	N
Geophysicists	Y

PROFESSIONAL REFERENCES

Mr. Lynn Helms, US Army Engineering & Support Center, Huntsville
4820 University Square
Huntsville, AL 35807-4301
(256) 895-1887

Mr. Bob Selfridge, US Army Engineering & Support Center, Huntsville
4820 University Square
Huntsville, AL 35807-4301
(256) 895-1887

Mr. Mark Murphy
Remediation Project Manager
Naval Facilities Engineering Command, EFANW
19917 7th Ave NE
Poulsbo, WA 98370
(360) 396-0070

EXPERIENCE SUMMARY

Master Explosive Ordnance Disposal Technician with 23 years in the United States Navy Explosive Ordnance Disposal (EOD), and industrial safety programs. Proven performance in EOD operations, planning, and administration. Extensive experience in ordnance clearance and diving operations, health and safety programs, explosive safety programs, and ammunition procurement, storage, and shipment.

REGISTRATIONS/CERTIFICATIONS

UXO Specialist, Explosives/Blasting, VA

TRAINING

40-Hour OSHA Hazardous Waste Health and Safety Training - 1993
8-Hour OSHA Hazardous Waste Health and Safety Supervision Training - 1993
Advanced First Aid and CPR - Current
CHEMRAD USRAD Training - 1/97
Alabama Blasters Certification- 5/200
Virginia Temporary Blaster - 6/96
DOT/HM-126F Hazmat Training 49 CFR 172, Subpart H - 1996
USACE Quality Control Engineering Course - 1996
G-822L Portable Cesium Magnetometer Certification - 9/94
Corporate Health and Safety Officer Training - 1994
Field Method, TNT/RDX Detection Analysis Certification Training - 1994
Building Construction Technology, Gulf Coast Community College - 1983
Project Manager Course and Executive Problem Analysis and Decision Making, American University - 1980
EOD Refresher Courses, Biannually - 1966-1977
Explosive Hazards Control; Industrial Safety; Industrial Hygiene; Explosive Safety and Hazard Analysis; and Ammunition Storage and Handling, Indiana University - 1973
Vietnamese Language, Department of the Army - 1968
Basic EOD Training at NAVSCOLEOD - 9/63
Naval Underwater Swimmers School, Naval Station - 3/63

EDUCATION

Building Construction Technology, Gulf Coast Community College, 1983
Executive Problem Analysis and Decision Making, American University, 1980
AA, Arts and Sciences, Charles County Community College, 1978
Explosive Hazards Control, Indiana University, 1973

REPRESENTATIVE PROJECT EXPERIENCE

Foster Wheeler Environmental Corporation; 08/94-Present

Project Manager and Superintendent for UXO projects and Health and Safety Officer for hazardous and toxic waste projects.

Ordnance and Explosive Response, Fort McClellan, AL; Senior UXO Supervisor, Site Manager and Health and Safety Officer 01/00-Present - Responsible for conducting archive search, plan preparation, surface UXO clearance, geophysical survey, and intrusive sampling of unexploded ordnance on Fort McClellan, pursuant to the Base Realignment and Closure (BRAC) Program. Duties and responsibilities include: cordinating daily operating schedule with other agencies/contractors; supervising UXO surface clearance activities; provide UXO escorts for all site personnel in uncleared areas; conducting EM-61 survey with USRAD system; supervising UXO excavation and investigation of selected anomalies;

supervising UXO identification and disposition of located UXO items; requisition and storage of demolition materials; and ensuring that UXO phase for project is completed in accordance with plans and specifications.

Tabbs Creek Dredging and Remediation, NASA; Langley AFB, VA; 11/99-12/99- Health and Safety Officer during site mobilization, dredging and remediation of selected areas in Tabbs Creek and wetlands. Task included; Laying in 5 miles of access roads through marsh and wetlands, excavating soils contaminated with PCBs, staging, sampling and disposal of contaminated soils, backfilling areas of excavation and recovering all access road materials.

Landfill Removal And Repair Project, Melville, RI; 10/99 - Health and Safety Officer, Sample, excavate, characterize, ship and dispose of contaminated waste. Principle hazards included; radiological components, potential UXO items, arsenic, lead, PCBs, volatile and semi volatile organic compounds.

Landfill Repair Project, Brunswick, MA; 09/99 - Health and Safety Officer during onsite activities. Principle hazards included potential UXO items, arsenic, lead, PCBs, volatile and semi-volatile organic compounds.

Proposal Team, Fort McClellan, AL; 02/99-10/99 - Health and Safety Officer and member of team to prepare proposal, work plan, health and safety plan for a five year project involving the location, detection, removal/disposal of conventional and chemical munitions.

Former Raritan Arsenal, Edison, NJ; 03/99 - Senior UXO Supervisor and Site Manager during a geophysical survey and UXO investigation of selected sites..

Navy; F-4 Aircraft Crash Site, White Sands Missile Range, Holloman AFB, NM; Site Manager/Senior UXO Supervisor; 01/99-02/99 - Responsible for mobilizing personnel and equipment to crash site to locate, recover and dispose all hazardous material from the crash site.

Fort Dix; Edison, NJ; Site Manager/Senior UXO Supervisor; 12/98 - During the geophysical survey, and intrusive sampling, locating and disposal of unexploded ordnance on Fort Dix under the Base Realignment and Closure act.

Adak Naval Air Facility; Adak, AK; 09/98-10/98 - Senior UXO Supervisor/Emergency Cordinator, during UXO clearance of suspected minefields on Naval Air Facility, Adak Island, Alaska pursant to the Base Realignment and Closure (BRAC) Program. Duties and responsibilities include: Supervising UXO clearance, UXO identification and disposition of located UXO items. Responsible for requisition and storage of demolition materials.

Nomans Island Impact Range; Nomans Island, MA; Site Manager; 04/98-09/98-Site Manager during a surface UXO clearance and removal of all hazardous and non hazardous material from an island twenty two miles at sea.. Responsibilities included: Assist in work plan preparation, Ensuring compliance with local, state and federal regulations, Mobilizing personnel and equipment to New Bedford, MA. -Arranging and coordination for surface transportation of personnel and equipment from New Bedford to Nomans Island, Establishing mooring and landing facilities at Nomans Island, Establishing seven miles of roads on the island, Conducting UXO surface clearance of 624 acres, Removal of all debris from the island, Locating four underground storage tanks and removal of 12,000 gallons of fuel products from the island, Locating 14,000 UXO/UXO related items, Explosively venting 4,400 suspect UXO items and shipment of over one million pounds of OE/OE related material off island,

Former Camp Wellfleet, Cape Cod National Seashore Park, Wellfleet, MA; Site Manager/Senior UXO Supervisor; 12/97-04/98- Responsible for conducting archive search, geophysical survey, and

intrusive sampling, locating and disposal of unexploded ordnance on Former Camp Wellfleet under the FUD program.

Nansemond; Former Army Ordnance Depot, Tidewater Community College, Portsmouth, VA; 10/97-11/97 - Senior UXO Supervisor, Site Superintendent, Health and Safety Officer and Quality Control Manager, during the completion of additional task for an EC/CA Study started 8/96..

Adak Naval Air Facility; Adak, AK; Site Superintendent, Senior UXO Supervisor, UXO Safety, UXO Quality Control, Site Emergency Coordinator, and SSHO during absence of assigned SSHO, 03/97-10/97 - Responsible for conducting archive search, geophysical survey, and intrusive sampling of unexploded ordnance on Naval Air Facility, Adak Island, AK, pursuant to the Base Realignment and Closure (BRAC) Program. Duties and responsibilities include: daily operating schedule; conducting daily safety briefs; supervising UXO surface clearance activities; provide UXO escorts for all site personnel in uncleared areas; conducting EM-61 survey with USRAD system; Chairman Anomaly Selection Committee; supervising UXO excavation and investigation of selected anomalies; supervising UXO identification and disposition of located UXO items; requisition and storage of demolition materials; and ensuring that UXO phase for project is completed in accordance with plans and specifications.

Nansemond; Former Army Ordnance Depot, Tidewater Community College, Portsmouth, VA; Senior UXO Supervisor, Site Superintendent, Health and Safety Officer, and Quality Control Manger; 10/96-03/97 - Responsible for an ECCA study. Duties and responsibilities included: provided basis of estimate for project operational phase; daily operating schedule included conducting daily safety briefs; supervised cutting and clearing activities; provided UXO escorts for all site personnel; coordinated scheduled activities of geophysical survey team; supervised UXO excavation and investigation of selected anomalies (1239); supervised UXO demolition operations to dispose of located UXO items; requisition and storage of demolition materials; and ensured that project was completed with plans and specifications.

Camp Wellsfleet; Cape Cod National Seashore Park, 12/96 - Member of a site visit team in preparation for development of an Engineering Evaluation/Cost Analysis for the site.

U.S. Navy; Port Hadlock Detachment Naval Weapons Station, Bangor, WA; Senior UXO Supervisor and alternate Health and Safety Officer; 08/96 -09/96 - Responsible for shoreline erosion remediation and capping of a landfill.

Lauderick Creek; Area UXO Removal Action, Edgewood Area, Aberdeen Proving Grounds, MD; 01/96 - 07/96 - Member of a team to prepare draft and final work plans for the mobilization, training, surveying, locating, excavating, identifying, removing, and disposing of potential UXO hazards and related waste. Responsibilities included: conducted archives search to define potential hazards associated with area; conducted site inspection to identify geographical features; and assisted in preparing Engineering Evaluation/Cost Analysis (EE/CA).

Environmental Remediation Services; Edgewood Area, Aberdeen Proving Grounds, MD; Senior UXO Supervisor/Health and Safety Officer; 02/95 - 07/96 - Significant assignments have included Site Safety and Health Officer (SSHO) of various projects involved with locating, removing, sampling, storing, and disposing of potentially-contaminated material. Potential hazards of concern have included chemical, biological, physical, and UXO.

Chlorine and Experimental Plant Dump Sites, Edgewood Area, Aberdeen Proving Grounds, MD; Site Safety and Health Officer; 06/95 - 11/95 - Responsible for ensuring compliance with the SHERP

during the sampling, locating, excavating, and removing of potentially-contaminated material (PCM) from an area where multiple chemical production plants, pilot plants, and chemical manufacturing plants operated from the WW1. The project involved the removal of 300 tons of PCM. All intrusive activities were conducted in level B PPE. Monitoring included the use of minicams, ICADs, DAAMs tubes, and standard air monitoring equipment. Potential hazards of concern were chemical, radiation, physical, biological, and UXO.

26th Street Radiation and UXO Removal Site, Edgewood Area, Aberdeen Proving Grounds; MD; Site Safety and Health Officer; 05/96 - 07/96 - Responsibilities included sampling, radiation monitoring, UXO removal operations, screening, and packaging of radiation-contaminated materials.

Stokes Avenue Dump Site, Edgewood Area, Aberdeen Proving Grounds, MD; Site Safety and Health Officer; 01/96 - 03/96 - Assisted in preparing basis of estimate and estimate for project. Responsible for ensuring compliance with the SHERP during the sampling, locating, excavating, and removal of PCM from an area where multiple chemical production plants operated from WW1. Potential hazards of concern were chemical, physical, biological, and UXO.

Pilot Plant Sumps, Edgewood Area, Aberdeen Proving Grounds, MD; Site Safety and Health Officer; 10/95 - Involved with sampling, pumping of sump contents, and filling of sumps with grout.

Building E-3640, Edgewood Area, Aberdeen Proving Grounds, MD; Site Safety and Health Officer; 11/95 - The project involved clearing and grubbing, sampling of soils and liquids, excavation of contaminated soils, sump pumping and backfilling, decontamination activities, and site restoration.

C-Field, Edgewood Area, Aberdeen Proving Grounds, MD, Site Safety and Health Officer; 06/95 - The project included sampling of soils and liquids, excavation of contaminated soils, and two abandoned septic systems.

U.S. Navy; Port Hadlock Detachment Naval Weapons Station, Bangor, WA; Senior UXO Technician; 06/94 - 07/94 - Involved in the UXO/OEW clearance of the open burn/open detonation (OB/OD) Areas 11 and 12.

J-Field, Edgewood Area, Aberdeen Proving Grounds, MD; Site Safety and Health Officer; 02/95 - 03/95 - Responsible for construction of a 275-foot gabion wall and rip rap shoreline protection system. Project involved clearing UXO, site clearing and grubbing, and excavation and construction of the shoreline protection system.

OU-1, NAS Jacksonville, FL; Site Safety and Health Officer; 04/95 - 06/95 - Responsible for the remedial action of a Navy Priority Listed site on the Navy Installation Restoration Program. Work activities included soil sampling, clearing and grubbing, excavating of contaminated soils, stockpiling contaminated soils, trenching and installing three ground water extraction systems, decontamination activities, and site restoration.

Raritan (Former) Army Depot; Raritan, NJ; 09/95 - Conducted a site visit to review 19 selected sites for possible remediation. Also conducted UXO escort for site visit in preparation for development of an EE/CA for the Arsenal.

Nansemond (Former) Army Depot; Suffolk, VA; Task Leader/Site Safety and Health Officer and UXO Escort; 04/96 - Responsible for a preliminary land survey in preparation for a UXO removal action.

Newport, RI; Senior UXO Supervisor; 06/96 - Responsible for power screening operation of 9,000 cubic yards of contaminated soils that also had three- and five-inch projectiles.

Nansemond (Former) Army Depot; Suffolk, VA; Task Leader/Site Safety and Health Officer/Senior UXO Supervisor; 06/96 - Responsible for a preliminary survey to estimate degree of cutting and clearing of 18 selected sites in preparation for a UXO removal action.

PRIOR EXPERIENCE

Conventional Munitions Systems Inc. (CMSI)
Chocolate Mountain Impact Range
El Centro, CA

Senior UXO Technician/Supervisor, 1/95-2/95 – The objective of the project was to clear an access 21.5 miles long by 75 feet wide by eight feet deep for the installation of a new gas line. Concept of operation was to conduct a visual surface sweep of the designated area followed by a towed magnetometer array, locating, and plotting magnetic anomaly system.

Explosive Ordnance Disposal World Systems Inc. (EODWSI)/Conventional Munitions Systems Inc. (CMSI), Kuwait

UXO Team Leader and Zone Manager, 2/92-10/93 – Involved in the post-war cleanup of Kuwait. Duties included mapping the area of operation and plotting located ordnance items with Global Positioning System (GPS), and pronavigation systems conducting land sweeps to located and dispose of hazardous munitions, reclaiming usable munitions, removing all vehicles, and restoring land area to pre-ware condition. Performed as UXO Team Leader for hands-on minefield clearance operation.

Florida, 1983-1992 – A licensed general contractor involved in government, commercial, and residential building projects.

Explosive Ordnance Disposal Detachment Naval Coastal System Center
Panama City, FL

Officer-in-Charge, 1977-1981 – Provided ordnance disposal services to the principal Navy activity for conducting RDT&E in mine countermeasures, antiship torpedo defense, diving and salvage, coastal and inshore warfare defense, and amphibious operations. Functional responsibilities included initiation, review, and approval of plans for the test/evaluation of explosive devices, diving equipment and systems, and explosive safety officer. Prepared technical reports and provided technical expertise to scientific and intelligence agencies in connection with the exploitation of foreign materials. Director of Safety for R&D activity.

Explosive Ordnance Disposal Group Two
Fort Story, VA

Operations Officer, 1974-1977 – Responsible for coordinating the assignment of EOD assets in the eastern United States, Europe, and Atlantic Fleet area of operations. Duties included:

Officer-in-Charge and Parachute Insertion Team, 1974-1977 – Responsible for a special team trained and equipped to respond to an EOD incident anywhere in the area of operation by parachute insertion.

Officer-in-Charge, Secret Service Support Team, 1974-1977

USS Seattle, Mediterranean Deployment, EOD Detachment, Officer-in-Charge, 1/76-7/76 – Completed surface warfare qualifications for deep draft vessels.

Suez Canal Clearance Operation, Senior Operational EOD/Diving Officer, 7/74-11/74

Operations Officer, 12/74-12/75 – Coordinated the assignment of EOD personnel and material assets in the eastern United States, Europe, and Atlantic Fleet area of operations. Initiated operations orders for special fleet and large ordnance clearing operations. Qualified surface warfare for deep draft vessels. EOD/Diving Officer for Task Force responsible for the Suez Canal Clearance.

EOD Detachment
Cecil Field, FL

Officer-in-Charge, 1970-1974 – Provided EOD services to a large military complex. Primary responsibilities included conducting periodic sanitation of four active bombing ranges to clear dud-fired munitions and performed as Explosive Safety Officer for all Naval Activities in the Jacksonville area of operation.

Explosive Ordnance Disposal Group One
Hawaii

1967-1970 – Completed three assignments in the Republic of Vietnam during combat operations.

NAVSCOLEOD
Indian Head, MD

1964-1967 – Primary instructor in explosive filler and filler identification, rockets and guided missiles, land mines and booby traps, and improvised explosive devices instructor. Duty station at NAVSCOLEOD Detachment, Eglin AFB, Florida. Performed practical application of basic EOD techniques covered at Indian Head, Maryland. All operations and procedures were performed on live explosive items.

USS Essex
Quonset Point, RI

EOD Team, 1963-1964 – Provided EOD services.

DISCIPLINE CODES

199 UXO Specialist, Y
109 Construction Experts, N

OTHER DATA

Office Location: Fort McClellan
FWENC Hire Date: 08/03/1994
Years w/Other Firms: 23
Daytime Phone: 256-820-7904

EXPERIENCE SUMMARY

Project UXO Quality Control Specialist. Responsible for ensuring that all site operations are conducted in accordance with recognized performance criteria and for performing QC checks of all fieldwork prior to Army Corps of Engineers (Huntsville, AL) Quality Assurance inspections. Additional responsibilities and performance criteria will be met during the project.

PROFESSIONAL AFFILIATIONS

American Society of Quality - 1999

REGISTRATIONS/CERTIFICATIONS

ASQ Member

TRAINING

40-Hour OSHA 29 CFR 1910.120(e)(3)-05/94
8-Hour OSHA 29 CFR 1910.120(e)(3)-08/00
40-Hour Radiation Safety Course-09/93
40-Hour OSHA Hazardous Waste Health and Safety Training - May 1994
OSHA 1910.120(e)(8) Refresher Training - Aug 2000
OSHA 1910.120(e)(4) Supervisor Training - Aug 2000
Environmental and Safety Supervisor Course - Aug 2000

EDUCATION

GED 1982US Naval EOD School,, Indian Head, MD, 1987
Awarded Senior EOD Badge, 1991
Defense Packaging of Hazardous Materials for Transportation, 1994
Instructor Training Course, 1992
MK-16 Diving Supervisor, 1997
Assistant Radiographer, 1994

REPRESENTATIVE PROJECT EXPERIENCE

U.S. Army Corps of Engineers (Huntsville) CHENC; FT McClellan, AL; UXO QC Specialist; 05/00 - Present - Responsible for ensuring that all site operations are conducted in accordance with recognized performance criteria and for performing Quality Control checks of all field work prior to CHENC QA inspections. Proficient with USRADS system and extremely knowledgeable with the EM-61 sub-surface detector and other types of metal detectors.

Regulatory Issues: Waste process investigation and management. Agencies-EPA and Alabama Department of Environmental Management.

PRIOR EXPERIENCE

State of Hawaii; Kaho'olawe Clean-up and Restoration Project, Kaho'olawe Island, Hawaii; UXO Quality Control Supervisor; 05/99 -05/00 - Responsible for 7 QC Specialists conducting various levels of inspections in all phases of operations.

Responsible for the conduct of Quality Control surveillance and inspections on all UXO operational teams on the Kaho'olawe cleanup and restoration operation. Valued for leadership and personal skills that have greatly contributed to the continuing improvement of the QC functions and its processes. Extremely knowledgeable in all Quality Control Operations including data collection and operation

with the EM-61 sub-surface detector. Excellent communication skills and consummate team player. Possess a working knowledge of survey equipment and are qualified in backhoe and excavation heavy equipment operations. Promoted to UXO Quality Control Specialist Supervisor in February.

Regulatory Issues: Waste process management. Agency State of Hawaii.

Military Experience:

Leading Chief Petty Officer; 11/96-05/99 - Detachment 10. EOD Mobile Unit Six, Charleston, SC. Responsible for the Mine Counter Measures Detachment as senior enlisted leader. Participated in the successful combined operations for UXO clearance with Canadian and British Clearance Divers. Responsible for the supervising of training the Kuwait and Saudi Arabian naval forces in MCM procedures during numerous exercises during this period. While deployed to the Persian Gulf, trained joint service and security personnel in bomb search techniques, bomb recognition and, condition evaluation and counter proliferation. Conducted and supervised safety briefings and UXO procedures. UXO Team Leader on numerous U.S. Secret Service assignments in support of the President of the United States and other dignitaries. Required to maintain basic demolition qualifications (electric and non-electric). Ordnance encountered: Influence mines, Moored mines, Contact mines, Limpet mines and IED's.

Operational Support Department Naval Explosive Technology Center; Indian Head, MD; Division Officer; 08/93-10/96 - Responsible for the Explosive Test Site, Photography Lab, Radiography Lab and Command Communication Crisis Center. Member of the Quality Assurance Team for the Kaho'olawe Island's contract development. Participated in the development and supervision of plans for the search, removal, detection, access, identification, and disposal of conventional air and ground ordnance, and the land reclamation/restoration project. Served as the Command's representative to the DOD (Under Secretary for Environmental Safety) and Corporate Information Management Group for the standardization of explosive safety. Reviewed and revised UXO procedures. Worked with staff to recommend enhancements to UXO programs. Ordnance encountered: MK-80 series bombs, practice bombs, 2.75" rockets and motors, Illumination rounds, 20mm-40mm projectiles.

EOD Mobile Unit Fifteen, Mare Island, CA; EOD Command Senior Enlisted Advisor; 07/91-07/93 - Implemented, administered, and served as lead instructor for the pilot Modular Scuba Diving course. Conducted classes in access, identification, detection, and evaluation of multiple types of ordnance. Managed the command's classified material and administered the Physical Security Program. Ordnance encountered: MK-80 series bombs, 2.75" rockets and motors, Illumination rounds, 20mm-40mm projectiles and Limpet mines.

EODMU Nine; Mare Island, CA; EOD Technician; 12/87-06/91 - Disposed of 1500 pounds of retrograde explosives at Naval Magazine Subic Bay, P.I. Supported clearance operations for the removal, detection, access, identification, and disposal of conventional air and ground ordnance at Kaho'olawe. Supervised a 35-man sweep troop line during three Off-Range Clearance Operations at NAS Fallon, NV. Responsible for the safe movement of personnel within the work area. Disposed of over 65,000 pounds of unexploded ordnance and related items.

I have never been removed from an EOD/UXO assignment due to unsatisfactory performance, safety, or personnel reliability reasons.

PROFESSIONAL REFERENCES

FT McClellan
CHENC
Jim Ennis
Site Supervisor
PO Box 5037, FT McClellan, AL - 36205
256 820-7904

FT McClellan
CHENC
Greg Williams
Civil Engineer
1595 Church Ave., SE, Apt 8B, Jacksonville, AL - 36265
256 782-2658

Adak
US Navy
Wendell Morgan
Quality Control Manager
Foster Wheeler Environmental, Adak, AK
907 592-2139

SKILL SET

OTHER

Health and Safety Officer
UXO Specialist
UXO Quality Control

DISCIPLINE CODES

Unexploded Ordnance Specialist Y

OTHER DATA

Office Location: Fort McClellan
FWENC Hire Date: 05/15/2000
Years w/Other Firms: 12
Daytime Phone: 256-820-7904

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EXPERIENCE SUMMARY

Mr. Rubino's immediate responsibilities at Foster Wheeler will include an assessment of current GIS requirements for the UXO program, a review of existing site GIS software, providing recommendations where deficiencies may exist or where requirements mandate; providing guidance in the establishment of data dictionaries and procedures to support the GIS segment of the UXO program; and finally the implementation and exploitation of GIS data to assist in supporting the control, site safety, project documentation, and presentation of UXO remediation work. Additionally, he will be responsible in designing the GIS system so that data collected can be used to assist project leads for planning purposes, having more clear and accessible data from which to make estimates and proposals for future remediation projects. Long term, Mr. Rubino will work to apply GIS technology for implementation in other areas outside of the UXO field.

TRAINING

Intergraph MGESX (MGE base) - 1993
Intergraph MGFN (Map Finisher) - 1994
Intergraph Image Station (Image Data Cap / Image Analysis) - 1994
Intergraph Geo-Media Professional - 2000

EDUCATION

BS, Environmental Rsc. Mgmt. & Planning, University of West Florida, 1988

REPRESENTATIVE PROJECT EXPERIENCE

US Corps of Engineers; UXO Fort McClellan, Ft. McClellan, Anniston, AL; GIS Specialist; Load and evaluate GIS products at Fort McClellan - Provide near term products and planning graphics to site managers and planners. Created thematic and spatial representation of data captured at Fort McClellan after aligning local databases for project reports. Responsible to establishing conventions for data import into the GIS environment, procedures for database maintenance, and methodologies and procedures for exploitation and presentation of data.

PRIOR EXPERIENCE

National Imagery and Mapping Agency (Intergraph Services Company); Hardcopy Map Production - Omnibus, Huntsville, AL / Bangkok, Thailand / Jackson, MS / New Orleans, LA; Huntsville, AL; Hardcopy Production Technical Lead; 02/98-10/00 - Mr. Rubino served as the Map Finishing/Publishing Technical Lead, engineering, implementing and streamlining workflows in the production of TLM 50,000, 100,000 sheets, Combat Charts, Nautical Charts, and JOG (A) sheets. His tasks included developing and documenting procedures to enhance workflow, create and implement parameter files and initialization data to support production, design applications and providing guidance to developers in the creation of production enhancement tools. Additionally, Mr. Rubino took part in project planning, system management, configuration management, and ISC marketing efforts.

Formerly Mr. Rubino acted as a Systems Consultant in the Special Projects area. In support of the Digital Production (Demonstration) program for the National Imagery and Mapping Agency (NIMA), Mr. Rubino used a Windows NT-based DCAFE Map Publisher workflow to produce 1:50,000 Topographic Line Maps (TLMs) in both TIFF Group IV (direct to plate) and film separate formats. During this project, refined workflow, testing software, and formalizing quality assurance procedures. Mr. Rubino also assumed primary responsibility for Vector Product Format (VPF) production of VMAP Level 2 data for DP (D). Mr. Rubino has also been responsible for performing revisions of discrepancies for both TLMs and VMAP2 on DP (D). In addition, Mr. Rubino has been performing VPF product finishing for the Digital Nautical Chart (DNC) program. In performing VPF product finishing, Mr.

Rubino is responsible for executing VPF Validator software and resolving any discrepancies detected and using the VPF Viewer to perform visual quality assurance inspections. While performing VPF product finishing, Mr. Rubino has implemented tools to automate the production workflow and ensure consistency in performing data archiving.

Mr. Rubino has taken a marketing responsibility in the development of web pages for ISC, as well as staffing at the 1998 Intergraph Users' Group ISC booth area. He has also provided assistance in the evaluation of customer requirements and the development of proposals.

- National Imagery and Mapping Agency
- NIMA College, Ft. Belvoir, VA
- Mapping and Charting Establishment, Ottawa Canada
- Hungarian Military, Budapest, Hungary
- French Military, Paris, France
- Spanish Military, Madrid, Spain
- AmilGeo, Bonn, Germany
- Korean Army Map Service, Taejan, Korea
- Topo Dienst, Emmen, Netherlands

Intergraph Corporation; Hardcopy and Digital Mapping projects under NIMA/VPF Implementations, International; Huntsville, AL; Systems Engineer; 08/92-02/98 - Mr. Rubino performed system and software integration of Intergraph UNIX- and Windows NT-based commercial and custom software and developed VPF and Hardcopy Map Production workflow for domestic and international customer sites. He also was an integral in the development of workflow documentation and training manuals, and he conducted domestic and international training classes on both civilian and military sites. Mr. Rubino performed customer software and system support, provided technical consultation, and product demonstrations in support of contract acquisition efforts, conducted site evaluations, and performed configuration management.

Mr. Rubino performed workflow design and implementation on the production of various hardcopy cartographic products using Intergraph Modular GIS Environment (MGE) products in populating and extracting map feature information exploiting relational databases. He developed, documented, and trained MPE workflow, integrating the data captured for VPF production using MGE Map Finisher and MGE Map Publishing environments. He also integrated custom and commercial software packages into the digital Vector Smart Map (VPF) production workflow and developed training and user guides.

One of Mr. Rubino's major tasks serving as the technical lead on the NIMA Vector Product Demonstration (VPD) program for the design and implementation of a VPF symbology prototype using CGM file formats and database structures. This symbology effort was to supply symbolization to VPF viewing software for twelve VPF products. Mr. Rubino was responsible establishing symbology rules and procedures and a comprehensive symbol library built in accordance with military standards and International Hydrographic Office (IHO) specifications of color, style, and ambient light observance. Additionally, Mr. Rubino created table structures and documentation, and he tested the product on SUN, Macintosh, Windows95, and Windows NT platforms. Mr. Rubino also identified issues in the NITFS CGM standard and was key in taking part in multi-agency discussions that resulted in revisions to the standard

Lastly, Mr. Rubino designed and wrote UNIX shell scripts for streamlining various workflow processes and system management functions and took configuration management, customer software delivery, and system management responsibilities for his organization.

Rand McNally; 1993 Road Atlas, Chicago, IL; Systems Engineer; 08/91-08/92 - Mr. Rubino provided technical assistance to development staff in the design and development of project workflow during the 1993 Road Atlas Project. He managed a network of Intergraph UNIX workstations; conducted network expansion planning; examined and facilitated operation protocol; evaluated, installed, and maintained on site and third-party software and hardware; and performed system baseline and software deliveries. Mr. Rubino also provided upgrade orientation to production and development personnel and provided assistance in the production areas whenever necessary.

Defense Mapping Agency; Washington, D.C.; Cartographer; 01/89-08/91

Cartographer, Mapping and Charting Department; 12/90-08/91 - Mr. Rubino acted as MPE technical lead responsible for supervising production of six cartographers, performing quality assurance reviews, and performing system manager duties. Mr. Rubino streamlined image Map production workflow by writing UNIX shell programs and creating product templates, cell and font libraries; developed training manuals and trained new users.

Temporary Additional Duty: Intergraph, Huntsville, AL; 08/90-12/90 - Mr. Rubino was selected to participate and work on site in the development, verification and factory acceptance testing of MPE hardware, software and developed standard production operating procedures for DMA. Areas of focus included Map Publishing, InterPlot, IVEC and, system management and shell authoring. While performing this assignment, Mr. Rubino participated in the production of image maps for the Desert Shield operation.

Digital Products Department; 01/89-08/90 - Mr. Rubino operated on PASS II analytical stereoplotter and UNIMACE automated profiling system in the collection of DTED, performed photo analysis on Intergraph InterMap analytical stereoplotter, assumed system manager duties, performed post process manuscript compilation, conducted quality control, and provided training to other personnel.

PROFESSIONAL REFERENCES

VPD / VPF International
Intergraph Federal Systems
Jim Kraus
Systems Engineer
786 Skyline Drive, Scottsboro, AL 35768
256-730 5288

VPD / VPF International
Intergraph Federal Systems
Glenn Graham
Systems Engineer
One Madison Industrial Pkwy, Huntsville, Al 35858
256-730 24851

Thailand TLM / Omnibus / DPD
Intergraph Services Company
William P. Davis
QA Manager
ISC; One Madison Industrial Pkwy, Huntsville, Al 35858
256-730 1752

PROFESSIONAL ACCOMPLISHMENTS

DOD TS Clearance (Not current)
Desert Storm Support Award
NIMA Beneficial Suggestion Awards (2) - Cash awards for processes enhancements: NIMA St. Louis/DC 1992

DISCIPLINE CODES

023 Surveyors, Y
006 Draftsmen, N

SKILL SET

BIOLOGICAL SCIENCES

Aerial Surveys
Mapping

SOCIAL SCIENCE

Cartography

OTHER DATA

Office Location: Huntsville
FWENC Hire Date: 10/18/2000
Years w/Other Firms: 12
Daytime Phone: 256-830-4100

4.0 OVERALL APPROACH to OE EE/CA

The EE/CA for the Fort McClellan Alpha Area will be conducted in accordance with the CEHNC Scope of Work. In addition, EE/CA activities will be executed consistent with the requirements of CERCLA and the NCP as well as requirements of CEHNC, USACE, and DoD for EE/CA activities at BRAC sites. The purpose of the EE/CA includes the following:

- Identify the density and extent of UXO contamination within each sector;
- Evaluate the effectiveness of various risk reduction and removal action alternatives;
- Assess the ability to implement various risk reduction and removal action alternatives;
- Determine the cost to implement the applicable risk reduction and removal action alternatives;
- Evaluate and determine the most appropriate alternative.

4.0.1 This section describes the overall approach for performance of the EE/CA for the Fort McClellan Alpha Area, including:

- Identification of the preliminary removal action goals;
- Description of data quality objectives, data needs, and evaluation of data; and
- Description and the incorporation and use of the data in the EE/CA.

4.0.2 Detailed descriptions of the geophysical and UXO investigations are presented in Sections 6.6 and 7.0, respectively.

4.1 PRELIMINARY REMOVAL ACTION GOALS

Preliminary removal action goals were developed for the Alpha Area site taking into consideration the past use of the site, historical findings of UXO items, and NCP evaluation criteria, including: 1) overall protection of human health and the environment; 2) compliance with ARARs; 3) long-term effectiveness and permanence; 4) short-term effectiveness; and 5) implementability. Based on these factors, the following Preliminary Removal Action Goals have been developed:

- Reduce the explosive threat posed by UXO items that potentially remain within the Alpha Area;
- Minimize the potential for exposure to UXO by current and future property users;
- Minimize the potential for exposure to UXO by workers developing previously undeveloped areas of the site; and
- Minimize impacts to sensitive environments and valuable ecological resources resulting from the implementation of removal actions.

4.1.1 To attain the goal of reducing the explosive threat posed by UXO that may be present within the Alpha Area, the alternatives identified must be effective,

implementable, and economical. The NCP criteria will be used to screen potential risk reduction and removal action alternatives under the three broad categories of Effectiveness, Implementability, and Cost. The preliminary removal action objectives established for this EE/CA will guide the development of sector-specific alternatives and streamline a comparative analysis of acceptable risk reduction and removal action alternatives.

4.2 IDENTIFICATION OF DATA QUALITY OBJECTIVES

The purpose of data quality assurance and quality control (QA/QC), as presented in Sections 6.6 and 11.0 of this Work Plan, are to plan and implement a comprehensive set of controls and systematic procedures to ensure that the data acquired are of a quality necessary to fulfill Data Quality Objectives (DQOs) defined for the project. The data collected during the geophysical and UXO field investigations, as well as data collected for the institutional analysis, will be used to support the evaluation of risk reduction and removal action alternatives for the site. Therefore, the field and institutional data shall be of sufficient quality and quantity to: 1) evaluate the risk of UXO exposure in each of the investigated sectors; 2) make decisions regarding appropriate risk reduction and removal actions to mitigate those risks; and 3) implement the selected actions.

4.2.1 Data Quality Objective Process

Data quality objectives (DQOs) are qualitative and quantitative statements that specify the quality of the data required to support decisions during evaluation of risk reduction and removal action alternatives. The DQO process provides a logical basis for linking the QA/QC procedures to the intended use of the data, primarily through the decision maker's acceptable limits on decision error. DQOs can be defined as what the end user expects to obtain from the analysis results, and are developed through a seven-step process:

- Step 1 State the problem
- Step 2 Identify the decision
- Step 3 Identify inputs to the decision
- Step 4 Define the study boundaries
- Step 5 Develop a decision rule
- Step 6 Specify limits on decision errors
- Step 7 Optimize the decision for obtaining data

4.2.1.1 For the Alpha Area EE/CA at Fort McClellan, screening data generated by geophysical mapping will achieve a data use level for UXO site characterization. Definitive UXO data generated during the intrusive field investigation will achieve a data use level to adequately characterize the sectors and support a UXO risk assessment. Specifically, these data will be used to:

- Confirm and further define the nature and extent of surface and subsurface UXO contamination, through the excavation of geophysical anomalies and identification of excavated material as scrap, ordnance scrap, inert ordnance, or live UXO;
- Obtain sufficient data for the performance of a UXO risk assessment; and
- Obtain sufficient data for the screening and detailed evaluation of appropriate risk reduction and removal action alternatives during the EE/CA.

4.2.2 Data Quality Characteristics

The overall QA/QC objective for the field investigation is to develop and implement procedures that will provide data of known and documented quality. DQOs are composed of written expectations for data quality characteristics (DQCs), which include precision, accuracy, representativeness, completeness, and comparability (PARCC). Data Quality Objectives for each of these parameters are determined based on the level of data required. Descriptions of these characteristics, and specific QA objectives for both screening (i.e., geophysical mapping) and definitive (i.e., anomaly excavation) data, are provided below.

4.2.3 The following parameters are considered when planning and implementing a geophysical and UXO investigation program:

- Precision – A measure of the agreement between repetitive measurements of the same property. Precision for most geophysical measurement processes can be performed in the laboratory and under field conditions. For most field measurement processes, analysis of the precision parameter can provide excellent quantitative information regarding the error in location (x,y coordinates) when using continuous (i.e., time-based) geophysical instrumentation. It can also provide information on the error(s) associated with the actual measurement process (i.e., the repeatability of the measurements). General performance goals specifying the required minimum detection depths for various ferrous objects, as established by CEHNC, were demonstrated by Foster Wheeler Environmental on the Fort McClellan test plot in 1999. For specific performance goals, the expected criteria is established based on the following functions:

  - Function 1 (Magnetometry): $\text{Log}(d) = 1.354 \log(\text{dia}) - 2.655$
  - Function 2 (Electromagnetics): $\text{Log}(d) = 1.002 \log(\text{dia}) - 1.961$

  Where: d = depth to the top of the buried UXO, in meters

  dia = diameter of the minor axis of UXO, in millimeters

  These functions have been demonstrated for diameters greater than or equal to 40 mm.

- Accuracy – A measure of the agreement of a measurement with a pre-defined (or accepted) value. Usually, geophysical instruments are "calibrated" for accuracy at the specific manufacturer's laboratory under controlled test conditions. As defined in this document, accuracy is an instrument-dependent parameter. The respective

instrument manuals provide achieved measurement accuracies under ideal laboratory conditions. However, in field operations this equipment response can vary with the skill and knowledge of the operator. Instrument calibration and testing procedures, outlined in the manuals for the instrumentation proposed and in this Work Plan, will be followed and thus provide a greater degree of confidence associated with the measurements. Performance goals for the accuracy are as follows:

- → Horizontally, 98 per cent of all excavated items must lie within a 20-cm radius of their mapped surface location as marked in the field after reacquisition.

- → There shall be no more than 15 per cent "false positives" where anomalies reacquired by the Contractor result in no detectable, metallic material during excavations. There may be specific site conditions and/or specialized acquisition/reacquisition methodologies employed that may result in these performance goals not being achieved. The proposed false positive and horizontal accuracy criteria for this specific task are provided in Section 6.6.9.1.

- Representativeness – A measure of the degree to which the results of the investigation accurately and precisely represent the characteristics of a sector. In this case, representativeness describes evidence demonstrating that placement of the investigation grids and data acquisition line, and selection of the proper instrumentation will result in data representative of the sectors to be measured. Often, this parameter is directly related to the experience of the personnel who design the geophysical survey. The representativeness of geophysical measurements is an applicable parameter when personnel knowledgeable with the methods and survey design compare the result with respect to the objectives of the geophysical program. Strictly defined, it assumes that at each measurement location the data are acquired with accepted measurement standards, and all measurement standards are applied uniformly among sampling locations.

- Completeness – Is the amount of valid data acquired compared to the amount of valid data expected. This parameter can be controlled by ensuring that qualified individuals who have requisite expertise with the proposed equipment plan and perform the geophysical survey. Completeness is entirely dependent upon the success of the geophysical program in meeting the objectives of the overall investigative program. Assuming the methods are successful in the detection of target UXO for each sector, the amount of data necessary to achieve the objectives will be collected. Comparability of the geophysical data can be evaluated with data derived from other sources (e.g., excavation results). If an anomaly that is consistent with the geophysical measurement characteristics is not recovered within a 3.5 foot radius of the mapped location at the estimated depth, the interpretation geophysicist will confirm the anomaly location and size by reevaluating the survey and/or processing of the data. Continuous communication and feedback between the UXO field team and the interpretation geophysicist is required.

- Comparability – Describes the degree of confidence in comparing one data set with another (e.g., two EM-61 surveys over the same area at two different time periods or reacquisition of State Plane coordinates with different DGPS units). In geophysical applications, it can also be interpreted as the comparison of the geophysical data with other geoscience data acquired within the same area. Geophysical instruments can be very precise and accurate measuring devices. However, geophysical techniques depend on the detection of contrasting physical properties between subsurface materials. In most circumstances, the relative contrast in physical properties is more important than the absolute contrast. Based on the test plot results and Foster Wheeler Environmental's previous geophysical investigations at sites similar to Fort McClellan, there appears to exist a sufficient contrast in physical properties to meet the program objectives. The probability of detection is dependent upon the data acquisition parameters, target characteristics, and the surficial and subsurface cultural "noise" at the site, which may adversely affect the geophysical measurement process. The QC representative will check the excavation results and compare the data (actual depth, size, location) obtained for all anomalies with the estimates calculated by the geophysicists. The project geophysicist will subsequently review the final dig sheets and excavation results, compare the data, and perform any necessary corrective actions.

4.3 REQUIRED DATA

The data required to effectively characterize UXO contamination and evaluate risk reduction and removal action alternatives (i.e., completion of the EE/CA) will be generated by geophysical and UXO field investigations, collection of data, and completion of an Institutional Analysis. The required data includes the following:

- Survey data (i.e., State Planar Coordinates) as collected by Foster Wheeler Environmental geophysicists using portable precision DGPS instruments or by a Professional Land Surveyor using conventional surveying techniques. These data will be used to locate the position of geophysical grids and anomalies, and aid in any future reacquisition efforts;

- Geophysical investigation data to identify and map the detected subsurface anomalies. Required data includes the precise location and approximate depth and size of all anomalies within each of the surveyed grids. An interpretation of the geophysical anomalies detected will be made to discern anomalies that have similar characteristics to the most probable UXO existing within the survey area. The interpretation and selection of anomalies will be validated through intrusive methods.

- Intrusive investigation data to determine the nature of the anomalies. Data includes detailed accountability records of UXO/OE and non-UXO encountered, their depths, and records of UXO detonation and disposition.

- GIS data files to establish the Alpha Area EE/CA database;

- Additional data to support the risk assessment. This includes terrain, slope, vegetation, accessibility, and future use of each sector investigated.

- Required data for the Institutional Analysis includes: the name of each agency considered, origin of institution, basis of authority, sunset provisions, geographic jurisdiction, public safety function, land use control function, financial capability and constraints of institutional effectiveness.

4.3.1 All data will be compiled and presented in the EE/CA Report. The data will also be incorporated into the site-specific GIS. This data use is discussed further in Section 6.0.

4.4 DATA REDUCTION AND EVALUATION

Geophysical data processing will be accomplished at the Foster Wheeler field office at Fort McClellan. Preliminary data reduction and evaluation activities will be completed on a daily basis to verify that the investigation objectives are being met and to aid in the planning of upcoming field activities. The on-site geophysicists will be responsible for the management and operation of the geophysical data processing center. Specific geophysical data reduction procedures are discussed in detail in Section 6.6.

4.4.1 Following the geophysical investigation, the UXO intrusive investigation will be performed. The project geophysicist will guide the investigation and select anomalies to be excavated in order to determine if UXO are present. During the intrusive investigation, excavated anomalies will be inspected by a QC geophysicist in the field office to assess UXO discrimination capabilities and alter the sampling effort as necessary.

4.4.2 Upon completion of the EE/CA field investigation, a risk analysis will be performed that incorporates the results of the investigation. The risk analysis is further discussed in Section 6.7 of this work plan.

4.5 DATA INCORPORATION INTO THE EE/CA REPORT

For each grid subject to geophysical and UXO investigations, the following information will be compiled for incorporation into the EE/CA report:

- A final interpretation map of the completed grids;
- A tabulation of surface UXO/OE location and size;
- A tabulation of subsurface UXO/OE location, depth, and size;
- A brief narrative which describes field activities performed at each grid and the results of the analyses of the data acquired within each grid;
- An evaluation of found UXO/OE items (i.e., fuzed/unfuzed, empty or containing explosives, etc.); and

- An assessment of compliance with DQO's and characteristics, and any non-conformances in data collection and associated corrective actions.

4.5.1 The compiled geophysical and UXO intrusive investigation results, the results from the risk assessment and the results of the institutional controls analysis will be presented in the EE/CA Report and used to develop, evaluate, and recommend appropriate non-time critical risk reduction and removal action alternatives for the Alpha Area.

4.6 OE Explosive Analysis

A summary of munition types potentially present in the vicinity of the Alpha Area, along with the explosive/incendiary hazard posed by each, is presented in Table 3.1 of this document. Explosive types that are anticipated in the Alpha Area are also summarized in the Conceptual Site Models prepared for each of the three Alpha Area sampling sectors. These models and the methods that will be used to analyze potential exposure to these OE items are presented in Section 6.7 of this work plan.

4.7 Alternatives Identification and Analysis

Alternatives to be considered for evaluation in the Alpha Area EE/CA will include but not be limited to one or a combination of the following:

- No DoD Action Indicated;
- Institutional Controls;
- Surface Clearance; and
- Clearance to Depth.

Each of the above listed alternatives will be evaluated based on the following criteria:

- Overall protection of human health and the environment;
- Compliance with ARARs;
- Long-term effectiveness and permanence;
- Short-term effectiveness;
- Implementability; and
- Cost.

The results of the evaluation will be reported in the EE/CA Report, and this information will be utilized, along with other issues such as stakeholders' concerns, regulatory acceptance, and community acceptance, to determine the remedial action to be taken at the site.

4.8 EE/CA Report

Foster Wheeler will prepare and submit an EE/CA report in accordance with DID OE-010. The report will contain conclusions as to the nature and extent of OE

contamination, a risk assessment, and recommendations for future work at Fort McClellan within the Alpha Area. The text portions of the Report will be supported with maps generated in GIS, along with tables to describe and document all conclusions and recommendations presented.

4.9 EE/CA ACTION MEMORANDUM

Following evaluation and incorporation of appropriate comments from USAESCH, other stakeholders and the public into the Final EE/CA document, Foster Wheeler will prepare an EE/CA Action Memorandum to detail the selected risk reduction alternative method(s) and the rationale for selection for the Alpha Area at Fort McClellan.

4.10 EE/CA COMPLETION AND CLOSE-OUT

Upon completion of all tasks in the Scope of Work (see Section 5.0), all raw data and copies of all draft and final deliverables will be archived by Foster Wheeler Environmental as directed by CEHNC. Archived files may be maintained by Foster Wheeler Environmental or delivered to CEHNC, as requested.

4.11 USE OF TIME CRITICAL REMOVAL ACTIONS DURING THE EE/CA PROCESS

No time-critical removal actions are anticipated for the Alpha Area. If such a need arises, this will constitute a change to the Scope of Work, and will be addressed in accordance with established procedures.

5.0 Scope of Work

The Scope of Work for the Alpha Area portion of this delivery order includes performance of the following tasks described in detail in the Basis of Estimate prepared to accompany the proposal for this Delivery Order. The Basis of Estimate is provided in Attachment 5-1.

5.1 Site Visit (Task 1)

Included a visit to the site by key Foster Wheeler Environmental and subcontract personnel to gain information concerning site contacts, data sources, site terrain, and general site conditions. This was completed in October 1999.

5.2 Prepare Project Work Plan (Task 2)

This includes preparation of this Work Plan for the Alpha Area. The plan follows the requirements of the appropriate Data Item Descriptions included in the basic contract, and references the existing General Site-Wide Work Plan where appropriate. This plan includes the following supporting plans:

- OE Planning and Operations Plan that describes all OE operations including equipment, procedures, personnel, and safety aspects of surface sweeps and intrusive investigations;

- Geophysical Plan that describes the methods, equipment, personnel, data collection procedures, and data quality control procedures associated with the geophysical investigation of sampling grids;

- Site Safety and Health Plan (SSHP), to describe the site-specific safety and health procedures, practices and equipment to be used to protect affected personnel from the potential hazards associated with the site and tasks to be performed;

- Environmental Protection Plan to describe site-specific measures that will be taken as necessary to protect sensitive areas during the EE/CA investigation activities;

- Data Management Plan to describe the proper management of the large quantities of data that will be generated during the investigation including geophysical data, navigation data, intrusive sampling data, and Quality Control data;

- UXO Quality Control Plan describes QC inspections and audits that will be performed to insure that the UXO/OE handling and data collection procedures are properly controlled and valid.

5.3 PHASE I SITE CHARACTERIZATION (TASK 3)

Based on FWENC's review of historical information and the field reconnaissance performed by FWENC at the three sampling sectors in the Alpha Area during March and April 2000, a field program consisting of geophysical and intrusive UXO investigations will be conducted at the site to characterize the UXO density and distribution in accordance with the specifications contained within this Work Plan. The sampling sectors contain varying concentrations of expected OE contamination (designated high, medium or low), and distribution of OE within each sector is expected to be homogenous. Within the Alpha Area, FWENC will perform geophysical sampling over areas totaling up to 64.5 acres throughout the 876-acre investigation area contained within the 3 sampling sectors delineated. This task also includes limited intrusive activities associated with data validation. Data validation will be conducted at 9 low-density grids covering 4.5 acres, with excavation of up to 450 geophysical anomalies. This represents 10 % of the low-density grids in the Alpha Area. The remaining intrusive activities are included in subsequent tasks. A detailed description of the Phase I Site Characterization of the Alpha Area is contained in the Basis of Estimate, Attachment 5-1 of this work plan.

5.4 DATA VALIDATION (TASK 4)

Includes evaluation of geophysical anomalies to distinguish OE items from other anomalies, excavation by UXO personnel of a subset of anomalies detected with the EM-61, and comparison of excavated items to geophysical signature in order to validate methods used for identification of OE items using geophysics. Data validation in this task will address grids where medium or high OE density is expected, since data validation for low-density grids was performed in Task 3. In the Alpha Area, anomalies within 5 medium density grids (2.5 acres, 250 anomalies) will be intrusively sampled in this task, and further OE sampling may be performed in Task 5 as deemed necessary.

5.4.2 As stated above, Foster Wheeler Environmental has proposed that all of the anomalies (up to a limit of 100/acre) in 10% of the low- and medium-density grids in Alpha Area be intrusively investigated. This effort would lead to a positive identification of subsurface items producing the observed electromagnetic responses. The effort also would provide the interpreting geophysicist with feedback regarding his/her performance relative to characterizing anomalies as being:

(1) very unlikely to be ordnance or ordnance-related;
(2) very likely to be ordnance or ordnance-related; or
(3) uncertain as to whether the item causing the anomaly is ordnance or ordnance-related.

5.4.3 The selection of 10% intrusive follow-up for low- and medium-density grids in Alpha Area was based on criteria used in other, similar circumstances and in consideration of the reliability of the application of the electromagnetic surveying process in the context of Alpha Area. Conceptually, the use of electromagnetic survey and the follow-up intrusive investigation is an example of two independent methodologies for identifying which anomalies may be ordnance or ordnance-related. In the first case, the methodology involves the electromagnetic survey and the interpretive and discriminating capabilities of the process (including the software and the experience of the geophysicist). In the second case, the methodology involves reacquiring the anomaly, digging it up, and positively identifying it and its characteristics. As can be seen, aspects of both methodologies may be influenced by site-specific factors and the experience of the personnel involved at that site and under those field conditions.

5.4.4 Two analogous circumstances were considered. The first analogy is from a quality control (QC) perspective. To comply with USEPA QC requirements (as defined in USEPA Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Contaminant, OLM04.2, May 1999), duplicates and other QC samples (i.e., matrix spikes, matrix spike duplicates, rinse blanks) must be tested or analyzed at a frequency of no less than 1 in 20 samples (i.e., 5% of the field samples from a similar matrix). This baseline level of testing has been judged to provide sufficient data to judge whether two applications of the same methodology by different personnel using a different analytical apparatus will generate essentially the same characterization result. However, this percentage would typically be judged to be too small if the initial and the follow-up methodologies were not the same.

5.4.5 The second analogy that was considered is the characterization of an area using a field screening methodology, with some percentage of the samples being also sent off-site for laboratory analysis using a more rigorous, conventional methodology. In this circumstance, between 10% and 20% of the field screened locations are also sampled for off-site analysis. Whether the most appropriate split is 10% or 20% generally depends on a number of considerations:

- If the field screening methodology is relatively "tried and true" under the conditions associated with the area being characterized or there are well-defined methodological procedures and techniques, a percentage toward the lower end of the range would be more appropriate. In this case, a degree of reliability and a level of confidence in the process and its results may have been previously demonstrated. 10%, or a value close to 10%, may be appropriate if there has been prior electromagnetic surveying at a site under similar or less "complex" conditions (e.g., hot rocks, confounding cultural metallic scrap).

- If the field screening methodology is relatively new or has not been applied under the conditions associated with the area being characterized, a greater amount of feedback may be warranted to establish the same approximate level of confidence. In this case, a degree of reliability and a level of confidence in

the process and its results may not have been previously demonstrated. 20%, or a value close to 20%, would be more appropriate if there has not been prior electromagnetic surveying at the site using this technique or if potentially confounding conditions are present in this area, which were not been encountered at the site previously.

5.4.6 Alpha Area is expected to be relatively free of the conditions that complicate an electromagnetic survey. In addition, the surveying process to be used in Alpha Area grids has been previously tested in a rigorous manner at Ft. McClellan during the CONUS/OCONUS procurement competition, and has been recently applied at the M2 Parcel under more difficult interpretive conditions. Consequently, follow-up intrusive sampling of 10% of the surveyed anomalies (as denoted by the number of grids) is judged to be most appropriate for Alpha Area.

5.4.7 Foster Wheeler Environmental has acknowledged that 10% may ultimately be determined not to be enough to provide the level of confidence needed in the survey results. This uncertainty arises from the factors noted above. Accordingly, Foster Wheeler Environmental identified additional intrusive investigation as a potentially necessary separate effort depending on what is learned from the initially specified 10% and the expected marginal benefit associated with more intrusive investigation. It should be noted that feedback on the interpretation of the geophysicist and his/her data processing process is most needed with respect to category (3) above: instances where he/she is uncertain as to whether or not an anomaly item is ordnance or ordnance-related. It is this "gray area" of anomalies where the follow-up intrusive investigation is most beneficial to producing better subsequent characterization results. As such, whether the most appropriate percentage of anomalies to dig up and identify is closer to 10% or 20% depends a great deal on how many of the anomalies in a grid are in the "gray area". If a relatively large proportion of the anomalies in a grid is associated with the "gray area" of signals, much can be learned from each grid. On the other hand, if only a small number of the anomalies in a grid are associated with the "gray area", more grids (and a larger percentage of the total number of grids) would then be required to be investigated to provide the same level of information for enhancing the discrimination process. At some point, the marginal benefit of further intrusive follow-up becomes insignificant relative to subsequent characterization.

5.5 PHASE II SITE CHARACTERIZATION (TASK 5)

Consists of excavation and removal of additional subsurface geophysical anomalies identified during Phase I of the assessment. The task will be performed by qualified UXO personnel. The SOW provides assumptions that 100 anomalies per acre will be

excavated, up to 4 feet in depth, and that 5 items per acre are assumed to be UXO that will require disposal. Task 5 is an optional Time and Materials task to be exercised at the discretion of the CEHNC Contracting Officer once the need for additional sampling data has been assessed. Information obtained in Tasks 3, 4, and 5 shall be sufficient to identify target anomalies, prepare the risk assessments, evaluate and recommend response alternatives, and prepare cost estimates for response alternatives.

5.6 DATA MANAGEMENT (TASK 6)

Requires data management in accordance with appropriate Data Item Description. Applies to all reports, drawings, and data generated. This task will be performed using Geographical Information Systems (GIS) applications and Data Base Management System.

5.7 PREPARE EE/CA REPORT (TASK 7)

The EE/CA Report will be prepared and submitted to detail the field investigation, as well as evaluate and recommend appropriate risk reduction and removal action alternatives. The document will be prepared in accordance with DID OE-010. Foster Wheeler Environmental will perform a risk assessment using the draft IR3M Risk Tool model and will evaluate the risk that the site represents to human health and the environment. An Institutional Analysis will be performed as part of the EE/CA Report. The objective of the Institutional Analysis is to identify the stakeholders, document which government agencies have jurisdiction (i.e., exercise control through regulatory endorsement, professional advice, federal support of lending institutions, etc.) over UXO contaminated lands, and to assess their capability and willingness to assert control which could protect the public at large from explosive hazards.

5.8 PREPARE THE EE/CA DECISION DOCUMENT (TASK 8)

Following an evaluation of public comments on the EE/CA Report, the EE/CA Action Memorandum document will be prepared to detail the selected risk reduction alternative method(s) for the Alpha Area at Fort McClellan.

5.9 MEETINGS (TASK 9)

Key personnel will attend and participate in three meetings with DoD, regulatory, and civilian personnel to support the project. In addition, Foster Wheeler will support the preparation of briefings, graphics, and presentations for three public meetings as directed by the Contracting Officer in support of public relations activities for the project.

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ATTACHMENT 5-1
Basis of Estimate

ATTACHMENT 5-1

BASIS OF ESTIMATE AND TECHNICAL APPROACH FOR OE SITE CHARACTERIZATION AND EE/CA PREPARATION FOR ALPHA, BRAVO, AND M1.01 AREAS FORT MCCLELLAN, ALABAMA

This Basis of Estimate is predicated on the Scope of Work (SOW) dated 21 September 2000, and includes the SOW modifications to Tasks 3, 4, and 5 dated 8 November 2000. The estimate utilizes the current rates contained in Foster Wheeler Environmental Corporation's Contract Number DACA87-99-D-0010. The majority of this work will be performed as a Firm Fixed Price project under a modification to Task Order 0001. Only Task 4, Data Analysis and Validation, and Task 5, Phase II Characterization, will be performed as a Time and Materials Task. All activities at Fort McClellan will be performed in accordance with relevant Data Item Descriptions (DIDs) identified in the current basic contract.

The estimate for the SOW for this project includes an assumption for lost field work productivity due to rain days. Historical information indicates that in the four month period from January 1 to April 30, approximately 18 work days are lost due to rainfall. Since the schedule for this project assumes 4-day work weeks (Mon.-Thurs.), it is assumed that some of these rain days can be made up by having crews work on Friday if a work day is lost earlier in the week. Thus, the number of lost work days during the period is assumed to be 12. This rain delay is built into the estimated effort for Tasks 3, 4, and 5.

Task 1. Perform Site Visit. (This task was partially completed in October 1999, prior to suspension due to protest of contract award)

The estimate for this task includes the effort to initiate project activities and for the project team to attend a site visit in order to view the sites and to review key pertinent information concerning site conditions collected during the reconnaissance phase of the project. The initial scope of work included only that effort to visit the area surrounding Range 16. The effort estimated here includes the additional work to visit the remainder of the areas now identified as Areas Alpha and Bravo. The site team visually inspected key impact areas within the Alpha and Bravo areas where Foster Wheeler will perform EE/CA sampling activities. In addition to these efforts already accomplished, parcel M1.01 will be inspected only, since Foster Wheeler will be preparing an EE/CA for that parcel based on field sampling data previously collected by other contractors. Site visit activities include:

- Preparation of an abbreviated Site Safety & Health Plan (SSHP); and
- Three days site visit (one day for travel, and one day each for Alpha and Bravo Areas. M1.01 area will be visited during other activities) at 8 hrs/day. The project team attending the site visit consisted of the Foster Wheeler Project Manager (PM), a Foster Wheeler Geophysicist, Foster Wheeler UXO Health & Safety (UXOSO), and a

Senior UXO Supervisor (SUXOS) provided by USA Environmental. Additional personnel attended the site visit at no cost to the Government.

Foster Wheeler's proposed effort includes three persons for three 8-hour days each (72 hours total). Additional effort in this task includes preparation of the Abbreviated SSHP, Project Manager coordination, and travel time.

Expenses include airfare, lodging, and car rental for personnel not already located in Anniston, as well as Meals and Incidental Expenses (M&IE), local mileage, and various materials and supplies. Subcontractor costs for USA Environmental (SUXOS) are also included.

Task 2. Preparation of Work Plans.

Foster Wheeler will prepare Site-specific Work Plans for Alpha and Bravo areas. The scope of work for this project includes the preparation of an EE/CA report for Parcel M1.01, but no Work Plan will be developed for that EE/CA since no field activities are planned for that site (the EE/CA for M1.01 will be prepared based on previously collected field data to be supplied to Foster Wheeler by USAESCH). The two Site-Specific Work Plans will be supplemented by the General Site-Wide Work Plan previously prepared by Foster Wheeler. These work plans will describe the policies, organization, health and safety activities, site characterization approach and methodologies, functional activities, environmental and cultural protection, and quality control (QC) procedures required to achieve the objectives for this task order. The Work Plans for the Alpha and Bravo areas will be prepared in accordance with the DIDs contained in the current contract. Each Plan will also include Conceptual Site Models developed for the specific areas. Foster Wheeler will consider technical requirements for site characterization as well as safety and security regulations during Work Plan development.

The proposed costs include efforts to prepare the Site Specific Work Plans in accordance with DID OE-001 and the General Site Wide Work Plan. For procedures that are applicable on a site-wide basis, the Site-Specific Work Plan will reference the General Site-Wide Work Plan already developed. The General Site-Wide Work Plan will be referenced with regard to subjects that are covered in that Plan. Work Plan costs include the preparation and submittal of a Draft and Final Work Plan, and response to comments provided by CEHNC, USEPA, and ADEM. The cost estimate assumes that one round of comments will be addressed for each Site-Specific Work Plan. No costs have been included to address general comments provided by USEPA on addition of new elements to the General Site-Wide Work Plan.

Due to the rapid turn-around time requested for delivery of the Work Plans, key contributors to the plans will travel to and work at Fort McClellan until the draft plan is complete. This will facilitate a rapid, coordinated effort to produce the plans, and provide a means to quickly resolve any issues that may arise during plan development. Each of the work plans will be prepared in an intensive week of coordinated activity at Fort McClellan. The draft document will be completed from the work of these intense weeks and then edited and submitted in accordance with the schedule in the scope of work.

Once comments are received, these will be incorporated by the planning team at their regular work locations, and submitted as the final work plan, with annotated resolution of comments to listed parties, as final work plans for approval and implementation.

Costs for each Work Plan include travel expenses, computer usage, telephone, fax, reproduction, shipping, and other miscellaneous items. Minimal subcontractor costs for USA Environmental to involve the key subcontractor in the planning process and to support the preparation of the UXO Operational Plans are also included. Only costs for including those elements required by the Scope of Work and the DID's are included in this estimate.

Task 3. Phase I Site Characterization.

The conceptual approach of the Phase I Site Characterization activities is based on Foster Wheeler's review of historical information and the field reconnaissance performed by Foster Wheeler at reported range sites throughout the facility during March and April 2000. Based on the records and field reconnaissance data, Foster Wheeler identified three sampling sectors within the Alpha area (not including M1.01 and M1.13) and ten sampling sectors within the Bravo area. Parcel M1.01 was divided into two sampling sectors, but those will not be utilized for sampling since field data has already been collected in Parcel M1.01. Details of the locations, acreage, and proposed number of grids in each sampling sector was presented in the "Reconnaissance Findings" report prepared by Foster Wheeler in August 2000. The sampling sectors contain varying concentrations of expected OE contamination (designated high, medium, or low), and distribution of OE within each sector is assumed to be homogeneous. Based on acreage and expected land use, the number of sampling grids within each sector necessary to delineate the magnitude and extent of OE contamination was determined.

Within the Alpha Area, FWENC will perform geophysical sampling over areas totaling 64.5 acres throughout the 876-acre investigation area contained within the three sampling sectors delineated. This is the minimum acreage that must be investigated without finding any energetic ordnance items in order to demonstrate with a 90% confidence level that a UXO density of 0.1 UXO/acre is not exceeded. This UXO target density was selected for the Redevelopment Area in anticipation of future use as commercial or industrial property. Geophysical data will be collected in 129 oversized grids, with ½-acre of geophysical data to be collected within each 1-acre grid. The oversized grid method reduces the amount of brush cutting necessary during geophysical data collection.

Within the Bravo Area, FWENC will perform geophysical sampling over areas totaling up to 161 acres throughout the 3,485-acre investigation area contained within the ten sampling sectors delineated. For sectors expected to contain low or medium OE density, this includes the minimum acreage that must be investigated without finding any energetic ordnance items in order to demonstrate with a 90% confidence level that a UXO density of 0.1 UXO/acre is not exceeded. For sectors expected to contain high OE density, this includes the acreage that must be investigated in order to demonstrate that greater than 5 UXO/acre is present.

Geophysical data will be collected using the grid method and the transect method. Using the grid method, 59 acres of data will be collected in 118 one-acre oversized grids, with ½-acre of geophysical data to be collected within each one-acre grid. Fourteen (14) acres of data will be collected in 56 one-half acre grids, with ¼-acre of geophysical data collected within each half-acre grid. Eighty-eight (88) acres of data will be collected using transects. Seventy and one-half (70.5) acres of geophysical data will be collected in areas of very steep terrain, and 17.5 acres of geophysical data will be collected using transects over and adjacent to areas suspected of containing "high" OE density in order to better define the extent of the high OE concentration.

GRIDS

The Phase I investigation approach provides an 80% randomly generated and 20% biased grid distribution to targeted areas in specific sectors.

The following general sequence of primary activities will be performed for each grid during this task:

- Grid point establishment by a surveying subcontractor with a UXO Escort (Grid point locations will be selected as part of the work plan development);
- Marking of the one-acre or half-acre oversized grid by the Foster Wheeler UXO Escort , and surveying of grid corners;
- UXO survey/surface sweep of the marked grid by Foster Wheeler UXO personnel;
- Brush clearance as necessary (in coordination with UXO surface sweep); and
- Geophysical data collection;
- Excavation of geophysical anomalies at selected "low density" grids.

Foster Wheeler proposes to use the USRADS navigational system in the wooded portions of Alpha and Bravo areas, and Differential Global Positioning System (DGPS), with post processing, navigation systems in sufficiently open areas. Within Alpha area, an estimated 76% of the total area to be sampled is considered heavily or moderately wooded based on field reconnaissance, and the remainder is open. Within Bravo area, 73% is considered heavily or moderately wooded, and the remaining area is considered open. The cost benefit of USRADS combined with the oversized grid method is that extensive vegetation removal is minimized. Using this technique, field crews can readily navigate through substantial parts of wooded areas without compromising the technical quality of geophysical data collection and subsequent target relocation during the intrusive phase. However, since it is anticipated that collection of geophysical data will occur mostly in the winter when leaf cover is at a minimum, DGPS may be used where possible, provided data quality is not compromised.

Foster Wheeler will obtain the services of an Alabama licensed professional land surveyor to provide services in accordance with DID OE-FMC-005-07. Surveying will include establishment of grid location points and surveying of grid corners in a single mobilization. Since the oversize grid method is being used, grid corners will be established during surveying activities by a UXO III escort who is familiar with the

operation and limitations of both the USRADS and EM-61 systems (so that vegetation cover can be assessed and minimum vegetation can be removed). This eliminates the necessity of a second surveyor mobilization following data collection.

Following grid location point and grid corner establishment, UXO teams will perform a visual surface sweep on each grid, aided with magnetometers, to assure the safety of the geophysical field personnel as well as reduce cultural interference in the geophysical data. Any ordnance recovered during this effort will be disposed of in accordance with the UXO Operational Plan. Surface OE clearance will be accomplished by one sweep team in the Alpha Area and two sweep teams in the Bravo Area. Each team will consist of a UXO escort and four OSHA 40-hour trained UXO Sweep Personnel. It is estimated that each sweep team will clear an average of 6 grids per day. Where necessary, brush cutting will be performed to clear surface vegetation prior to geophysical data collection.

The geophysical investigation crews will be using time-domain electromagnetic induction (TDEMI) for the geophysical mapping of grids within the Alpha and Bravo areas. The Geonics EM-61 man-portable system TDEMI will be used in conjunction with USRADS or DGPS navigation, depending on vegetation cover. A three-person geophysical crew (UXO Technician III and two UXO Technician IIs) is capable of achieving an average production rate of 1.75 grids per 10-hour day in heavily or moderately wooded areas. This rate includes daily startup (1 hour), travel to the grid (0.5 hours), setting up and dismantling the USRADS at each grid (approximately 1.5 hours), data collection and initial processing and screening of geophysical data in the field (2 hours per grid), transit to the second grid (0.5 hours), transit to base and daily closeout procedures (1.0 hours). For each grid package, two hours are estimated for preprocessing, target selection, Level I UXO discrimination, and comparison with cultural features maps to discern if particular anomalies are related to background conditions. In addition to the field crew personnel described above, an USRADS field mechanic (UXO III), a senior geophysicist and a SUXOS will be deployed to supervise the three data collection crews. These personnel will serve to coordinate field crew activities and respond to any equipment problems encountered in the field, thereby reducing or eliminating down time during data collection.

In 10 per cent of the grids within Alpha and Bravo Areas where low OE density is expected (grids with 10 or fewer anomalies), field processing of geophysical data will be performed immediately following data collection. Anomalies will then be located and excavated by the field crew while the USRADS navigation system is still in place. This will allow data validation to be performed on these grids during Task 3, thus eliminating the need to remobilize an excavation crew to these grids at a later date. This approach will save the time needed for remobilization and performance of a second USRADS set-up at these grids. It is expected that this data validation will be conducted at 9 grids (4.5 acres, 450 anomalies) within the Alpha Area, and at 5 grids (2.5 acres, 250 anomalies) within the Bravo Area. Production rates during the data collection and validation at these areas are estimated to be 1.0 grid per day.

Utilizing three crews, geophysical data collection in the Alpha area is scheduled for approximately 30 workdays. Utilizing three crews, geophysical data collection in the grid portion of the larger Bravo area is scheduled for approximately 40 workdays.

The itemized Cost Proposal provides the labor distribution and itemized expenses associated with this task. A Foster Wheeler dedicated UXO Health & Safety Officer, as well as a UXO QC specialist, will be on site for the duration of the field activities. A portion of their time is allocated to oversight of this task.

The itemized Cost Proposal provides the labor distribution, itemized expenses, and subcontractor costs associated with this task.

TRANSECTS

Geophysical data will be collected over 88 acres in the Bravo Area using transects. In order to cover the required acreage, 220 miles of transects will be walked, collecting a 1-meter wide swath of geophysical data using a hand-held EM-61. The criteria used for this cost estimate are as follows:

- Each of the three teams will collect data over approximately 74 miles of transects.
- Each team will consist of two members that will navigate the transects and collect geophysical data. In transects within "low" OE density areas, as part of the Validation Task, two other members will follow, and will excavate the anomalies marked by the lead pair and others selected from analysis of the data.
- In "low" density areas (176 miles), each team will cover 4 transect miles per 10-hour workday.
- In "high" density areas (44 miles), each team will cover 2 transect miles per 10-hour workday.
- DGPS will be used to record the position of transects and excavated anomalies.

A Foster Wheeler dedicated UXO Health & Safety Officer, as well as a UXO QC specialist, will be on site for the duration of the field activities. A portion of their time is allocated to oversight of this task.

The above durations take into account work days lost due to rain. Work delays caused by rain, as described in the introductory paragraphs of this document, are included in the cost estimate for this task.

Task 4. Data Analysis and Validation.

During and immediately following the Phase I Site Characterization field effort for each of the two areas, Alpha and Bravo, Foster Wheeler geophysicists will perform post-processing and data analysis on the geophysical data collected.

In order to achieve geophysical data validation, a subset of the anomalies targeted during the Level I UXO discrimination phase will be selected for UXO intrusive action at each site. Data validation in this task will address grids where medium or high OE density is expected, since data validation for low-density grids was performed in Task 3. Anomalies will be re-acquired by Foster Wheeler personnel using USRADS and hand-held EM-61 units. Each re-acquisition team will consist of a UXO III and two UXO IIs. A SUXOS and a UXO III USRADS mechanic will also be deployed to coordinate field crew activities and respond to equipment problems. The production rate of the re-

acquisition team is estimated to be 100 anomalies per 10-hour workday. Fifty per cent of the expected high density grids, and ten per cent of the expected medium density grids will be intrusively investigated in this effort. It is assumed that 100 anomalies per acre will be excavated. In the Alpha Area, anomalies within 5 medium density grids (2.5 acres, 250 anomalies) will be intrusively sampled by USA Environmental excavation crews. In the Bravo Area, anomalies within 28 high density grids (7 acres, 700 anomalies) and 8 medium density grids (4 acres, 400 anomalies) will be intrusively sampled by USA Environmental. These are in addition to the grids intrusively sampled in Task 3.

In addition, 176 miles (70.5 acres) of transects will be intrusively investigated. In the areas covered by the transect approach, an alternate intrusive investigation approach will be used. In areas where few anomalies (less than one per 100 feet) are found, all anomalies detected by the geophysical team will be marked for investigation. In areas containing more than 1 anomaly per 100 feet, up to three strong anomalies will be marked for investigation. In addition, other anomalies, selected from the geophysical data will be investigated to validate the approach. For the purposes of this cost estimation, it is assumed that the production rate for sampling transects will be the same as the production rate for geopysical data collection in the transects (4 miles/day/team). Information obtained from the validation phase will be used to refine and calibrate the UXO discrimination process. Validation sampling will be performed at both Alpha and Bravo areas by USA Environmental with both a Site Safety and a Quality Control (QC) representative provided by Foster Wheeler on a part time basis.

It is anticipated that a predominant portion of the validation sampling will be conducted in the heavily and moderately wooded areas, therefore hours are included for the use of the USRADS navigational systems. Any OE encountered during the validation process will be blown in place or removed and transported (if declared safe to move) to a designated storage area for disposal by the dedicated UXO disposal team prior to demobilization. Foster Wheeler assumes that fire suppression equipment that may be necessary during planned UXO detonations will be supplied by Fort McClellan Transition personnel.

During the geophysical data analysis process, Foster Wheeler will employ the use of innovative proprietary software developed for analysis of the Geonics EM-61 TDEMI data. Foster Wheeler's proprietary program (WAVE) is an automated target-selection routine, which quickly and efficiently selects TDEMI anomalies generated by subsurface metallic bodies. The program generates a numbered list of subsurface targets and locations, along with depth and size estimates for each target.

A Foster Wheeler dedicated UXO Health & Safety Officer, as well as a UXO QC specialist, will be on site for the duration of the field activities. A portion of their time is allocated to oversight of this task.

The above assumptions take into account work days lost due to rain. Work delays caused by rain, as described in the introductory paragraphs of this document, are included in the cost estimate for this task.

Task 5. (OPTION 1) Phase II Site Characterization.

For the purpose of estimating costs for this task, it is assumed that intrusive investigation will be conducted in additional grids within the Alpha and Bravo Areas as follows:

An additional 20 per cent of the remaining unsampled grids will be intrusively sampled. Within the Alpha area, 17 additional low density grids and 10 additional medium density grids will be sampled. At an assumed 10 anomalies per low density grid and 50 anomalies per medium density grid, 670 total additional anomalies will be excavated in the Alpha area.

Within the Bravo area, 9 additional low density grids and 15 additional medium density grids will be sampled. Again, at an assumed 10 anomalies per low density grid and 50 anomalies per medium density grid, 840 total additional anomalies will be excavated in the Bravo area.

As part of the intrusive site characterization task, the USRADS navigational system will be redeployed in wooded areas to relocate targeted anomalies with a high degree of precision. Therefore, costs within this task include two USRADS systems with a three-person team. Once the anomalies are relocated, the UXO intrusive team will enter the grid and commence characterization activities while the USRADS team moves on a second location. The USRADS team will be comprised of UXO qualified personnel so that no UXO escort will be required.

Intrusive sampling characterization for the Alpha and Bravo areas will be performed by USA Environmental using a six UXO specialist excavation team with a UXO supervisor. Up to 670 anomalies will be excavated in the Alpha area, and up to 840 anomalies will be excavated in the Bravo area (removing 50 anomalies per grid in medium grids and 10 anomalies per grid in low grids). This represents an additional 20 per cent of the total grids. Also, included in this estimate is demolition of 5 OE per acre (or 5 for every two grids). Foster Wheeler assumes that fire suppression equipment that may be necessary during planned UXO detonations will be supplied by Fort McClellan Transition personnel.

As part of the Phase II Site Characterization task, QC activities will be performed to ensure that the targeted anomalies are recovered or determined to exist below the 4-foot limit of excavation. Foster Wheeler's dedicated QC representative will compare the UXO dig sheets against geophysical size and depth estimates to verify comparability. In addition, the QC representative will resurvey a representative number of excavations following completion to verify removal of targets.

A Foster Wheeler dedicated UXO Health & Safety Officer, as well as a UXO QC specialist, will be on site for the duration of the field activities. A portion of their time is allocated to oversight of this task.

The itemized Cost Proposal contains a detailed cost breakdown including Foster Wheeler's level of effort, itemized expenses, and subcontractor costs.

The above assumptions take into account work days lost due to rain. Work delays caused by rain, as described in the introductory paragraphs of this document, are included in the cost estimate for this task.

Task 6. Data Management.

Foster Wheeler's Data Management activities will continue with this task order modification in order to maximize the cost and technical advantages of information technology. Upon the start of this phase of the project, Foster Wheeler will incorporate data collected by Foster Wheeler. Pertinent information available on diskettes or CD-ROM will be incorporated into the site GIS system.

Foster Wheeler will take the GIS data, manual, file, and database structure from the CEHNC OE-GIS standard and apply it during performance of the Alpha, Bravo, and M1.01 EE/CA activities. Site specific GIS will be assembled and used to compile and analyze the digital geophysical and UXO data collected at these three areas and incorporate it into the GIS.

The geophysical mapping will digitally capture the instrument readings into a file coincident with the state grid coordinates/or equivalent. Navigation and instrument position will be based on established grid corners and permanent monuments. Geophysical data will be checked to assure positional accuracy, proper instrument calibration and for the initial threshold analysis. The location in State Grid Plane coordinates and the instrument response and anomaly code(s) will be provided in an Excel spreadsheet. The excavated anomalies will be identified on these digital map files and tabulated into the Excel spreadsheet. The results of the excavations will be added to the spreadsheet to include all pertinent features of the anomaly to include items such as type, condition, actual location, depth, size, mass and any other information that would significantly assist in classifying the geophysical anomaly. A subset of the master anomaly spreadsheet will be created to show the selected anomalies and pertinent features.

Foster Wheeler's GIS will be utilized in all project phases: planning, site characterization, and reporting. During the planning phases, the GIS will assist Foster Wheeler's engineers and scientists in selecting the biased portion of grids (approximately 20% of Phase I Site Characterization grids. The GIS will be used as an aid in developing conceptual site models of OE contamination in Alpha and Bravo areas.

Included in this task are the costs to integrate all newly-collected data and pertinent data provided by others into the GIS data base in a format for production of maps and figures for the Work Plans and Reports. The Cost Proposal presents an itemized breakdown of Foster Wheeler's level of effort and expenses.

Task 7. Prepare EE/CA Reports.

The estimate for this task includes effort to prepare nine submittals: Draft EE/CA, Draft-Final EE/CA, and Final EE/CA, for each of the three areas: Alpha, Bravo, and M1.01. The EE/CAs will detail the fieldwork, as well as evaluate and recommend appropriate risk reduction alternatives for each area. Foster Wheeler will use the March 2000 Draft of the Interim Range Rule Risk Methodology to make an evaluation of the risk that the

site represents to human health and the environment. During this task, Foster Wheeler will identify and analyze risk reduction and removal action alternatives.

A full range of alternative plans to address project objectives will be developed in each of the three EE/CA Reports. Screening of alternatives will produce a manageable set of plans that address the concerns of the community, regulators, and the Department of Defense (DoD). Alternatives evaluated will be distinct, feasible and fully developed. All plans included in the Draft Reports will be developed to the same level of detail. Unfeasible alternatives will be discarded during the screening process. A minimum of five alternatives will be developed: one alternative will emphasize the basic strategy of access control; one alternative will emphasize the basic strategy of physical OE removal; one alternative will emphasize the basic strategy of behavior modification; one alternative will combine all strategies; and one alternative will be no action. Several alternatives that address a single strategy may be developed if there are significant differences in performance with respect to selection criteria and it is pertinent to the decision process. Only the best unique strategies will be combined. For the M1.01 area, the alternatives will be presented so as to reflect the fact that a removal action has already occurred in a portion of the parcel.

An Institutional Analysis Report (IAR) will be prepared and presented as an Appendix to each EE/CA Report. The objective of the IAR is to document which government agencies have jurisdiction (i.e., exercise control through regulatory endorsement, professional advice, federal support of lending institutions, etc.) over OE contaminated lands and to assess their capability and willingness to assert control which could protect the public at large from explosive hazards. Institutional Control Alternatives will be based on the opportunities to satisfy project objectives discovered while executing institutional analysis.

Access control alternatives will formulate plans based on concepts such as: direct intervention (e.g., fencing and other barriers) combined with trespass law enforcement; land use restrictions (e.g., zoning laws and enforcement); regulatory control (e.g., permit application, review, or approval of development plans); and passive measures (e.g., dedication of property to appropriate land uses). Behavior modification alternatives will formulate plans based on concepts such as: notification of real estate defect; notices attached to building and/or construction permits; and training clinics, etc. These alternatives will be completely formulated. All management, execution, and support roles will be identified and costs will be estimated.

The effort for preparation of the EE/CA submittals includes labor for preparation of the Engineering, Geology/Geophysics, UXO, GIS, and Regulatory Compliance sections of each of the three EE/CAs, and technical editing support to prepare and revise, as necessary, each submittal. Additionally included is the effort to prepare responses to CEHNC and agency comments. The estimated effort for response to comments assumes that one round of consolidated comments from all reviewers will be addressed for each of the Draft EE/CAs, and one round of comments will be addressed for each of the Draft-Final EE/CAs.

Task 8- Prepare Action Memorandum.

The estimate for this task includes the effort to review public comments, provided by the Contracting Officer, on the each of the three EE/CAs and prepare Action Memoranda detailing the selected risk reduction alternative method(s) for the Alpha, Bravo, and M1.01 areas at Fort McClellan. The estimated labor for preparation of each submission includes effort for personnel specializing in Engineering, Regulatory Compliance, GIS, and UXO Operations. Expenses for each submission include computer usage time, and miscellaneous expenses for photocopies, telephone/fax usage, and miscellaneous supplies.

Task 9- Meetings, Public Affairs.

Key project personnel will attend and participate in nine meetings with the DoD, regulatory, and civilian agencies as directed by the Contracting Officer (CO). Each meeting will last one day and will be held at Fort McClellan. In addition, Foster Wheeler will assist the USAESCH Public Affairs Officer (PAO) and the USACE, Mobile District PAO in preparing for and implementing a Public Affairs program for the Fort McClellan site. Foster Wheeler will support these activities at public meetings and Restoration Advisory Board (RAB) meetings.

The estimate for this task includes the effort as follows:

- Project Manager- 9 meeting,
- Senior UXO Supervisor -9 meetings,
- Civil Engineer - 9 meetings,
- Lead Geophysicist – 3 meetings,
- Lead Risk Assessor – 3 meetings.

Additional effort is provided for the Community Relations Specialist to coordinate with the USAESCH and USACE, Mobile District Public Affairs Office and prepare meeting minutes. Foster Wheeler will also prepare a Public Affairs Plan as part of this task. Expenses for this task include travel, M&IE, car rental, reproduction of meeting materials, and miscellaneous expenses.

6.0 Site Characterization Planning and Operations

This information is discussed in Section 5.5 of the approved General Site Wide Work Plan.

6.1 Site Characterization Goals

The goal of the site characterization effort is to obtain sufficient geophysical and intrusive data to characterize the Alpha Area of Fort McClellan with regard to the location, extent, density, and types of UXO/OE present at the site. This characterization must provide sufficient quantity and quality of data to perform a risk assessment, remedial alternatives evaluation, and to develop cost estimates for remedial alternatives which can be feasibly implemented at this site.

6.2 Site Characterization Procedural Overview

Section 4.0 of this document details the approach to be taken during the EE/CA activities. The procedures that Foster Wheeler will follow in performing the individual work elements are described in Sections 6.6, 6.7, and 7 of this Work Plan.

6.3 OE Sampling Locations

As described in Section 2.5 of this document, OE sampling sectors were defined at Fort McClellan based on historical information and site reconnaissance. This process is described in detail in *Reconnaissance Findings, Conceptual Plan, and Proposed Scope of Work*, prepared by Foster Wheeler Environmental and included as Attachment 6-1 in this document. A statistical analysis was performed to determine the sampling acreage necessary to characterize each sector, and the number of sampling grids necessary to obtain sufficient data was determined. The sampling quantity was based on performing enough investigation to be able to show that a relatively low OE/UXO density (i.e., 0.1.acre) is or is not present with relatively high confidence (i.e., 90 %). One-half acre of data will be collected within each one-acre sampling grid, as discussed in paragraph 6.6.2.1.1. For the Alpha Area, the number of one-acre grids required for each sampling sector is as follows:

- Sector M5-1L: 44 grids (22 acres)
- Sector M6-1L: 39 grids (19.5 acres)
- Sector M6-1M: 46 grids (23 acres)

Total 129 grids (64.5 acres)

6.3.1 Within each sector 80 per cent of the grid locations were chosen at random and 20 per cent of the grid locations were chosen at the discretion of Foster Wheeler Environmental. The discretionary grids were located to clarify or confirm the findings of prior reconnaissance work or indications from the historical record. Figures 6-1 through 6-3 show the locations of sampling grids to be utilized in the three sectors contained within the Alpha Area.

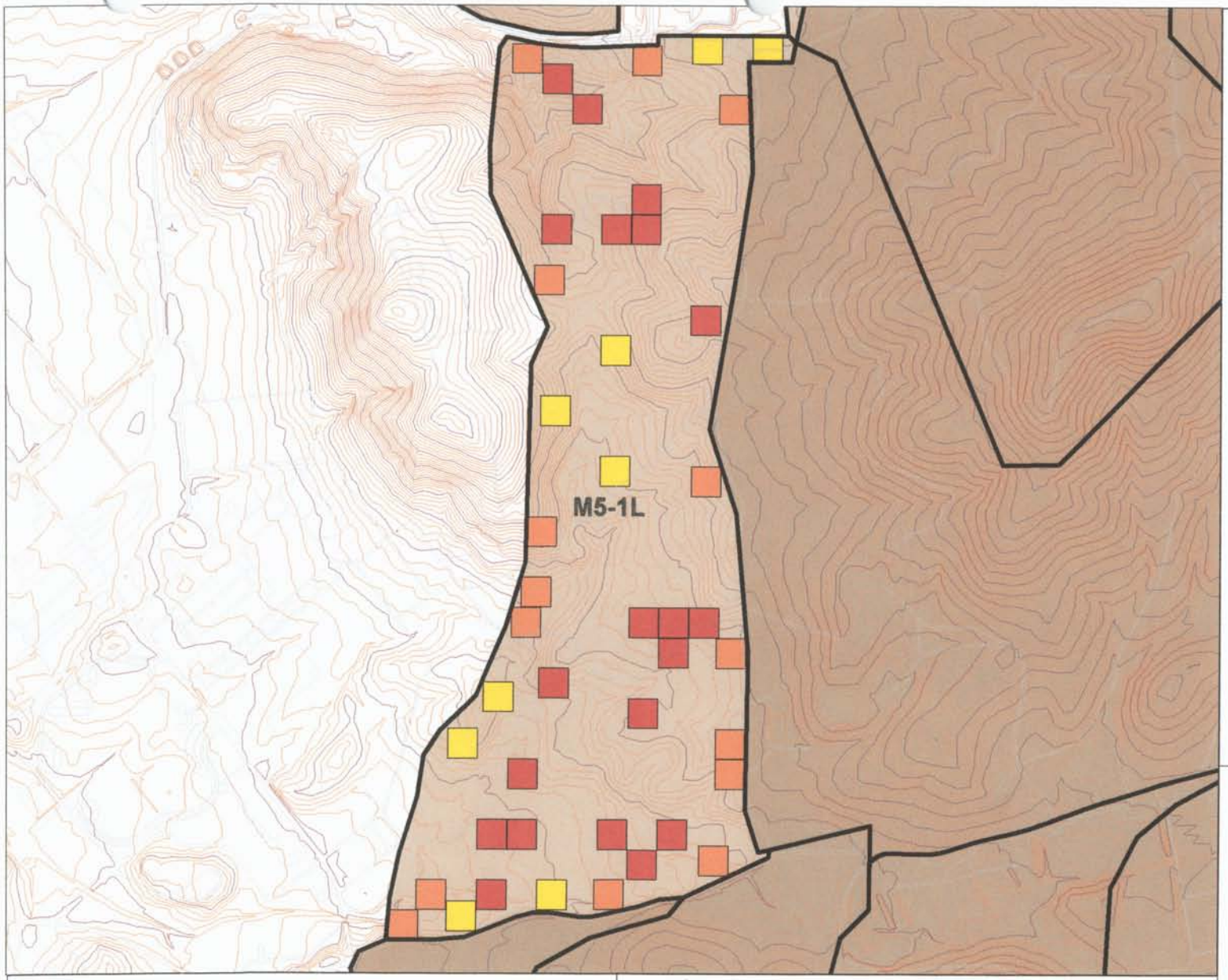
6.3.2 The selection of random points used in the EE/CA exercise was completed with the use of a random number generator and GIS tools. First, a controlled number of locations were derived through the establishment of a uniform network of one-acre polygons. Each of the polygons was then assigned an identification number and tagged. Attribution, including externally generated random numbers, was added to the tagged polygons. Once the number of polygons was derived, the same number of random numbers was generated and a lookup table was made. Once the number of samples required for a particular sector was obtained, the table was sorted by random number occurrence and the prescribed number of polygons was selected from the sorted list. From the random samples, a center point has been established from which coordinates have been generated which will be used for surveying in the polygon, or sampling grid, locations. Randomly selected grids that fell partially outside of the sampling sector were shifted the minimum distance necessary to bring them within the sector boundary.

6.3.3 The 20 per cent of grid locations chosen by Foster Wheeler Environmental were positioned with bias based on the criteria listed here. Grids were placed: 1) In areas where ordnance were found during field reconnaissance; 2) In areas where known range fans or suspect training areas were historically located; 3) Along topographic features which may have served as a backstop for firing of artillery; 4) In areas along sector boundaries to determine if those boundaries between probable areas of differing OE density are appropriately located, and; 5) To fill in larger gaps in coverage where no randomly selected grids happened to fall.

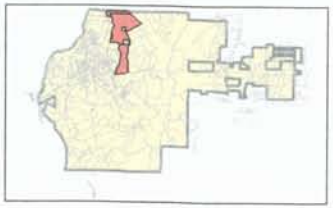
6.3.4 The actual final grid locations and orientations will differ slightly from those depicted in this Work Plan. The final grid location and orientation will be determined at the time the grids are surveyed in the field by a UXO Technician III familiar with USRADS operation. Grids will be positioned around the center points of the locations depicted in Figures 6-1 through 6-3, but grid boundaries will be adjusted slightly to encompass the areas of least vegetative cover in order to minimize the brush cutting required prior to data collection in a given grid.

6.4 OE Sampling Procedures

Descriptions of the procedures used during the intrusive sampling activities in the Alpha Area are presented in Section 7.1.2 of this Work Plan.



Fort McClellan
Alabama



N
W
E
S

Figure 6-1

Alpha Area EE/CA Sector

M5-1L

Fort McClellan
Calhoun County
Alabama

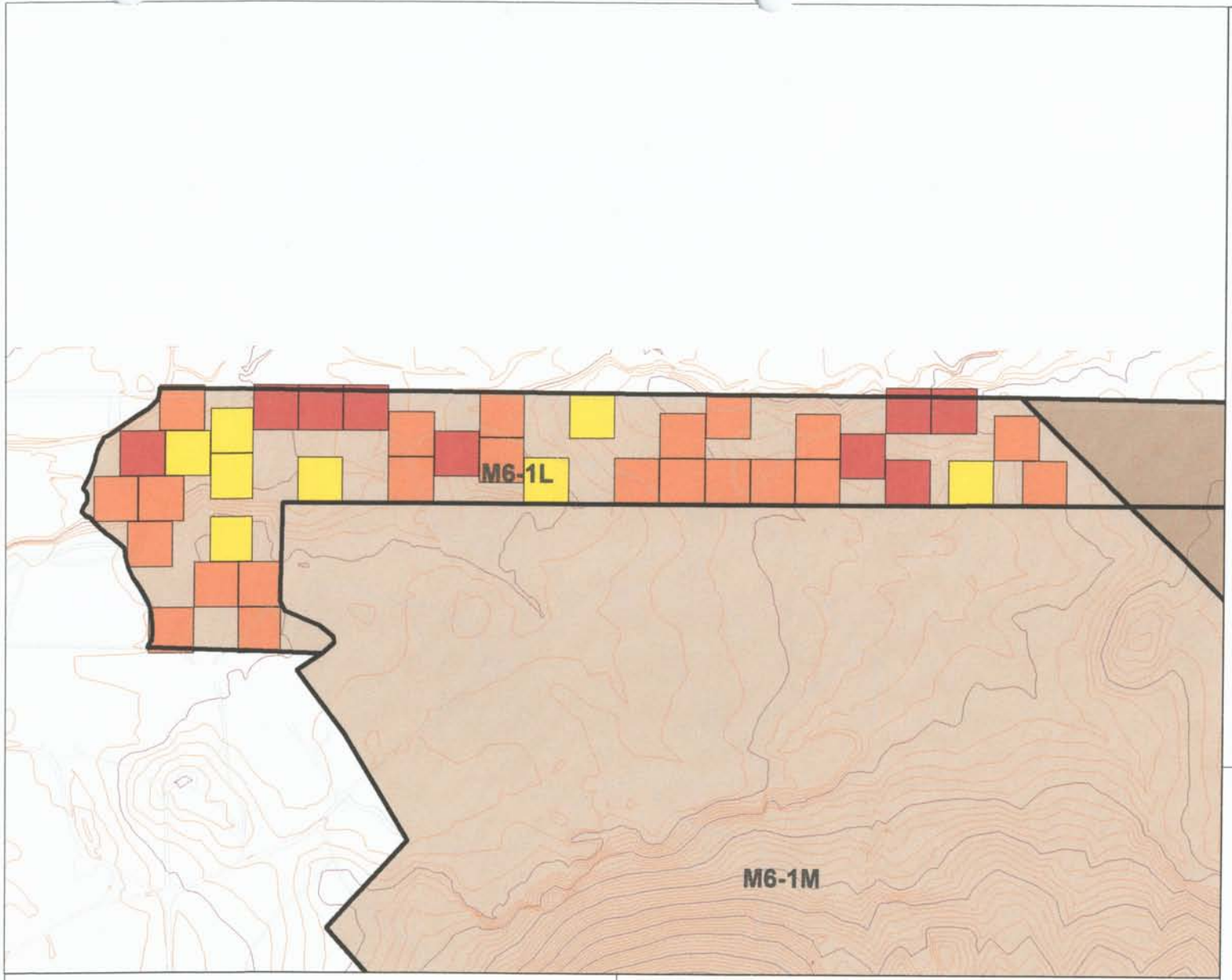
12 Feb 2001

FOSTER WHEELER ENVIRONMENTAL CORPORATION

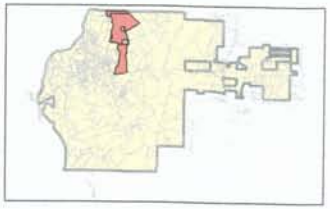
HU:DCR

0 300 600 900 1200 1500 ft

Locations of 1 acre Grids
Random Grids
Discretionary Grids
Shifted Random Grids



Fort McClellan
Alabama



N
W
E
S

FOSTER WHEELER ENVIRONMENTAL CORPORATION

HU:DCR

0 250 500 750 1000 1250 ft

Locations of 1 acre Grids
Random Grids
Discretionary Grids
Shifted Random Grids

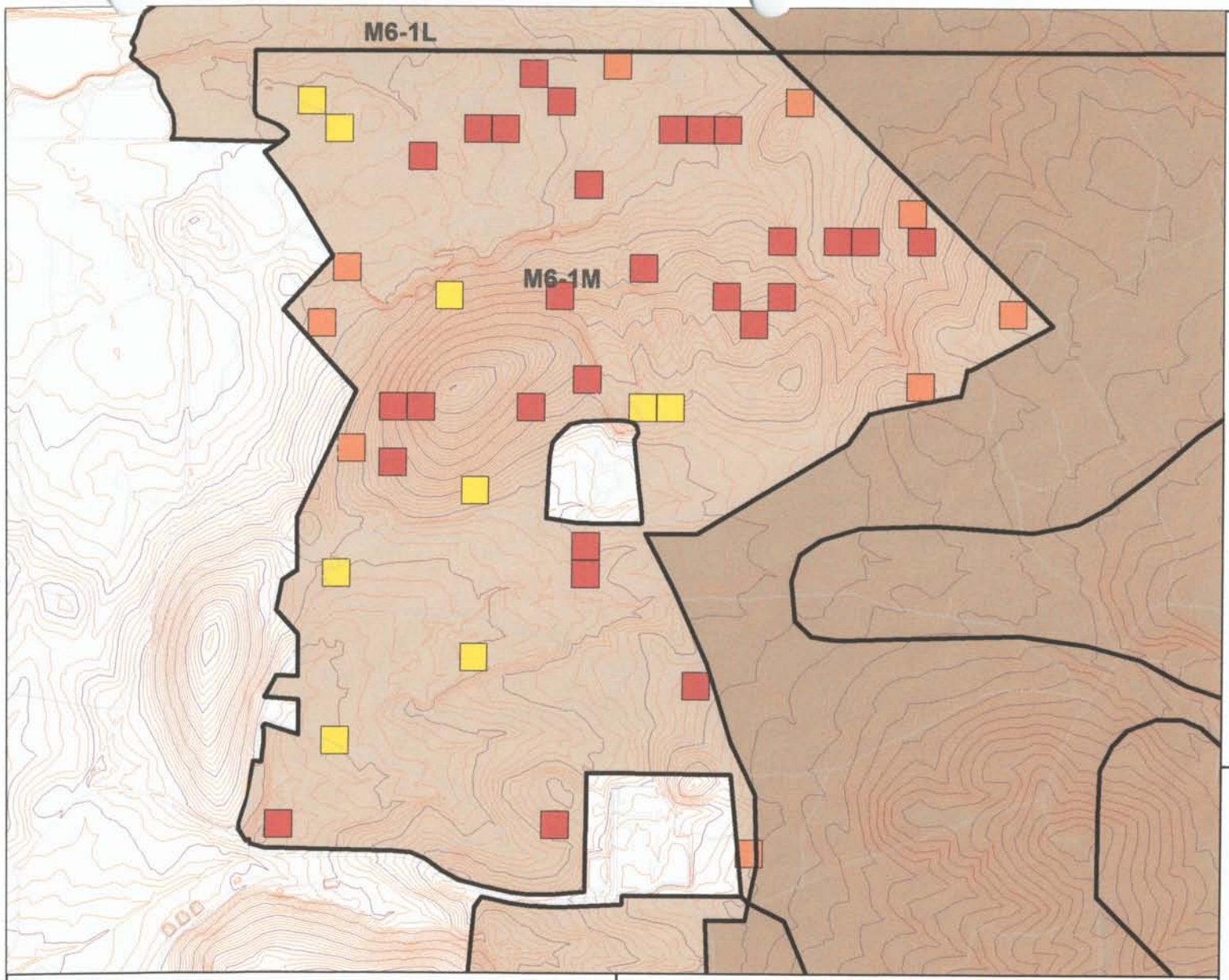
Figure 6-2

Alpha Area EE/CA Sector

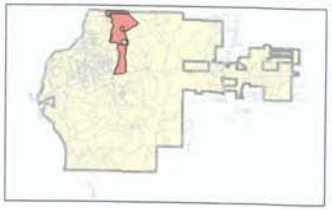
M6-1L

Fort McClellan
Calhoun County
Alabama

12 Feb 2001



Fort McClellan
Alabama



N
W
E
S

FOSTER WHEELER ENVIRONMENTAL CORPORATION

HU:DCR

0 400 800 1200 1600 2000 ft

Locations of 1 acre Grids
Random Grids
Discretionary Grids
Shifted Random Grids

Figure 6-3

Alpha Area EE/CA Sector

M6-1M

Fort McClellan
Calhoun County
Alabama

12 Feb 2001

6.5 SURVEYING AND SITE LAY OUT AND CONTROL

6.5.1 Surveying and navigational control are discussed in Sections 5 and 7 of the approved General Site Wide Work Plan.

6.5.2 Using the method described in sections 6.2.2 and 6.2.3 of this plan, a listing of the coordinates for grid location points ('center points') will be generated and provided to the surveyors. The surveyors will mobilize to the field, accompanied by a UXO Technician III familiar with USRADS operation, to begin placement of grids. Once the location point for a given grid has been marked in the field, the UXO Technician III will assess the vegetation within an approximate 200-foot radius around that point to determine the area with the least ground vegetation. The UXO Technician III will then direct the surveyors to place the four grid corner points, defining a one-acre grid which encompasses both the original grid location point and the area of least vegetation in the vicinity of the point.

6.5.3 Descriptions of Site Access and Control, the Field Office/Command Post, Traffic Control/Parking, and Communications have been provided in Section 3.11 of this document.

6.6 GEOPHYSICAL INVESTIGATION PLAN

6.6.1 Pre-Survey Surface Inspection and Sweep (UXO Safety). This information is reviewed in Section 5.01 of the approved General Site Wide Work Plan.

6.6.1.1 Personnel Qualifications

All geophysical investigations shall be supervised by a geophysicist meeting the qualification requirements listed in DID OE-025. During the geophysical investigation of the Alpha Area, a geophysicist will be on-site during data acquisition operations.

6.6.2 Site Description (provided in Section 2)

6.6.2.1 Geophysical Investigation Program Objectives

6.6.2.1.1 A geophysical survey will be performed over a minimum of 64.5 acres using 129 grids in the Alpha portion of the Redevelopment Area of Ft. McClellan, AL. The

oversized grid method of data collection will be utilized, with ½-acre of geophysical data to be collected within each of the 129 one-acre grids. The oversized grid method reduces the amount of brush cutting necessary during geophysical data collection. The objective of the geophysical investigation is to detect metallic objects and features (anomalies) equal to or larger than the size of a hand grenade or 37mm projectile that might be related to potential UXO contamination. These anomalies may represent a hazard for future activities planned for the site.

6.6.2.1.2 Based on the prove-out test performed in the summer of 1999, it is anticipated that the primary geophysical sensor technology that will be used to meet the program objectives is time domain electromagnetics (TDEM). Due to the dense and tall vegetation within the survey area, the most appropriate positioning technology to use to accurately locate the geophysical sensor systems will be the Ultrasonic Ranging and Data System (USRADS). The geophysical sampling methodology that will be employed is two-dimensional grids (i.e., closely spaced parallel transects). This sampling methodology will be applied over contiguous areas ranging in size from approximately 0.5 acres to one acre in size.

6.6.2.2 Area of Investigation

The Alpha Area is composed of three sampling sectors totaling 876 acres. The area is heavily vegetated, sloping terrain extending from the northern boundary of Ft. McClellan near Reilly Airfield and Anniston Beach south to Bains Gap Road. Only 811 of the 876 acres will be assessed during this investigation using geophysical data collected over 64.5 acres. The 65 acres not assessed include the Chemical Decontamination Training Facility (CDTF), other structures, parking areas, and several other facilities. The CDTF has been transferred to another federal agency and will not be addressed by this document. It is anticipated that because of the high level of human activity historically associated with these facilities there is a low likelihood that they were used as impact areas.

6.6.2.2.1 The M5-1L Sector is 249 acres in size, of which 22 acres will be sampled during the geophysical program. The M6-1L Sector encompasses a total of 64 acres, 19.5 of which will be sampled during the geophysical program and used to assess the entire parcel. The M6-1M Sector is 563 acres in size. 498 of these acres will be assessed using the geophysical data acquired over 23 acres. Previous reconnaissance activities in these parcels by Foster Wheeler Environmental personnel have indicated a low to medium probability of OE presence in these areas. The types of ordnance that may be present in the Alpha Area are addressed in the Conceptual Site Models presented in Section 6.7 of this work plan, as well as in Table 3.1, which summarizes explosive types potentially located in the Alpha Area and vicinity.

6.6.2.3 Past, current and Projected Future Use

6.6.2.3.1 M6-1L Sector

Previous investigations conducted in and around Sector M6-1L did not indicate the presence of historical impact areas. Reilly Airfield is adjacent and located to the west of the parcel and was used as an active training area from post WWII until base closure. The airfield was used to demonstrate evasive driving, helicopter operations, and radiological surveys. The POW Compound is located to the south of the parcel and was used to demonstrate the handling of enemy prisoners of war. Currently the land is abandoned and not in use by any agency or group. Future use of the parcel is anticipated as commercial or industrial property.

6.6.2.3.2 M6-1M Sector

Investigations in and around M6-1M and surrounding areas indicate that it was primarily used as a training area. Training Area 16C is located in the southwest section of the parcel. When active, the training area was known as the U.S. Marine Corp (USMC) Nuclear, Biological, and Chemical (NBC) Defense Training Area. Currently the land is abandoned and not in use by any agency or group. Future use of the parcel is anticipated as commercial or industrial property.

6.6.2.3.3 M5-1L Sector

Previous investigations in and around Sector M5-1L indicate that it was used primarily as a training area. The Obstacle Course (1996)/ Bayonet Assault (1996) Training Area 8 is included within the sector boundary. This training area was used to complete training in the use of a bayonet and as an obstacle course for troops. Currently the land is abandoned and not in use by any agency or group. Future use of the parcel is anticipated as commercial or industrial property.

6.6.2.4 Anticipated UXO Type, Composition, and Quantity

The types of ordnance that may be present in Alpha Area are addressed in the Conceptual Site Models presented in Section 6.7 of this work plan, as well as in Table 3.1, which summarizes explosive types potentially located in the Alpha Area and vicinity.

6.6.2.5 Anticipated Depth of UXO

The limit of the depth of investigation for this scope of work is four feet, though it is anticipated that most of the ordnance items found will be significantly shallower than four feet. This statement is based on expected ordnance types from historical data in the ASR. Foster Wheeler Environmental's methodology was developed for this task based on the U.S. Army Corps of Engineers' Publication EM 1110-1-4009 Ordnance and Explosives Response Engineer Manual, which covers typical detection depths of ordnance items using various geophysical instruments. In addition, a geophysical prove-out test was performed in the summer of 1999. The purpose was to demonstrate that the geophysical sensor technology, time domain electromagnetics, to be used at Ft. McClellan will detect the suspected ordnance types under the specific conditions encountered at the site. The prove-out also demonstrated that the time domain electromagnetic detection to be performed with the EM-61 will meet the minimum requirements of the publication cited above.

6.6.2.6 Topography

6.6.2.6.1 Sector M6-1L is roughly rectangular in shape and trends east-west. It is a narrow sliver of land approximately 0.75 miles in length by 0.12 mi. in width whose western boundary abuts Reilly Airfield, and northern boundary is the Ft. McClellan property boundary. The eastern boundary includes a section of the POW Compound Training Area. The topographic gradient within the parcel gently increases to the east.

6.6.2.6.2 Sector M6-1M is asymmetrical in shape and includes the POW Compound Training Area to the northeast and the CDTF to the southeast. The topographic gradient of the sector gently increases to the east. The area is characterized by a relatively significant hill in the northwest of the parcel. The parcel is just east of Cemetery Hill and former Training Area 16C was located along its southwestern boundary.

6.6.2.6.3 Sector M5-1L is also approximately rectangular in shape, however it trends north-south. The parcel is a narrow section of land roughly 0.38 miles wide and 1 mile in length. It is located east of Reservoir Ridge and includes the former Obstacle Course (1996)/ Bayonet Assault Training Area 8 (1996). The sector has a topographic gradient that gently increases to the east.

6.6.2.7 Vegetation

This information is discussed in Section 5.3.7 of the FWENC General Site Wide Work Plan. Details of the expected vegetation cover in the Alpha Area are discussed in the

Reconnaissance Findings, Conceptual Plan, and Proposed Scope of Work for EE/CA Sampling, prepared by Foster Wheeler Environmental in August 2000 and included as Attachment 6-1 to this document.

6.6.2.8 Geologic Conditions

Fort McClellan is situated near the southern terminus of the Appalachian Mountain chain. All but the easternmost portion of the Main Post lie within the Valley and Ridge Province of the Appalachian Highlands. The portion of Fort McClellan east of Choccolocco Creek lies within the Piedmont Province. The age of the consolidated sedimentary and metamorphic rocks range from Precambrian to Pennsylvanian. On a large scale, most of the rocks have been intensely folded into an aggregate of northeast-southwest trending anticlines and synclines with associated thrust faults. The shallow geology in the area is characterized by colluvial deposits. Table 5-1 in the General Site Wide Work Plan summarizes the major stratigraphic units underlying Fort McClellan.

6.6.2.8.1 The presence of metamorphic rocks increases the potential for minerals such as magnetite and other associated magnetic minerals. If the presence of magnetic minerals are identified they will be noted during the surveying and/or data interpretation activities.

6.6.2.9 Soil Conditions

This information is reviewed in Section 5.3.9 of the approved General Site Wide Work Plan.

6.6.2.10 Shallow Groundwater Conditions

This information is discussed in Section 5.3.10 of the approved General Site Wide Work Plan.

6.6.2.11 Site Utilities

There are no known existing subsurface utilities in the areas that will be geophysically surveyed based on current information. However, if utilities are encountered during the initial surface sweep of the Alpha Area or detected during the geophysical investigation, they will be identified and their locations posted on the color-coded geophysical map of the area to ensure that intrusive activities occur in the safest manner possible.

6.6.2.12 Man-Made Features Potentially Affecting Geophysical Investigations

Man-made features such as above and below ground power lines, buildings/ foundations, storage tanks (above and below ground), fences, landfills/disposal areas, roads, and any other features that may influence the geophysical investigation will be documented and accompany the USRADS field data acquisition form with specific information on the location, extent, and nature of the feature.

6.6.2.13 Site-Specific Dynamic Events

This information is discussed in Section 5.3.13 of the approved General Site Wide Work Plan.

6.6.2.14 Overall Site Accessibility and Impediments

The Alpha Area of Fort McClellan contains numerous paved roads, unpaved improved roads, and dirt roads, as well as fire breaks and trails that will be used to access areas to collect data. However, since grid locations are randomly selected and may not fall near

roads or trails, it is anticipated that vegetation and terrain impediments will have to be overcome during field activities. Many of these conditions should be mitigated through the use of brush cutting activities and all terrain vehicles, but some grids will likely only be accessible on foot.

6.6.2.15 Potential Worker Hazards

This information is reviewed in the Site-Wide Plan, Section 5.5.16.

6.6.3 Geophysical Investigation Methods

6.6.3.1 Equipment

The EM-61 utilizes two coaxial receiver coils to measure the residual magnetic field generated by conductive and/or magnetic materials (i.e., non-ferrous and ferrous objects and features). The EM-61's employed by Foster Wheeler Environmental are designed to measure the residual magnetic field at a time when the response from conductive and/or magnetic objects is maximized compared to the response from most earth materials. The use of two receiver coils also makes it possible to differentiate, in a simplistic fashion, shallow versus deeper objects. An additional benefit of the specific design of the EM-61 system is that it permits a more focused observation of the subsurface in areas of cultural interference, as well as areas characterized by a high spatial density of medium to large-size (e.g., 81mm, 155mm) subsurface objects. This is due to both the mechanical design and operational parameters of the instrument, as well as the inherent nature of active EM fields, which diminish in magnitude at a much higher rate than other sensor technologies such as magnetometry.

6.6.3.1.1 The primary factors that affect the ability to detect objects or features with TDEM methods include volumetric size and orientation, distance from the sensor, the material properties contrast between the object or feature and the surrounding materials, and the magnitude of natural and manmade sources of "noise".

6.6.3.1.2 The EM-61 is relatively insensitive to nearby surface cultural interference such as buildings, power lines, and fences, and has the ability to record digital data at 0.10-second intervals (using USRADS recording system), which translates to a spatial sample density of approximately 0.25 to 0.75 feet along the ground surface.

6.6.3.2 Procedures

Each geophysical survey sampling grid will be cleared of vegetation and other natural materials that may impede the data acquisition process, or significantly alter the resultant quality of data from the geophysical survey. After vegetation removal, UXO personnel will perform a surface clearance of metal prior to geophysical data acquisition. After these activities are completed, the area will be surveyed with the EM-61 and georeferenced using the USRADS positioning system. Geophysical and position measurements will be digitally recorded and the raw data acquired in the field for each survey grid will be presented to the on-site data processing center at the end of each day's survey activities. These data will be processed, analyzed, and interpreted to prepare dig sheets for intrusive activities.

6.6.3.2.1 In order to survey densely wooded areas in the most efficient and cost-effective manner, portions of a one-acre site will be selectively cleared of vegetation and metallic items residing on the surface. Areas within the one-acre parcel that will be cleared will be those that require a minimum amount of time and use of ancillary equipment (e.g., chain saws, etc.). Priority for the removal of vegetation in the selected areas of the one-acre parcel will be based on the potential to degrade the quality of the geophysical data and/or adversely affect the safety of the geophysical equipment operators (e.g., tripping hazards). Metallic items located on the surface will also be removed by qualified UXO personnel prior to the commencement of geophysical data acquisition activities. Removal and disposition will conducted pursuant to the FWENC General Site Wide Work Plan.

6.6.3.2.2 Within the one-acre parcel that has been selectively cleared, the equivalent of 0.5 acres of geophysical data will be digitally collected using an EM-61 coupled to an USRADS positioning and data recording system. The data acquired may not be contiguous in all areas due to obstructions and other natural features that may adversely affect the data acquisition process. The proposed method of site vegetation removal, surface metal clearance, and geophysical survey permits the acquisition of the highest quality data to ensure the most accurate determination of the OE contamination, or lack thereof, in a specific area.

6.6.3.2.3 To effectively use the USRADS positioning and data recording system, a minimum of Three transponders will be located at positions with known coordinates (relative or absolute). The remaining transponders will be positioned over the area with a geometry that enables the instrument location to be accurately determined. A minimum of one location will be occupied with a transponder where the coordinates are known, however, this x-y coordinate will not be entered as a fixed (i.e., known) point in the USRADS acquisition software. Locations such as these will be used in the field as QC checks of the relative accuracy of the position coordinates. All transponders that are not

located at points with known coordinates will have their location marked with PVC pin flag for future reference. A portable computer located near each survey grid will be used to record the EM-61 instrument data and coordinate position information. The intensity of the EM-61 measurements will be closely monitored to ensure the EM-61 data recording system is functioning properly.

6.6.3.3 Personnel

The geophysical staff will consist of a Geophysical Task Manager (GTM) and two field geophysicists (FG). Three geophysical survey crews will be used to acquire data. Each acquisition team will consist of one experienced USRADS operator and two UXO personnel.

6.6.3.3.1 The GTM will work with the field geophysicists and Foster Wheeler Environmental PM to ensure the production rates are met and the data quality, especially during field data acquisition activities, is adequate to meet the program objectives. The GTM will be responsible for the overall quality of the geophysical program, and will provide guidance to the FG's in the processing and interpretation of the data. The FG's will process and interpret the geophysical data in conjuction with the GTM, as well as provide field QC oversight for the data acquisition and specific intrusive investigation processes (e.g., target reacquisition, comparison of excavation results with the interpreted geophysical characteristics). The data acquisition personnel will be responsible for collecting data and providing this data to the processing center on a daily basis. Due to the importance of maintaining an acceptable level of data quality for the geophysics portion of the investigative program, a more thorough description of the responsibilities of the FG's are reviewed below. The FG's are responsible for overall coordination of data acquisition, data processing, and technical review of geophysical and intrusive investigation data. The FG's work as an integrated team with the GTM and the PM to ensure the success of the geophysical phase of the project. The specific responsibilities of the FG's include the following:

- Scheduling field crew activities in concert with the Delivery Order Manager;
- Establishing and maintaining communications with data acquisition team personnel;
- Assisting the information systems manager with the maintenance of the data stream pertaining to the geophysical survey;
- Ensuring that all materials needed at the survey site are in stock (e.g., geophysical equipment, writing materials, tape, diskettes, CDROM, PVC pin flags, etc.);
- Planning the field data acquisition schedule for the next day with the Delivery Order Manager;
- Reporting survey production and level of quality information to the GTM on a bi-weekly basis;
- Performing weekly inspections of geophysical instrumentation;

- Creative thinking to improve the efficiency and/or quality of the data based on site-specific survey conditions;
- Processing and interpretation of the geophysical data;
- Comparison of the intrusive results with the characteristics of the geophysical data; and
- Transfer of the raw and positionally corrected data to CEHNC geophysical representative on a weekly basis.

6.6.3.3.2 The members of the data acquisition teams are responsible for the acquisition of geophysical data and will work in conjunction with the FG's. Their responsibilities include:

- Following the designed geophysical survey protocol in a consistent manner;
- Documenting pertinent information for each USRADS setup file (e.g., acquisition settings, data acquisition personnel for the EM61 backpack and coil, sources if interference, etc.);
- Transfer of data from the data recording devices to PCMCIA (or equivalent) media and delivery of the raw, uncorrected position and EM-61 data for each USRADS setup file for each grid (organized by date and grid hierarchy) to the processing center on a daily basis;
- Maintaining geophysical and related equipment and supplies in excellent condition; and
- Performing weekly inspections of position instrumentation.

6.6.3.4 Production Rates

The anticipated geophysical survey production rate for the Alpha Area is 1.75, 0.5 acre grids per day. Factors that may affect the production rate include excessive grade of topography, increased near-surface vegetation and tree density, accessibility (i.e., remoteness of site), site-specific "noise" (i.e., radio transmissions, large magnetic storms) and other dynamic events.

6.6.3.5 Data Resolution, or Line/Grid Width Requirements

This information is discussed in Section 5.4.5 of the FWENC General Site Wide Work Plan.

6.6.3.6 Data Density

This information is discussed in Section 5.4.6 of the FWENC General Site Wide Work Plan.

6.6.3.7 Data Processing

The Foster Wheeler Environmental FG's will perform preliminary geophysical and navigation data processing and Quality Control (QC) checks on a daily basis at the on-site processing center. The final analysis and interpretation of the data will also be performed at the on-site processing center and at a centralized processing center located at the Foster Wheeler Environmental Lakewood, Colorado office. Processing, QC, and analysis and interpretation of the data are performed with internally developed software that has been specifically produced to integrate and interpret digital geophysical data acquired with USRADS positioning systems. The specific parameters used to process the EM-61 and USRADS data may vary, however, the processing parameters and results are documented in digital computer files so that the sequence of events can be reconstructed and analyzed at a later date, if necessary. This level of documentation helps to ensure that the overall process is repeatable.

6.6.3.7.1 The Foster Wheeler Environmental computer workstation(s) at the on-site processing center will be used to store all finalized project data for the geophysical survey. Digital processing/interpretation portfolios will be maintained for the survey so that the processing/interpretation sequence can be reproduced at a future date, if necessary. The format of the digital geophysical data, as well as the graphics produced, will be compatible with the existing project database protocols (CEHNC ASCII ADF space delimited x,y,z file format, with appropriate header information). Foster Wheeler Environmental shall preserve the integrity of the raw, positionally corrected data and ensure that these data are provided to a CEHNC representative on a weekly basis.

6.6.3.7.2 The geophysical and position data supplied to CEHNC will allow for corrections such as navigation, and instrument bias shift but there will be no filtering or normalization of this data. All corrections to the data and pertinent field activities will be documented in a Microsoft Word file that will be delivered to CEHNC with the numerical data. Each grid of data shall be logically and sequentially named so that the file name can be easily correlated with the grid name used by other project personnel.

6.6.4 Location Surveying, Mapping and Navigation

This information is discussed in Section 5.5 of the FWENC General Site Wide Work Plan.

6.6.5 Instrument Standardization

This information is discussed in Section 5.6 of the approved General Site Wide Work Plan.

6.6.6 Data Processing, Correction, and Analysis

This information is discussed in Section 5.7 of the approved General Site Wide Work Plan.

6.6.7 Quantitative Interpretation and Dig Sheet Development

This information is discussed in Section 5.8 of the approved General Site Wide Work Plan. For this specific task, signal peaks recorded by the EM-61 that are separated by more than 3.5 ft will be selected as individual targets unless ancillary information (signal gradient, anomaly shape) suggest the anomaly is unique. Areas of increased target density will be identified on the dig sheets as "multiple targets probable" in order to assist excavation personnel to the highest degree possible.

6.6.8 Anomaly Reacquisition

Based on the site characteristics, it is anticipated that USRADS will be the primary method used to provide navigation assistance to relocate the x-y grid coordinates of interpreted targets. Based on some of the results from the 1999 Fort McClellan prove-out test, as well as testing conducted by Foster Wheeler Environmental personnel at the M1.01 Parcel in December 2000, the USRADS transponders will be positioned around and within the survey grid at the same x-y locations used during data acquisition. Small non-metallic markers (e.g., PVC pin flags) will be used to mark the location of all transponders during the data acquisition process so that this objective can be achieved. This procedure should ensure that anomalies selected for excavation can be reacquired within approximately 1 - 2 feet of their interpreted location.

6.6.8.1 Because of the relatively long time it takes to setup and initialize the USRADS positioning system, a robotic total station instrument will also be tested prior to or during the initial stages of the program in order to assess its effectiveness for target relocation. Based on the client's acceptance of the test results, the robotic total station may be used for target reacquisition in lieu of the USRADS. If the robotic total station is used, it will be positioned at one of the known coordinates (preferably the southwest

corner of the grid), and the relative grid north direction determined by occupying another known coordinate (preferably the northwest corner of the grid).

6.6.8.2 At this stage, an EM-61 (Hand-held mode) and/or Vallon VMX 2 will be used by FWENC UXO and/or the FG's to pinpoint the target location within approximately 20 cm. The interpreted target position will be marked on the ground surface with a boot mark or other simplistic method of identifying the interpreted location. Using the interpreted location as the origin of search, a 3.5 ft radius will be scanned with the reacquisition instrument. The reacquired location of the target will be flagged and a unique identification number written on the flag. This location will also be digitally stored or transcribed onto the reacquisition sheet in relative or absolute coordinates, not as an offset from the interpreted location.

6.6.8.3 Where there is an indication during reacquisition of multiple targets within a 3.5 ft radius of the interpreted location, or a positive instrument indication is not received, the interpreted location will be flagged and the pertinent information logged on the target reacquisition sheet (e.g., positive instrument response at x= 23, y= 57, ~ 4.5 ft SW of interpreted location, or multiple small hits ~ 5 ft N of interpreted location). The reacquisition information will be returned to the on-site processing center and stored in a separate folder for each grid. Reacquisition information will be reviewed by the FG's on a daily basis, and the GTM informed of interpreted locations that have been flagged, however reacquisition data indicate may not exist within a 3.5 ft radius of the flag. Foster Wheeler Environmental will also report any anomalies that could not be reacquired and the reason(s) for the occurrence.

6.6.8.4 A separate excavation team will return to the grid and excavate each flagged location. The excavation information will be digitally logged on a field computer and transferred to the on-site processing center on a daily basis. Any detectors used for additional search at or surrounding the flagged location and/or for hole clearance will be approved by the Foster Wheeler Environmental SUXO and FG's prior to use by the excavation team.

6.6.9 Feed-Back Process (Comparison of Dig-Sheet Predictions With Ground-Truth)

Intrusive investigation results will be constantly evaluated and compared against interpretation data to ensure that the interpretation is as repeatable and accurate as possible for the specific site conditions. Should intrusive results diverge significantly from interpretation data, CEHNC will be notified and a procedure implemented to evaluate the components of the relevant processes involved. This procedure will ensure that the disparity between the results is minimized for subsequent grids investigated in the Alpha Area. If necessary, geophysical investigation components will be evaluated

including data acquisition (coverage, density, quality, noise levels, positioning), data processing (merging of EM data and position data, filtering if necessary, background shifts), and data interpretation (anomaly analysis, computer calculations for locations, sizes, and depths). The procedures for target reacquisition will also be evaluated. Corrective measures will be implemented, as necessary, to ensure that subsequent interpretive data and/or reacquisition procedures are modified to more accurately reflect ground-truth results.

6.6.9.1 For the investigative methods proposed for use in the Alpha Area, Foster Wheeler Environmental believes that for singular, isolated (not multiple, closely spaced) targets, 95% of these items will be excavated within a 20 cm radius of their surface location as marked in the field after target reacquisition. In addition, there will be no more than 15% "false positives" where the anomalies reacquired by the excavation team and/or target reacquisition team result in no detectable, metallic material during excavations.

6.6.10 Quality Control

Quality control mechanisms will be implemented to ensure the data acquisition, processing and interpretation, and target reacquisition practices are monitored to a sufficient level to meet the overall program objectives for a particular area.

6.6.10.1 Each EM-61 and USRADS used during the project will be listed according to make, model, and serial number in the field logbooks and/or in the digital data logger for the respective instruments. Instrument functional and repeatability tests for the EM-61 and USRADS will be digitally recorded and available for review by quality assurance (QA) personnel. Instrument-specific functional and testing procedures are described below.

6.6.10.2 At the beginning of each EM-61 data acquisition file prior to the commencement of coil movement, data will acquired for approximately 30 seconds to ensure the repeatability of the data measurements. At the commencement of coil movement, the instrument operator will traverse over a elongated metallic object (Schonstedt, rebar, etc.) a minimum of three times in opposite directions to ensure the detection capability of the EM-61, as well as provide timing information used to positionally shift the USRADS measurement locations. The actual position of this "time synch" target will be marked in the field with three PVC pin flags (two on the end and one in the middle). These flags will not be removed until the final excavation has been performed on that grid.

6.6.10.3 No calibration will be made to the EM-61 or USRADS instrumentation since they are calibrated prior to leaving the factory. However, EM-61 and positioning measurements will be recorded over a portion of an existing data acquisition for each data acquisition session or at a designated location to provide information on the precision and repeatability of the entire data acquisition process.

6.6.10.4 QC mechanisms will also be applied to the analysis and interpretation of the geophysical data. All significant processing and interpretation parameters are digitally logged to a computer file to provide an audit trail for QA. In addition, some targets interpreted to be the result of above ground cultural features (e.g., metallic monitoring wells, time synch target) may be selected for target reacquisition to exhibit the repeatability of the acquisition, processing, interpretation, and target reacquisition processes.

6.6.11 Corrective Measures

This information is provided in Section 5.8 of the approved General Site Wide Work Plan.

6.6.12 Records Management

This information is presented in Sections 5.2.7 and 14 of the approved General Site Wide Work Plan.

6.6.13 Interim Reporting

This information is presented for the geophysical data in Section 5.2.7 of the approved General Site Wide Work Plan.

6.6.14 Final Reports and Maps

This information is presented in Section 14 of the approved General Site Wide Work Plan.

6.7 RISK ASSESSMENT

This section provides the plan for the analysis of potential exposures to residual ordnance and explosives (OE) to be performed for the Alpha Area at Fort McClellan, in Anniston, AL in Calhoun County. This assessment and the subsequent assessment of relative safety risk and risk reduction afforded by potential response action alternatives will be undertaken as part of the EE/CA being performed for Alpha Area.

6.7.1 The Exposure Analysis and Explosives Safety Risk Assessment Methodology

The BRAC Cleanup Team has not made a decision on the risk methodology to be used at Fort McClellan. The March 2000 Draft of the Interim Range Rule Risk Methodology (IR^3M) Explosives Safety Risk Tool was originally planned for use, but with the cancellation of the Range Rule, a decision on the risk analysis has been postponed. Alternative methods are being considered. Until further notice, Foster Wheeler Environmental plans to apply the IR^3M to evaluate the potential exposures and explosives safety risk due to OE in Alpha Area. As part of this analysis, Foster Wheeler Environmental will evaluate the nature and magnitude of potential exposures to OE in three sectors, or sub-areas, of the Alpha Area relative to current conditions and a set of alternate OE response actions. The Draft IR^3M Explosives Safety Risk Tool (ESRT) was developed by representatives of the Department of Defense (DoD), the U.S. Environmental Protection Agency (USEPA), state and tribal regulatory authorities, and a wide variety of stakeholders to aid in effectively managing risk posed by OE commonly found on former military ranges.

6.7.1.1 Although the March 2000 Draft of the IR^3M is still a working document and the ESRT is subject to further development, review, and revision, this draft reflects over three years of refinement and evolution in concepts and approach relative to explosives safety risk assessment in this specific context. In consideration of this and other factors, the approach and framework of the March 2000 Draft IR^3M ESRT was selected to be applied to scale the level of explosives safety risk at the three sectors in Alpha Area. This draft methodology also is being used at other OE sites in the U.S., either in its March 2000 form or in a form tailored to make the tool more applicable to a specific site.

6.7.1.2 Table 6.1 shows the flowchart of the ESRT presented in the March 2000 Draft IR^3M. This flowchart demonstrates how individual risk factors and sub-factors feed into the overall exposure assessment and safety risk determination. The March 2000 Draft IR^3M explosives safety risk assessment process is based on three primary OE risk factors: (1) Accessibility; (2) Overall Hazard; and (3) Exposure. Each of these three risk factors is defined by considering a particular set of risk sub-factors relating to the site, the OE that are present, or the projected use of the area, as follows:

1)	Accessibility	←	Depth (of OE) Below Land Surface
		←	Migration / Erosion

		←	Intrusion Level of Activity (Current and/or Future Land Use)
2)	Overall Hazard	←	UXO (Energetic OE) Hazard Type
		←	Fuzing (of the OE)
		←	Amount of Energetic Material (in a single OE item)
3)	Exposure	←	Frequency of Entry
		←	UXO (OE) Density
		←	Intensity of Activity (Current and/or Future Land Use)
		←	Portability (Potential for facilitated migration)

6.7.1.3 A series of scoring rules and weighting factors is presented for combining the sub-factor characteristics into a composite score for each of the three primary risk factors. Another set of scoring rules and weighting factors is then used to combine the three primary risk factors to obtain a relative explosives safety risk categorization (i.e., defined on a five-step scale from low risk "A" to high risk "E" – see Table 6.1). The March 2000 Draft IR^3M does not include criteria for specifying the "acceptability" of the relative risk categories that are defined. This draft also does not identify which of the five final risk categorization scores should be considered to reflect conditions in an area of potential concern that warrant "no further action" and which scores should trigger an immediate response action or further evaluation in an EE/CA.

6.7.1.4 Throughout the assessment of potential exposures to possible residual OE items, Foster Wheeler Environmental will apply the March 2000 Draft ESRT in a manner consistent with the available documentation of the tool provided in the March 2000 Draft IR^3M Document, and recent discussions held with members of the committee who are developing the methodology. The expected land uses and activities at the site, the projected frequency of occurrence of activities, and the expected distribution of residual surface and subsurface OE will likely be the most influential factors in the assessment. The range of activities currently conducted at the site or reasonably projected for the future and the numbers of plausible participants in these activities will be identified based on: the site reconnaissance performed by Foster Wheeler personnel; discussions with USACE personnel; and the most current, published plans for redevelopment in Alpha Area. The expected type and amount of surface and subsurface OE remaining at the site will be estimated based on an evaluation of site-specific inspection and sampling data from the Phase I Site Characterization, and the historical records of the site.

Table 6.1 Flowchart of the Baseline Explosives Safety Risk Assessment Process Presented in the March 2000 Draft IR^{3}M

ACCESSIBILITY	OVERALL HAZARD	EXPOSURE
SUBFACTORS • Depth Below Land Surface • Migration/Erosion • Intrusion Level of Activity	SUBFACTORS • UXO Hazard Type • Fuzing • Amount of Energetic Material	SUBFACTORS • Frequency of Entry • UXO Density • Intensity of Activity • Portability
⇓	⇓	⇓
Accessibility Weighting Factors and Scoring Rules	Overall Hazard Weighting Factors and Scoring Rules	Exposure Weighting Factors and Scoring Rules
⇓	⇓	⇓
ACCESSIBILITY SCORE	OVERALL HAZARD SCORE	EXPOSURE SCORE
⇓		
Explosives Safety Risk Weighting Factors and Scoring Rules		
⇓		
EXPLOSIVES SAFETY RISK SCORE		
A (Lowest Risk Level) B C D E (Highest Risk Level)		

6.7.2 Sources of Information to Be Used in the Exposure Analysis and Risk Assessment

This potential exposure analysis and assessment of ordnance-related safety hazards will incorporate information and findings from some key information sources, which will include (but will not be limited to): The review of the historical records for Fort McClellan and the Archives Search Report (ASR) (updated 2000);

- Information gathered from the field reconnaissance effort conducted by Foster Wheeler Environmental in March and April of 2000 (as documented in the "Reconnaissance Findings Report" – August 2000);
- The results of the Phase I Site Characterization to be performed in early 2001 as part of this EE/CA; and
- Multiple discussions with USACE personnel.

6.7.3 Background and the Conceptual Site Models for Alpha Area

Alpha Area consists of an irregularly-shaped area located in the northern portion of the Fort McClellan Redevelopment Area (see Figure 2-2). Alpha Area lies on the northeast of the Main Post, just west of the Coccolocco Mountains.

6.7.3.1 Based on the review of the historical records for this portion of Fort McClellan and the field reconnaissance data, Alpha Area was divided into three sectors for purposes of the Phase I Site Characterization sampling and the assessment of potential exposures to ordnance and explosives:

- Sector M5-1L (in Redevelopment Parcel M5) – Located immediately adjacent to and east of the main cantonment area and trending north-south, between Reservoir Ridge to the west and an existing unimproved road to the east. This is the southernmost of the three Alpha Area sampling sectors.
- Sector M6-1M (in Redevelopment Parcel M6) – Located between the existing development to the west and a series of the existing paved and unimproved roads to the east. This is the centrally located sampling sector within the Alpha Area.
- Sector M6-1L (in Redevelopment Parcel M6) – Located between the northern boundary of Sector M6-1M and the site boundary, extending somewhat farther west toward the former Reilly Airfield. This is the northernmost of the three Alpha Area sampling sectors.

6.7.3.1.1 The available information for each of these areas was reviewed and evaluated with the purpose of developing a conceptual understanding of the possible sources of ordnance and explosives items in each of these sectors and the potential for direct contact exposure to those items assuming future redevelopment activities. This conceptual

understanding, formulated as a conceptual model of potential exposures to ordnance and explosives, is presented below for each sector.

6.7.3.2 Conceptual Site Model for Sector M5-1L

Figure 6-4 presents the conceptual site model (CSM) for potential exposures to ordnance and explosives in sector M5-1L in Redevelopment Parcel M5. The CSM was developed in recognition of multiple uses of this area over time, as listed in Figure 6-4 (Note: Plate 3 reflects the earliest activities in the area, with more recent periods of use depicted on additional sequential plates up to and including Plate 8). This CSM depicts the potential exposure pathways associated with direct contact with energetic ordnance and explosive items on the ground surface and in the subsurface soils of this sector. The CSM identifies the primary sources or ordnance-related activities that were, or may have been conducted at some point in time, that resulted in ordnance being present in this sector. The primary sources were various range safety fans located throughout the sector, a maneuvers area, a bivouac area, and a demonstration/testing area. Impact or target areas for ordnance and munitions that were not limited to small arms also were indicated by the historical documentation, but have not been confirmed (and are therefore depicted in the CSM as a dashed source box). Firing is the mechanism by which OE would have been deposited into these impact or target areas. OE may be present in the range safety fans as a result of being fired and in the maneuvers area as the result of firing, poor housekeeping, mishandling, or loss. OE may have been purposefully placed or deposited in the bivouac area, and would have been released and dispersed at the demonstration/testing area as the result of kickouts or the incomplete destruction or disposal of items. These releases result in OE likely being present on the ground surface or in the subsurface soil of the sector.

6.7.3.2.1 This CSM also indicates the principal mechanisms by which ordnance items may migrate or move from one location to another in the sector or shift from one depth in the soil to another. These potential transport and migration mechanisms include mechanical redistribution and human activity, precipitation run-off, and erosion (in limited specific locations). The net result of the original deposition of the ordnance items and the localized transport and migration processes is a new distribution of OE items in the soil, which may be locations of direct contact exposure by current or reasonably foreseeable future receptors associated with redevelopment of the sector. These may include future residents, commercial or industrial workers, construction workers, possible hunters, and recreational users of the area. Terrestrial wildlife also may be exposed to ordnance items present in the sector.

6.7.3.3 Conceptual Site Model for Sector M6-1L

Figure 6-5 presents the CSM for potential exposures to ordnance and explosives in sector M6-1L in Redevelopment Parcel M6. This CSM depicts the potential exposure pathways associated with direct contact with energetic ordnance and explosive items on the ground surface and in the subsurface soils of this sector. The CSM identifies the primary sources or ordnance-related activities that were, or may have been conducted at some point in time, that resulted in ordnance being present in this sector. The CSM again reflects the multiple uses of this area over time, as listed in Figure 6-5. The primary sources were a maneuvers area and a bivouac area. The indicated firing point appears to only have been related to a small arms range. OE may be present in the maneuvers area as the result of firing, poor housekeeping, mishandling, or loss and may have been purposefully placed or deposited in the bivouac area. At the firing point located in the sector (assuming that OE in addition to small arms may be present), ordnance may be present as the result of mishandling, poor housekeeping, or loss. These releases result in OE likely being present on the ground surface or in the shallow subsurface soil of the sector.

6.7.3.3.1 This CSM also indicates the principal mechanisms by which ordnance items may migrate or move from one location to another in the sector or shift from one depth in the soil to another. These potential transport and migration mechanisms include mechanical redistribution and human activity, precipitation run-off, and erosion (in limited specific locations). The net result of the original deposition of the ordnance items and the localized transport and migration processes is a new distribution of OE items in the soil, which may be locations of direct contact exposure by current or reasonably foreseeable future receptors associated with redevelopment of the sector. These may include future residents, commercial or industrial workers, construction workers, possible hunters, and recreational users of the area. Terrestrial wildlife also may be exposed to ordnance items present in the sector.

6.7.3.4 Conceptual Site Model for Sector M6-1M

Figure 6-6 presents the CSM for potential exposures to ordnance and explosives in sector M6-1M in Redevelopment Parcel M6. This CSM depicts the potential exposure pathways associated with direct contact with energetic ordnance and explosive items on the ground surface, in subsurface soils, and in the surface water and sediments of this sector. The CSM identifies the primary sources or ordnance-related activities that were, or may have been conducted at some point in time, that resulted in ordnance being present in the sector. Once again, the CSM reflects the multiple ordnance-related uses of this area over time as listed on Figure 6-6. The primary sources were various firing points and range safety fans located throughout the sector, a maneuvers area, multiple impact or target areas, and an ordnance demonstration area. At the firing points, ordnance may be present due to mishandling, poor housekeeping, or loss. OE may be

present in the range safety fans as the result of being fired, while OE in the maneuvers area may be present as the result of firing, poor housekeeping, mishandling, or loss. OE is deposited into the impact or target areas due to the action of firing. OE would have been released and dispersed at the demonstration area as the result of kickouts or the incomplete detonation, destruction, or disposal of items. These releases result in OE likely being present on the ground surface, in the subsurface soil, or in the surface water and sediments of the sector.

6.7.3.4.1 This CSM also indicates the principal mechanisms by which ordnance items may migrate or move from one location to another in the sector or shift from one depth in the soil to another. These potential transport and migration mechanisms include mechanical redistribution and human activity, precipitation run-off, and erosion (in limited specific locations). The net result of the original deposition of the ordnance items and the localized transport and migration processes is a new distribution of OE items in the soil, surface water, and sediments, which may be locations of direct contact exposure by current or reasonably foreseeable future receptors associated with redevelopment of the sector. These may include future residents, commercial or industrial workers, construction workers, possible hunters, and recreational users of the area. Terrestrial and aquatic wildlife also may be exposed to ordnance items present in the sector.

6.7.4 Response Action Alternatives Evaluated

Potential exposures to OE will be estimated and an explosives hazard safety score will be projected for each sector in Alpha Area, assuming baseline or current conditions (i.e., the "No DoD Action Indicated" alternative) and a set of candidate OE response actions to be identified during the EE/CA. These are anticipated to include (but may not be limited to):

- Institutional Controls
- Surface OE Clearance
- OE Clearance to Depth

6.7.5 Exposure Analysis and Risk Assessment Assumptions and Results

An explosives safety exposure and risk assessment will be performed for each sector in Alpha Area for each of the response action alternatives identified. The site characteristics, field data, and land use projections will be used collectively to assign appropriate values to each of the ten risk subfactors defined in the ESRT. The March 2000 Draft IR^{3}M ESRT will be used to integrate these inputs and generate a relative measure of explosives safety risk and subsequently the level of risk reduction associated with each alternative relative to the "No Further Action" scenario.

6.7.5.1 Table 6.2 presents an illustrative summary of the type of analysis that will be performed. Each summary table will identify the subfactor scores and descriptions, the basis of the assigned scores (i.e., either field data or best professional judgment), and specific notes relative to the justifications for the assigned subfactor scores. Each table will further present the individual risk factor scores for Accessibility, Overall Hazard and Exposure, and the final relative explosives safety risk letter score for each response action alternative.

6.7.5.2 The results of the assessment for each alternative and the No Further Action scenario will be presented and discussed relative to the comparative evaluation of alternatives for each sector to be developed in the EE/CA.

Table 6.2 Application of the Interim Range Rule Risk Methodology Explosives Safety Risk Tool (March 2000 Version) to Sector XX-XX in Alpha Area Assuming Alternative 1 – No Further Action

ACCESSIBILITY ASSESSMENT		SUBFACTOR SCORE AND DESCRIPTION	BASIS OF SCORING	JUSTIFICATION NOTES
Depth Below Surface	☑	#)	(Field Data)	[ ]
Migration/Erosion	☑	#)	(Site Characterization/ Best Professional Judgement)	[ ]
Level of Activity	☑	#)	(Best Professional Judgement)	[ ]
ACCESSIBILITY SCORE	→	**#) Depth = #; Migration ≤ #; Intrusion ≤ #**		
OVERALL HAZARD ASSESSMENT				
UXO Hazard Type*	☑	#)	(Field Data)	[ ]
Fuzing*	☑	#)	(Field Data)	[ ]
Amount of Energetic Material	☑	#)	(Field Data)	[ ]
* Overall UXO Hazard = UXO Hazard Type + Fuzing (maximum score of 5)				
OVERALL HAZARD SCORE	→	**#) Overall UXO Hazard ≤ #; Energetic Material ≤ #**		
EXPOSURE ASSESSMENT				
Frequency of Entry	☑	#)	(Best Professional Judgement)	[ ]
UXO Density	☑	#)	(Field Data)	[ ]
Intensity of Activity	☑	#)	(Best Professional Judgement)	[ ]
Portability	☑	#)	(Field Data/ Best Professional Judgement)	[ ]
EXPOSURE SCORE	→	**#) Frequency ≤ #; Density ≤ #; Intensity ≤#; Portability ≤ #**		

EXPLOSIVE SAFETY RISK ASSESSMENT → X) Accessibility ≤ #; Overall Hazard ≤ #; Exposure ≤#
[XXXXXX Risk Score on a relative qualitative scale of "A" Lowest Risk to "E" Highest Risk]

FIGURE 6-4
CONCEPTUAL SITE MODEL FOR POTENTIAL EXPOSURES TO ORDNANCE AND EXPLOSIVES IN SECTOR M5-1L IN REDEVELOPMENT PARCEL M5 AT FORT McCLELLAN

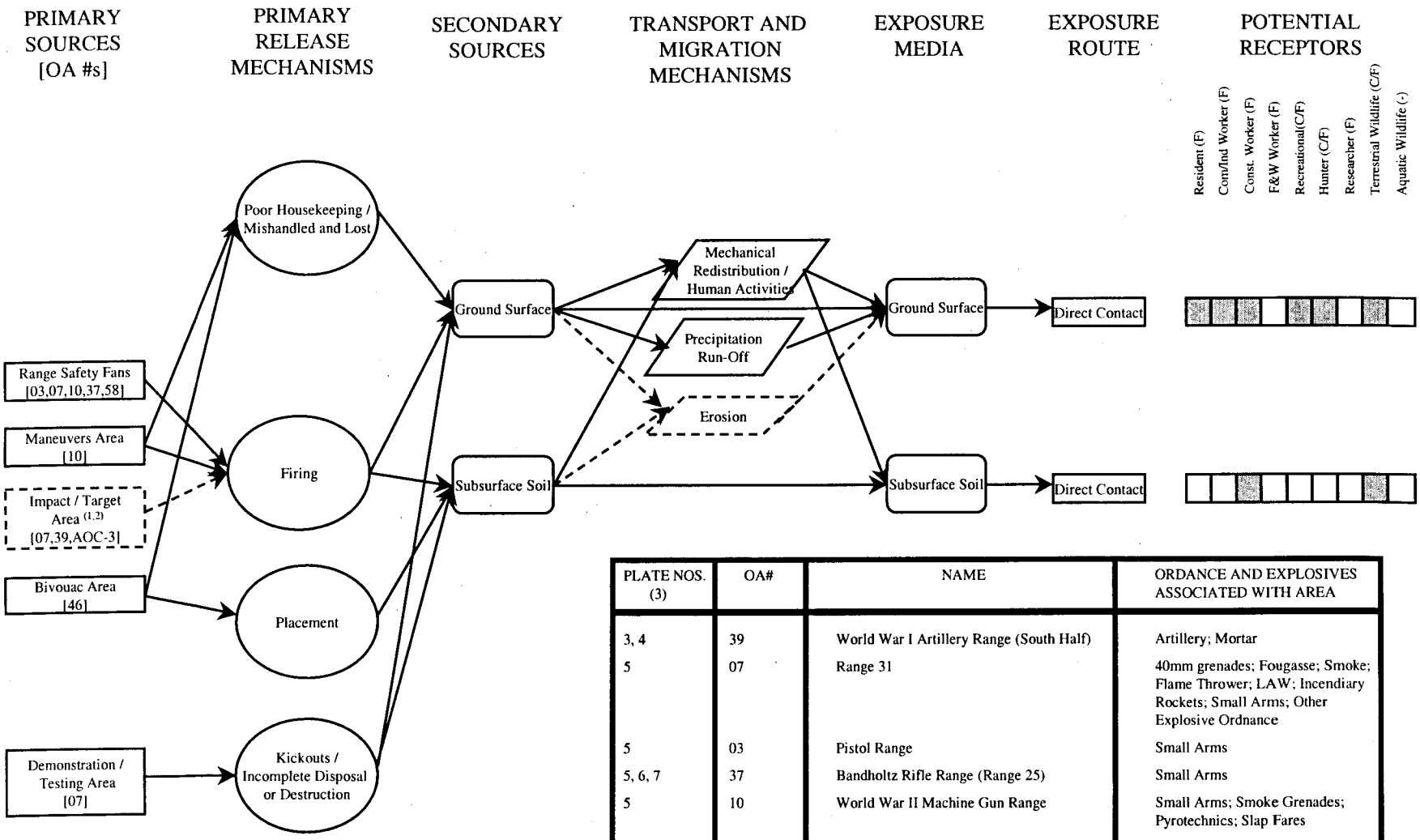


PLATE NOS. (3)	OA#	NAME	ORDANCE AND EXPLOSIVES ASSOCIATED WITH AREA
3, 4	39	World War I Artillery Range (South Half)	Artillery; Mortar
5	07	Range 31	40mm grenades; Fougasse; Smoke; Flame Thrower; LAW; Incendiary Rockets; Small Arms; Other Explosive Ordnance
5	03	Pistol Range	Small Arms
5, 6, 7	37	Bandholtz Rifle Range (Range 25)	Small Arms
5	10	World War II Machine Gun Range	Small Arms; Smoke Grenades; Pyrotechnics; Slap Fares
6	58	Infiltration Course (R-26; Range 20)	
7	46	Bivouac Site B-40	Training Debris (Rifle Blanks); Pyrotechnic Devices (Smoke Grenades)
11C	-	Obstacle Course/Bayonet Assault TA-8	Not Indicated
11C	-	Mock Combat Area	Not Indicated

NOTES:
(1) For non-Small Arms muntions.
(2) Dashed boxes or lines indicate a potential source area or linkage that requires further verification or is a linkage that is indicated to be present in only a small number of specific locations.
(3) Plate numbers obtained from the Fort McClellan Archives Search Report
C = Current Receptor
F = Potential Future Receptor
- = Not plausible for this sector

FIGURE 6-5
CONCEPTUAL SITE MODEL FOR POTENTIAL EXPOSURES TO ORDNANCE AND EXPLOSIVES IN SECTOR M6-1L IN REDEVELOPMENT PARCEL M6 AT FORT McCLELLAN

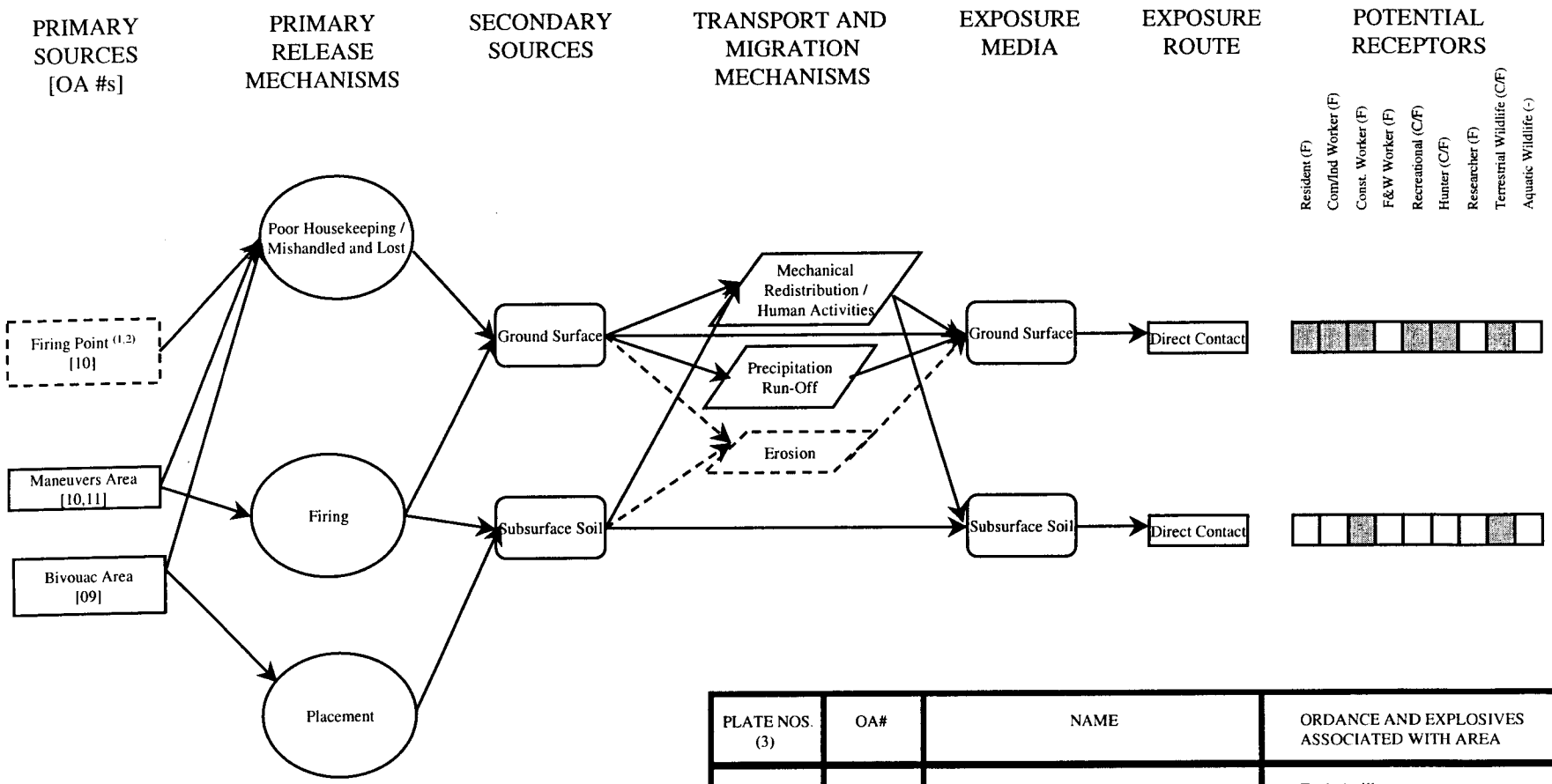


PLATE NOS. (3)	OA#	NAME	ORDANCE AND EXPLOSIVES ASSOCIATED WITH AREA
4	11	Tank Combat Range	Tank Artillery
5, 6	10	World War II Machine Gun (Rifle) Range	Small Arms
7	09	Bivouac Site B-30	Training Debris (Rifle Blanks); Pyrotechnic Devices (Smoke Grenades)

NOTES:
(1) Indicated firing point is for Small Arms muntions.
(2) Dashed boxes or lines indicate a potential source area or linkage that requires further verification or is a linkage that is indicated to be present in only a small number of specific locations.
(3) Plate numbers obtained from Fort McClellan Archives Search Report
C = Current Receptor
F = Potential Future Receptor
- = Not plausible for this sector

FIGURE 6-6
CONCEPTUAL SITE MODEL FOR POTENTIAL EXPOSURES TO ORDNANCE AND EXPLOSIVES IN SECTOR M6-1M IN REDEVELOPMENT PARCEL M6 AT FORT McCLELLAN

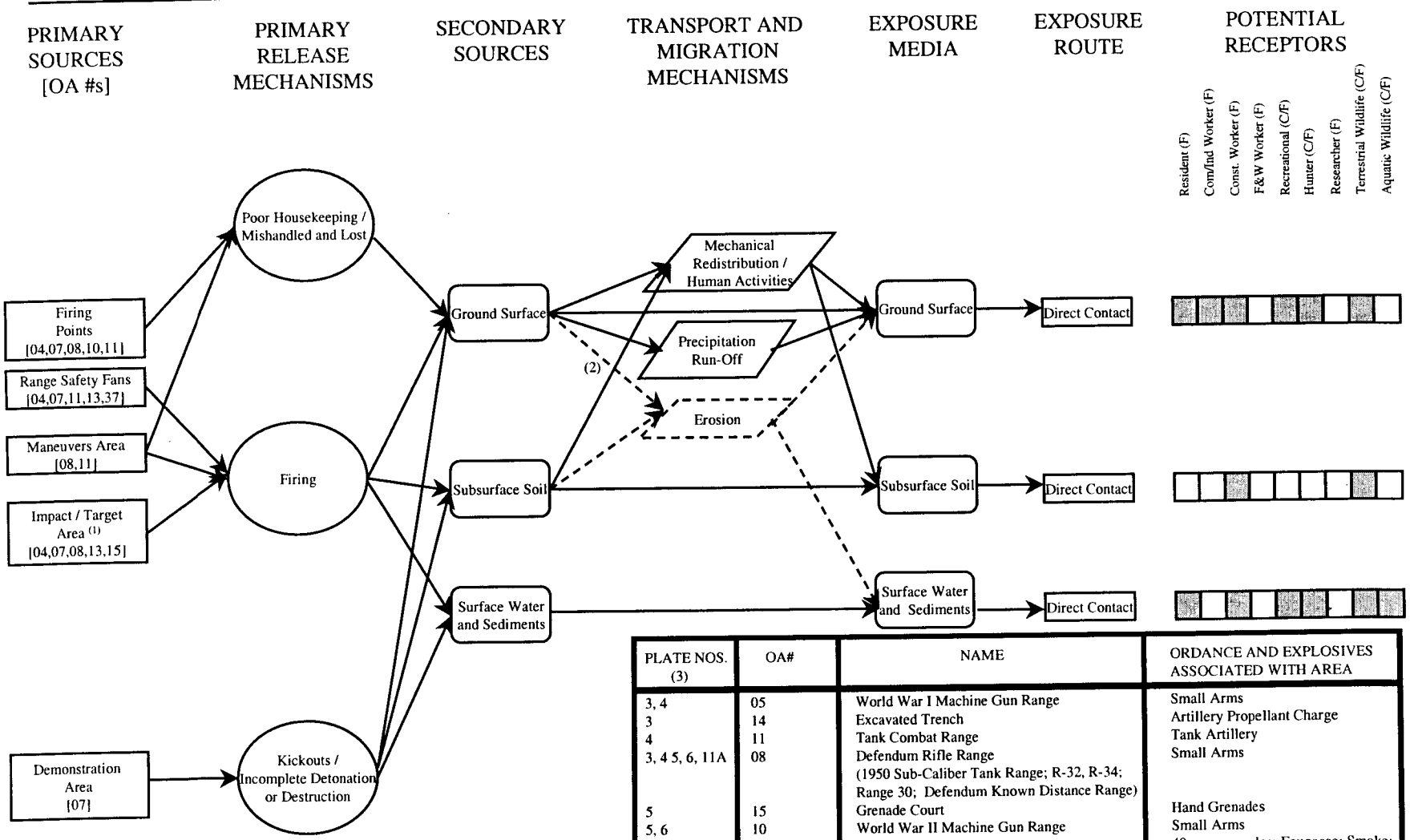


PLATE NOS. (3)	OA#	NAME	ORDANCE AND EXPLOSIVES ASSOCIATED WITH AREA
3, 4	05	World War I Machine Gun Range	Small Arms
3	14	Excavated Trench	Artillery Propellant Charge
4	11	Tank Combat Range	Tank Artillery
3, 4 5, 6, 11A	08	Defendum Rifle Range (1950 Sub-Caliber Tank Range; R-32, R-34; Range 30; Defendum Known Distance Range)	Small Arms
5	15	Grenade Court	Hand Grenades
5, 6	10	World War II Machine Gun Range	Small Arms
5, 6, 7, 8	07 (AOC-18)	Range 31	40 mm grenades; Fougasse; Smoke; Flame Thrower; LAW; Incendiary Rockets; Small Arms; Other Explosive Devices
5, 6	04	37mm Anti-Tank Range (T-31)	Small Arms
6	13	Tank Range #2	Unknown
6	58	Infiltration Range (R-26; Range 20)	Not Indicated
7	37	Bandholtz Rifle Range (Range 25)	Small Arms
11B	B-31	Bivouac Site 31	Small Arms
11C	-	TA-16C	Not Indicated
11C	-	POW Compound	Not Indicated

NOTES:
(1) Indicated firing point is for non-Small Arms munitions.
(2) Dashed boxes or lines indicate a potential source area or linkage that requires further verification or is a linkage that is indicated to be present in only a small number of specific locations.
(3) Plate numbers obtained from Fort McClellan Archives Search Report
C = Current Receptor
F = Potential Future Receptor

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ATTACHMENT 6-1

Reconnaissance Findings, Conceptual Plan, and Proposed Scope of Work for EE/CA Sampling

RECONNAISSANCE FINDINGS, CONCEPTUAL PLAN,

AND

PROPOSED SCOPE OF WORK

FOR EE/CA SAMPLING

at

FORT MCCLELLAN, ALABAMA

AUGUST 2000

Prepared by:
Foster Wheeler Environmental

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1.0 INTRODUCTION

This document summarizes the findings of the reconnaissance activities performed by Foster Wheeler Environmental Corporation (FWENC) at Fort McClellan, AL, and presents the Conceptual Approach and proposed Scope of Work (SOW) for the sampling activities for the upcoming Engineering Evaluation/ Cost Analyses (EE/CAs). The EE/CAs are necessary to address Ordnance and Explosives (OE) contamination at the site.

The objective of this conceptual planning is to design the data collection process to ensure that the right types, quantity and quality of data are collected to perform risk assessments and support the decision making process. This planning is necessary during the early stages of the project in order to obtain feedback from key parties involved in decision making, and to obtain a common understanding among the parties concerning the data to be collected and the decisions which will be based on that data.

Site reconnaissance performed in conjunction with the conceptual planning consisted of two phases of work: the records review phase and the field reconnaissance phase. In the records review, FWENC reviewed existing documents to gather information on historical range fan locations, firing points and impact areas within the fans, and types of ordnance reportedly used at Fort McClellan. The Archives Search Report (St. Louis District COE, 1997) was the primary source of historical information, but other documents reviewed include: Historical Aerial Photograph Investigation (Oak Ridge National Laboratory, 1999); Environmental Baseline Survey (ESE, 1997); and the EPIC aerial photograph investigation (EPA, 1990).

The main focus of the field reconnaissance was to identify, based on surface inspection only, areas of relative high, medium, or low OE contamination prior to design of the EE/CA sampling plan. Information collected by the two reconnaissance teams included locations and types of ordnance found, locations of suspected craters related to ordnance impact, and locations of targets. FWENC also collected other information important to the sampling design, including slope of terrain, thickness of undergrowth, and locations of accessible roads or trails. Each team carried a GPS unit to record the location of pertinent observations.

At the request of the Army, FWENC performed additional, more intense reconnaissance in Parcel M1.13, since this parcel is slated for release in the near future. The purpose was to determine whether preliminary indications of OE presence are sufficient to include, or exclude, the M1.13 parcel from future EE/CA sampling. Results of that reconnaissance are included below. The Scope of Work described in this report currently includes sampling activities in Parcel M1.13.

Using information obtained during reconnaissance, FWENC identified and delineated apparent homogeneous areas of high, medium, and low OE or UXO density on a map of the site. Since the site characterization performed during reconnaissance and concept planning is preliminary and non-quantitative, the designation of areas as high, medium, or low OE or UXO density is based on qualitative criteria and professional judgement of the reconnaissance teams. The general guidelines used are: High density areas are those in which multiple ordnance-related

items were found in close proximity to a suspected or known impact area. Low density areas are those where only sporadic or isolated OE related items were found, or no items were found, usually in the more distal portions of firing ranges or between firing ranges. Medium density was assigned to areas where occasional OE related items were found by the reconnaissance teams, or to "buffer" zones around high density areas. These areas served as the basis for designating the sampling sectors in which to obtain geophysical and ordnance data for the EE/CA. Other factors considered when delineating sampling sectors were: 1) the anticipated future use of a given sector, and 2) the current parcel boundaries obtained from the Army, showing parcel boundaries to be used for real estate transaction purposes.

During performance of the sampling phase of the EE/CA process, FWENC will conduct sector sampling in the following manner. Prior to geophysical data collection, FWENC will survey the corners of sample grid locations and/or select transect paths in each of the sectors. Minimum underbrush will then be cleared from sampling grids and pathways as necessary. FWENC's field crews will collect geophysical data. This data will be correlated with navigational data so that anomalies can be examined and the selected targets can be reacquired. Selected anomalies will be excavated to determine the type of UXO, OE, scrap, or other object that generated the geophysical anomaly, and to validate the geophysical data collection and analysis performance. Sufficient acreage will be sampled to arrive at logical and statistically defensible determinations of OE or UXO density in each homogeneous sampling sector.

During performance of the analysis phase of the EE/CA process, FWENC will define and evaluate various feasible options for further action, based upon the risk posed by UXO present and anticipated future land use of a given area. All feasible alternatives for UXO removal actions will be evaluated. The data and analysis, descriptions of alternatives, cost and risk analysis of each alternative, and rationale for selection of the proposed remedial options will be contained in the EE/CA Report.

2.0 FINDINGS

FWENC performed a records review during the early stages of site reconnaissance in order to gain information concerning the types, locations, and quantity of ordnance used at Fort McClellan. This information was used as a starting point for determining areas to be traversed during the field reconnaissance that followed.

The Archive Search Report and other records for this site showed four major geographic divisions at Fort McClellan: 1) the Washington Range Area, Bandholtz Range Area, Defendum Range Area, and the Choccolocco Corridor. Numerous historic firing fans and training areas are located within these general geographic areas. Table 1 summarizes the information found during the records review. Range designations are shown, followed by types of ordnance reportedly used at that range. The ranges are tabulated in groupings or clusters (separated by horizontal lines in Table 1) which fall roughly within individual parcel designations provided by the Army. Within each grouping, ranges tend to overlap or fall within very close proximity to each other.

Table 1
Range and Ordnance Background Information from Archives

RANGE ID	AREA	EXPECTED ORDNANCE and REMARKS	FWENC SECTOR(S)	OA#	COORD
R19	Wa	Small arms, LAW, Rockets	M3-1H/1M	50	109-293
Machine Gun	Wa	Small arms	M3-1H/1M	2	106-298
Rocket Range	Wa	2.36" rockets (part of Combat Range #2)	M3-1H/1M	1	106-295
Rifle Grenade R.	Wa	Rifle Grenades	M3-1H/1M	51	110-296
Combat Range #2	Wa	Initial use unknown	M3-1H/1M	52	110-298
Skeet	Wa	Rifle Grenade, Shot Gun	M3-1H	-	-
R15	Wa	Small arms, LAW	M3-1M	47	114-278
R12	Wa	Small arms, LAW, Antitank, 60mm, Rockets	M3-1M	48	109-287
R13	Wa	Small arms, LAW	M3-1M	49	109-288
Tank Range	Wa	Unknown	M3-1L	54	95-283
1950 Rocket R.	Wa	2.36" Rockets	M3-1L	57	95-287
60 MM Mortar R.	Wa	60 MM Mortars	M3-1L	53	97-280
R18	Wa	Small Arms	M3-2M	44	127-299
R17	Wa	Rifle Grenade(adj. to R16)	M3-3H/2M	-	-
R16	Wa	Rockets, Grenades	M3-3H/2M	45	124-294
EOD	Wa	Variety	FWS-3M	60	134-261
R26	Ba	Small Arms (Live Fire & Maneuver Range)	M4-1H	-	143-301
R28	Ba	81mm, 60mm	M4-1H/1M	-	143-303
Close Combat	Ba	Old Range 27, Small Arms	M4-1H/1M	35	148-305
R25	Ba	Small Arms (Known Distance Range)	M4-1H/1M	37	139-302
R23	Ba	Small Arms, Artillary, Old Range 21	M4-1H/1M	41	142-295
R29	Ba	Small Arms, Old Range 21	M4-2H	-	139-292
Combat Range #1	Ba	37mm, 75mm	M4-2H	43	138-294
B23	Ba	Rifle Blanks, Smoke Grenades	M4-1M	38	138-301
B25	Ba	Batallion size bivouac - training debris	M4-1M	36	135-305
R20	Ba	Small Arms (Infiltration Course)	M4-1M, FWS-2L	-	148-303
R32	Ba	Hand Grenade	FWS-2L	-	142-280
R27	Ba	Small Arms (Special Operations Range)	FWS-2L	-	149-309
R24	Ba	61mm	FWS-2M	31	160-310
Old Range 28	Ba	81 mm, 60 mm Mortars	FWS-2M/2L	34	153-309
R22	Ba	Small Arms, 61mm, Artillary, Old Range 28	FWS-2M/1L	33	153-310
R21	Ba	Small Arms	FWS-2M/1L	32	154-311
WWI Artillary(S1/2)	Ba	Artillary, Mortar	FWS-2L	39	155-285
R24A	Ba	Small Arms, Flare, Demo., Chem. Demo.	-	21	152-276
Trench Hill	De	Training Area	M1.13-1L	6	126-335
B40	De	Batallion size bivouac - training debris	M5-1L	46	139-312
Rifle Range	De	Tank Sub-Caliber	M6-1M,M1.13-1L	8	135-346
Grenade Court	De	Hand Grenade	M6-1M,M1.13-1L	15	135-345
End of Cycle Test R.	De	Grenades. Flares, Small Arms	M6-1M,M1.13-1L	-	135-342

Table 1
Range and Ordnance Background Information from Archives

RANGE ID	AREA	EXPECTED ORDNANCE and REMARKS	FWENC SECTOR(S)	OA#	COORD
Antitank Range	De	37mm, Part R31	M6-1M,M1.13-1L	4	135-330
R31	De	Small Arms, LAW, 40mm	M6-1M,M1.13-1L	7,18	135-334
WWI Machine Gun	De	Small Arms	M6-1M,M1.13-1L	5	134-337
WWII Machine Gun	De	Small Arms	M6-1M	10	140-347
Tank Combat R.	De	Unknown	M6-1M	11	142-346
R30	De	Small Arms, 37mm			
R32	De	Small Arms (Carbine Transition Range)	M6-1M	8	135-346
B30	De		M6-1M	9	138-347
Tank Range #1	De	Unknown	M6-1M,FWS-1M	12	147-347
Tank Range #2	De	Unknown	M6-1M,FWS-1M	13	147-344
R35	De	Tank Range #1 and #2, Grenade Range			
Excavated Trench	De	Unknown	M6-1M,FWS-1M	14	148-346
81MM Mortar R.	De	81 mm Mortars	FWS-1H/1M	18	168-346
French Hill	De	Mock Fire Base	FWS-1H/1M	-	~163-346
Truitt Hill	De	81mm, Extended into Choccoollocco Area	FWS-1H/1M	-	~167-346
1958 Grenade R.	De	Grenade	FWS-1M	59	150-347
1967 Grenade R.	De	Grenade	FWS-1M	61	153-342
Mock Fire Base	De	Training - Rifle Blanks, Smoke Grenades	FWS-1M	17	162-347
Range	De	Unknown	FWS-1M	19	162-344
WW1 Artillary(N1/2)	De	Artillary, Mortar	FWS-1L	29	160-315
Hand Grenade, R30	De				
R40	Ch	Small Arms	CC-1L	21	198-323
R41	Ch	Small Arms	CC-1L	22	199-326
R42	Ch	Small Arms	CC-1L	23	199-329
R43	Ch	Small Arms	CC-1L	24	198-332
TA47	Ch	Training Area	CC-2L	28	198-301
B44	Ch	Batallion size bivouac - training debris	CC-3L	25	198-301
Willis Creek (T-46)	Ch	Grenade	CC-4L	26	221-307
Morgan Mountain	Ch	Training Area	CC-5L	27	225-318

WA=Washington
Ba=Bandholtz
De=Defendum
Ch=Choccolocco Corridor

Also included in the table are the Ordnance Area Number (OA#) and the map coordinates as reported in the Archive Search Report, as well as the proposed Foster Wheeler sampling sector designation.

FWENC field teams performed field reconnaissance based on the information summarized in Table 1. Much of the field reconnaissance concentrated on areas of suspected high UXO or OE density based on historical information, and on determining whether those areas contained surface indications of UXO or OE contamination. Areas of suspected low OE density were also traversed. The object was to determine if the types and concentrations of suspected OE contamination reported in the Archive Search Report and other documents were present, and to provide preliminary delineation of areas of homogeneous UXO or OE density (high, medium, or low). Table 2 shows the types of ordnance related items found within the various groups of historical ranges. Table 2A shows the ordnance items found within each high-density sector designated by FWENC. It should be noted that the items found were surface items only and the determination of whether an item was practice, high explosive (HE), spent, etc. was not always possible during this reconnaissance. No items were excavated, removed, or blown in place for this qualitative assessment of OE contamination.

During the intense reconnaissance of Parcel M1.13, FWENC UXO personnel walked approximately 16 miles of transects with Schonstedt metal detectors and hand held GPS units. Visual inspection along the 16 miles of transects yielded five OE items at the surface. Two expended smoke grenades were found in a former training area, and three expended smoke grenades were found along the roads where troop activities are reported by the Army to have taken place. Numerous subsurface anomalies were also detected, but none were excavated. Table two includes the five items found in M1.13.

FWENC used the reconnaissance information to delineate homogeneous EE/CA sampling sectors containing suspected high, medium, or low OE or UXO concentrations. Sectors were named based on a two part labeling system: the first part of the sector designation is based on the parcel name used by the Army for a given area (e.g., Parcel M3). This is based on the EDC Parcel Map dated 9 June 00. The second part of the sector designation differentiates between high, medium, or low UXO or OE density expected within the sector. Sectors with like densities are numbered sequentially (e.g., 1H, 2H). Figure 1 shows a map of Fort McClellan with the sampling sectors outlined and labeled. Table 3 shows all proposed geophysical sampling sectors with their parcel and density designations, levels of contamination, area (acres), and projected future use. Table 4 shows the sectors and the associated vegetation and terrain conditions expected in each one. Tables 3 and 4 also show the proposed acres of geophysical sampling to be conducted.

Table 2
Type of UXO or OE Found During Reconnaissance

RANGE ID	AREA	ORDNANCE FOUND and REMARKS	FWENC SECTOR
R19	Wa	2.36 rocket OE scrap to west of R19, rifle	M3-1H/1M
Machine Gun	Wa	grenade (heat) northeast of R19	M3-1H/1M
Rocket Range	Wa	Craters at machine gun range	M3-1H/1M
Rifle Grenade R.	Wa		M3-1H/1M
Combat Range #2	Wa		M3-1H/1M
Skeet	Wa		M3-1H
R15	Wa	2 rifle illumination grenades south of R15	M3-1M
R12	Wa	Rifle grenade southwest of R12 and R13	M3-1M
R13	Wa		M3-1M
Tank Range	Wa		M3-1L
1950 Rocket R.	Wa		M3-1L
60 MM Mortar R.	Wa		M3-1L
R18	Wa	40 mm grenades, scrap, fuzes, 3.5 rockets,	M3-2M
R17	Wa	Craters	M3-3H/2M
R16	Wa		M3-3H/2M
EOD	Wa	1 empty M18 smoke grenade	FWS-3M
R26	Ba	Large amount of popups and several targets,	M4-1H
R28	Ba	pop flares, & rifle grenades in R20, R25, R26,	M4-1H/1M
Close Combat	Ba	R28 areas	M4-1H/1M
R25	Ba	9 - 3-inch stokes & 3 - 3-inch projectiles in	M4-1H/1M
R23	Ba	R28 area	M4-1H/1M
R29	Ba	6 - 75mm projectiles in R29 area	M4-2H
Combat Range #1	Ba	40mm rifle grenade R29 area	M4-2H
B23	Ba	75mm OE scrap west of R29 area	M4-1M
B25	Ba	Mechanical time fuze (spent), 81mm, 75mm	M4-1M
R20	Ba	projectile (spent) south of R32 area	M4-1M, FWS-2L
R32	Ba	81 mm and 60 mm OE scrap	FWS-2L
R27	Ba	Craters & targets south of R22 & R24	FWS-2L
R24	Ba	Some 81mm HE UXO in north central part of	FWS-2M
Old Range 28	Ba	Sector	FWS-2M/2L
R22	Ba		FWS-2M/1L
R21	Ba		FWS-2M/1L
WWI Artillary(S1/2)	Ba		FWS-2L
R24A	Ba	no reconnaissance	-
Trench Hill	De		M1.13-1L
B40	De	40mm illumination round found in B40	M5-1L
Rifle Range	De	81mm mortar fins	M6-1M,M1.13-1L
Grenade Court	De	40mm rifle grenade (practice) on French Hill	M6-1M,M1.13-1L
End of Cycle Test R.	De	OE scrap & popups near Moorman Hill	M6-1M,M1.13-1L
Antitank Range	De	>20-81mm mortars south of French & Truitt Hills	M6-1M,M1.13-1L
R31	De	5 expended smoke grenades in Sector M1.13 –1L	M6-1M,M1.13-1L

Table 2
Type of UXO or OE Found During Reconnaissance

RANGE ID	AREA	ORDNANCE FOUND and REMARKS	FWENC SECTOR
WWI Machine Gun	De	4 - 75mm projectiles (spent) near Noyes Hill	M6-1M,M1.13-1L
WWII Machine Gun	De	OE scrap, smoke grenades, & 5.56mm blank	M6-1M
Tank Combat R.	De	ammunition near Caffey Hill	M6-1M
R30	De	Mechanical time fuze M1907 (spent) for	
R32	De	155mm, 75mm, smoke grenades southeast	M6-1M
B30	De	of R35	M6-1M
Tank Range #1	De	75mm (spent) & 57mm (spent) projectiles in	M6-1M,FWS-1M
Tank Range #2	De	central part of sector	M6-1M,FWS-1M
R35	De	Hand smoke grenade (spent) east of R35	
Excavated Trench	De	OE scrap, popups, targets, and M118 grenade	M6-1M,FWS-1M
81MM Mortar R.	De	northeast of R30 & R31	FWS-1H/1M
French Hill	De	Smoke grenade found north of Trench Hill	FWS-1H/1M
Truitt Hill	De		FWS-1H/1M
1958 Grenade R.	De	81mm mortars (spent), 75mm projectiles	FWS-1M
1967 Grenade R.	De	(spent), and mechanical time fuze (spent)	FWS-1M
Mock Fire Base	De	south of R24A	FWS-1M
Range	De		FWS-1M
WW1 Artillary(N1/2)	De		FWS-1L
Hand Grenade, R30	De		
R40	Ch		CC-1L
R41	Ch		CC-1L
R42	Ch		CC-1L
R43	Ch		CC-1L
TA47	Ch		CC-2L
B44	Ch		CC-3L
Willis Creek (T-46)	Ch		CC-4L
Morgan Mountain	Ch		CC-5L

Wa=Washington
Ba=Bandholtz
De=Defendum
Ch=Choccolocco Corridor

Table 2 A
UXO or OE Found during Reconnaissance - Used to Define High Density Sectors

FWENC SECTOR	TYPE OF ORDNANCE and REMARKS
M1.01-1H*	Rifle grenades, illumination 60mm practice mortar M2 practice grenade 81mm practice mortar
M3-1H	2.36-inch OE scrap over large area 1 – 60mm mortar Rifle grenade, heat
M3-2H	EODT area OE scrap, popups 1 – 60mm mortar Empty illumination rifle grenade
M3-3H	3.5-inch rockets OE scrap (grenade fuzes, pins, spoons) LAWs 40mm grenades (numerous) Rifle grenade, heat Targets (tanks and vehicles)
M4-1H	21 – 3-inch stokes 1 – Livins projectile 3 - 3-inch projectiles 2 – M18 grenades Spent illumination rifle grenades Target masses Training grenades
M4-2H	Mechanical time fuze OE Scrap (40mm grenades, popups, 75mm projectiles, small arms) 75mm HE projectiles (>5) 40mm rifle grenades (numerous) Small arms Targets (tanks and vehicles)
M6-1M	M118 Grenades OE Scrap (popups)
FWS-1H	81mm mortars (many whole units and some fragments)
FWS-2H	3-inch or 75mm projectiles Possible 5-inch projectile (nose only) 57mm recoilless (spent) 75mm projectiles (spent) Timing ring for mechanical time fuze Rifle grenade, smoke (spent)

Table 2 A
UXO or OE Found during Reconnaissance -
Used to Define High Density Sectors

FWENC SECTOR	TYPE OF ORDNANCE and REMARKS
FWS-3H	Target masses OE scrap 81mm and 60mm mortar UXO 81mm and 60mm mortar, OE scrap Craters 60mm HE mortars 81mm HE mortars (live and empty)

* Items found by EODT during Summerall Road clearance.

Table 3
Homogeneous Sampling Sectors

Parcel	Sector	Level of Contamination	Total Area (acres)	Investigation Area (acres)	Sample Area (acres)	Future Use
M1.01	1M	Medium	25	25	15.5	Devel.
	1H	High	41	25	15.5	Devel.
M1.13	1L	Low	495	495	22.5	Devel.
M3	1L	Low	2,202	2,116	43	Devel.
	1M	Medium	430	311	22.5	Devel.
	2M	Medium	129	129	21.5	Devel.
	1H	High	78	73	20	Devel.
	2H	High	199	88	20.5	Devel.
	3H	High	54	54	19	Devel.
M4	1L	Low	77	77	20	Devel.
	1M	Medium	356	356	22.5	Devel.
	1H	High	152	152	21.5	Devel.
	2H	High	129	129	21.5	Devel.
M5	1L	Low	249	249	22	Devel.
M6*	1L	Low	64	64	19.5	Devel.
	1M	Medium	563	498	23	Devel.
FWS	1L	Low	1,746	1,746	35	F&WS
	2L	Low	3,219	3,219	64.5	F&WS
	1M	Medium	1,114	1,114	22.5	F&WS
	2M	Medium	280	280	6	F&WS
	1H	High	75	75	2.5	F&WS
	2H	High	238	238	5	F&WS
	3H	High	254	254	5.5	F&WS
	3M	Medium	10	10	2.5	F&WS
CC	1L	Low	1,466	1,466	29.5	F&WS
	2L	Low	20	20	2.5	F&WS
	3L	Low	18	18	2.5	F&WS
	4L	Low	74	74	2.5	F&WS
	5L	Low	12	12	2.5	F&WS

NOTES:
Total area: 13,769 acres
Total investigation area: 13,367 acres
Total sample area: 533 acres

* : Also includes M8.

Table 4
Vegetation and Terrain of Sampling Sectors

Parcel	Sector	Level of Contamination	Total Area (acres)	Investigation Area (acres)	Sample Area (acres)	Vegetation (acres)				Terrain (acres)		
						Open	Light Woods	Moderate Woods	Heavy Woods	Flat	Hills	Mountains
M1.01	1M	Medium	25	25	15.5	-	-	7.5	8	-	15.5	-
	1H	High	41	25	15.5	-	-	-	15.5	6	9.5	-
M1.13	1L	Low	495	495	22.5	2	-	5.5	15	18	4.5	-
M3	1L	Low	2,202	2,116	43	3	10	10	20	1	1	41
	1M	Medium	430	311	22.5	0.5	3	6.5	12.5	-	2	20.5
	2M	Medium	129	129	21.5	1.5	5	5	10	3.5	9	9
	1H	High	78	73	20	-	1.5	3	15.5	-	7.5	12.5
	2H	High	199	62	19.5	-	3.5	6.5	9.5	-	-	19.5
	3H	High	54	54	19	1.5	7	3.5	7	-	2	17
M4	1L	Low	77	77	20	1.5	6	6	6.5	16	4	-
	1M	Medium	356	356	22.5	2	4.5	4.5	11.5	4.5	18	-
	1H	High	152	152	21.5	2.5	3	3	13	6.5	15	-
	2H	High	129	129	21.5	1	5	5.5	10	6.5	15	-
M5	1L	Low	249	249	22	-	8	7	7	2	20	-
M6*	1L	Low	64	64	19.5	3	-	7	9.5	15.5	4	-
	1M	Medium	563	498	23	1.5	3	9	9.5	4.5	14	4.5
FWS	1L	Low	1,746	1,746	35	0.5	1	7	26.5	-	1.5	33.5
	2L	Low	3,219	3,219	64.5	-	13	15.5	36	-	3.5	61
	1M	Medium	1,114	1,114	22.5	1	5	7	9.5	-	4	18.5
	2M	Medium	280	280	6	-	0.5	2	3.5	0.5	0.5	5
	1H	High	75	75	2.5	-	-	0.5	2	-	1	1.5
	2H	High	238	238	5	-	0.5	1	3.5	-	0.5	4.5
	3H	High	254	254	5.5	-	1.5	2	2	-	0.5	5
	3M	Medium	10	10	2.5	1	1.5	-	-	-	-	2.5
CC	1L	Low	1,466	1,466	29.5	-	-	9	20.5	-	5.5	24
	2L	Low	20	20	2.5	1.5	-	1	-	2.5	-	-
	3L	Low	18	18	2.5	-	1	-	1.5	1	-	1.5
	4L	Low	74	74	2.5	0.5	-	-	2	2.5	-	-
	5L	Low	12	12	2.5	-	-	1	1.5	2	0.5	-
TOTALS:			13,769	13,367	533	24.5	83.5	136	289	92.5	158.5	282

* : Also includes M8.

The method utilized to determine how many acres will be geophysically sampled in each sector is statistically-based, and a summary of the rationale and criteria used is presented below. In each sector, a minimum of 2 percent of the total acreage will be sampled.

In designing the sampling programs to achieve statistical significance, FWENC has assumed certain levels of OE contamination that would usually be considered to be so low that remedial actions are not normally necessary, and levels that are so high that removal actions are always normally necessary. The levels that were assumed are shown in the following table. In FWENC's experience, when risk analyses are performed at the assumed low levels, the results consistently predict acceptability of the property for the uses indicated. Similarly, risk analyses above the high level consistently result in requirements for removal action.

Proposed Future Use	**Low level** – Risk analyses consistently predict acceptable levels of risk with no further clearance action	**High level** – Risk analyses consistently predict unacceptable levels of risk without further clearance action
Residential	<0.1 OE per acre	> 5.0 OE per acre
Commercial/Industrial	<0.1 OE per acre	> 5.0 OE per acre
Wildlife refuge	<1.0 OE per acre	> 5.0 OE per acre

For high density sectors known to contain ordnance items, the characterization goal is to collect enough information for cost estimating and evaluation of response alternatives. Acreage will be sampled until statistical results indicate that a threshold density of greater than 5 UXO/ acre is demonstrated with a 90% confidence level. This is the proposed criterion to signal that further characterization is not worthwhile, since that sector will go to the alternatives evaluation phase of the EE/CA. A 5 UXO/ acre threshold is used for both the Redevelopment and Choccolocco Areas. The 5 UXO/ acre threshold was derived from previous project experience and professional judgement. This "rule of thumb" threshold was the default value during development of the Grid Stats/ Site Stats statistical programs used in former UXO characterization work, and has been used as a cutoff at Southwest Proving Ground during performance of that project.

For suspected low density sectors which, based on current information, are anticipated to be free or essentially free of UXO. The characterization goal is to collect enough information to demonstrate statistically that the specified target density is not exceeded. The specified target density for LOW sectors is 0.1 UXO/acre in the Redevelopment Area where the future use is residential, commercial, or industrial, and 1.0 UXO/acre in Choccolocco Area where the future use is by the US Fish and Wildlife Service for a wildlife management area. The required sampling acreage for each of these sectors is calculated to demonstrate with a 90% confidence level that appropriate target density (0.1 or 1.0) was or was not exceeded.

For suspected medium density sectors, it is not currently known whether ordnance is likely to be present or not. The characterization goal is to collect enough information to determine whether ordnance is present. If ordnance items are found, the sector will be evaluated to determine if they are associated with an adjacent HIGH, or exhibit criteria of a HIGH. If no ordnance items are found, the sector will be evaluated to determine if area is associated with an

adjacent LOW. As with suspected low density sectors, the required sampling acreage for each sector is calculated to demonstrate with a 90% confidence level that the appropriate target density (0.1 or 1.0) was or was not exceeded.

The sampling criteria may change for any given sector if it becomes clear that the preliminary density designation has changed. For example, if an unknown HIGH is found in a LOW area, or if boundaries of sectors are adjusted based on ordnance finds, the overall size of the sector changes. At this point, the required sampling acreage may need to be modified.

Proposed sampling is further discussed in the SOW section below.

3.0 PROPOSED SCOPE OF WORK

Figure 1 divides Fort McClellan into two main areas for the purposes of UXO assessment and remediation, as well as for future property use. These two areas are the Redevelopment Area and the Choccolocco Area. The Redevelopment Area is slated for commercial and industrial future use, and the Choccolocco Area will be used predominantly by the Fish and Wildlife Service (FWS) as a Wildlife Management Area. FWENC further subdivided these areas into the 29 sampling sectors discussed above, and shown on Figure 1. These sampling sectors are the basis for developing the following Scope of Work.

The area to be investigated at Fort McClellan in the upcoming EE/CAs totals 13,367 acres, contained within the 29 defined sampling sectors. Areas for which FWENC does not propose sampling include: 1) the core of the Redevelopment Area containing numerous structures, parking areas, and other facilities; 2) the majority of the Choccolocco Corridor extending east of the main base, and 3) a large section of land in the Choccolocco Mountains along the southern border of the Fort. The core portion of the Redevelopment Area is not included in EE/CA sampling since no historical impact areas are known to be present, and a high level of human activity, including construction, has taken place in that portion of the Installation for many years. However, some OE training items have been recovered there over the years, and UXO support may be prudent during excavation or construction activities. In addition, FWENC found no records of ordnance related activities in the Choccolocco Corridor and southern Choccolocco Mountains, and a separate decision document will address those areas. For the purposes of this document, the Scope of Work will be described in two parts: the Scope of Work for the Redevelopment Area EE/CAs, and the Scope of Work for the Choccolocco EE/CA.

4.0 REDEVELOPMENT AREA

There are 16 sampling sectors within the Redevelopment Area totaling 4,841 acres of area to be investigated for ordnance. These are located within parcels M1 through M6 as shown in the upper half of Table 3, and do not include areas already investigated in connection with the Chemical Warfare Agent EE/CA, the Eastern Bypass, or the buffer area surrounding the Chemical Decontamination Training Facility (CDTF). Within the Redevelopment Area, FWENC will perform geophysical sampling over areas totaling up to 350 acres throughout the 16 sectors. The sampling acreage required for each sector is shown in Table 3. These are the

minimum acreage necessary in each sector that must be investigated without finding any energetic ordnance items in order to demonstrate with a 90% confidence level that a UXO density of 0.1 UXO/acre is not exceeded. This UXO target density was selected for the Redevelopment Area in anticipation of future use as commercial or industrial property.

In areas where terrain is flat or moderately sloping, FWENC geophysical teams will collect data using a Geonics Model EM-61 Time Domain Electromagnetic Induction (TDEMI) detector in one-acre oversize grids. One half acre of EM-61 data will be collected in each one-acre oversize grid until the necessary sampling acreage is achieved. This method allows minimizing the brush clearance and environmental impact necessary for data collection. Grid locations will be randomly selected for 80% of the grids in a given sector, and 20% of the grids will be located at the discretion of FWENC based on information gathered to date. Random grid placement within sectors will be accomplished by dividing the entire sector into equal sized squares, numbering each square, and utilizing a random number generator to pick which of the squares will contain sampling grids. Discretionary grids will be positioned by FWENC to assure uniform grid coverage of a given sector, to confirm the location of sector boundaries of areas of different OE density, or to address areas of special concern related to past activities or specific proposed future use. Field teams will collect navigation data within grids using USRADS 2200. Following geophysical data collection and identification of anomalies, FWENC will excavate selected anomalies during the intrusive phase of the sampling to determine what type of UXO or OE items, if any, are present. In order to maximize the probability of finding UXO items during the intrusive phase, the anomalies selected first for excavation will be those which give a geophysical response larger than the smallest target munition believed to be present in that area. In addition, some smaller anomalies will be excavated in order to calibrate and validate the geophysical responses to the range of items present. FWENC anticipates performing intrusive activities at approximately 10 percent of the grids investigated, with the remaining 90 percent of the grids characterized by geophysical response. This approach utilizes a high degree of geophysical calibration to reduce the number of targets excavated during the characterization phase of the project.

If some of the terrain within the Redevelopment Area is too steep to investigate using grids, FWENC field teams will collect data using hand-held metal detectors or magnetometers carried along a series of transects through that sector. This method allows data to be collected along a series of approximately 3-foot swaths over steep or difficult terrain until the necessary sampling acreage is achieved. This minimizes brush clearance and environmental impact, and can be used where oversize grids are not logistically feasible. FWENC will collect navigation data along transects using Differential Global Positioning Systems (DGPS) with special techniques for determining transect paths.

In areas suspected of containing a high UXO density, FWENC may be able to sample fewer grids (less acreage) while still demonstrating a UXO target density greater than 5/acre. It is assumed that in areas with more than 5 UXO/acre, further action will be necessary during the remediation phase. In such high-density areas, FWENC may terminate sampling of grids once a 5 UXO/acre density is verified, but a minimum of 10 grids will be sampled in each sector regardless of density in order to provide sufficient sample to verify statistical significance of the sample data.

In areas of suspected medium UXO density (more than 0.1 UXO per acre and less than 5 UXO per acre), sufficient acreage will be sampled to quantify the UXO density present. Depending upon the findings, FWENC will consider redesignating those areas, or portions of areas, as high or low UXO density, as necessary.

5.0 CHOCCOLOCCO AREA

There are 13 sampling sectors within the Choccolocco Mountains and Choccolocco Corridor Areas totaling 8,526 acres of area to be investigated for ordnance. These are located within unnamed parcels designated for future use by the F&WS in the Choccolocco Mountains and in the Choccolocco Corridor. Prefixes for these sectors are FWS and CC as shown in the lower half of Table 3, and do not include areas already investigated in connection with the Eastern Bypass. Within these areas, geophysical sampling will be performed over areas totaling up to 183 acres throughout the 13 sectors. The sampling acreage required for each sector is shown in Table 3. These are the minimum acreage necessary in each sector that must be investigated without finding any energetic ordnance items in order to demonstrate with a 90% confidence level that a UXO density of 1.0 UXO/acre is not exceeded. FWENC selected this UXO target density for the Choccolocco Areas in anticipation of future use as a Wildlife Management Area maintained by the F&WS. In areas of potentially high UXO density, the sampling acreage in Table 3 represents the baseline sample area required to demonstrate a high level of contamination (more than 5 UXO/acre). In any sector where the calculated sampling acreage is less than 2 percent, a default value of 2 percent of total sector acreage is the recommended sampling acreage.

In areas where terrain is flat or moderately sloping, FWENC geophysical teams will collect data using an EM-61 in one-acre oversized grids as described in the above Redevelopment Area SOW. However, much of the terrain in these areas is very steep and not suitable for data collection using grids. Data in very steep areas will be collected using a hand-held metal detector or magnetometer carried along a series of transects through each sector, as described above, until the necessary acreage is sampled. This method minimizes brush clearance and environmental impact, and can be used where oversize grids are logistically not feasible. FWENC will collect navigation data along transects using Differential Global Positioning Systems (DGPS) with special techniques for determining transect paths. Following geophysical data collection, anomalies will be excavated during the intrusive phase of the sampling to determine if and what type of UXO or OE items are present. In areas of low anomaly density (less than 1 anomaly per 100 feet of transect), all anomalies will be investigated. In areas of anomaly density greater than 1 anomaly per 100 feet, selected anomalies, as determined by analysis of the geophysical data, will be investigated.

In areas suspected of containing a high UXO density, less acreage may need to be sampled in order to demonstrate a UXO target density of 5/acre. It is assumed that in areas with more than 5 UXO/acre, further action will be necessary during the remediation phase. In such high-density areas, FWENC may terminate sampling once a 5 UXO/acre density is demonstrated.

As with the Redevelopment Area, in areas of the Choccolocco Mountains or Choccolocco Corridor suspected of having medium UXO density (more than 1.0 UXO per acre and less than 5

UXO per acre), sufficient acreage will be sampled to quantify the UXO density present. Depending upon the findings, FWENC will consider redesignating those areas, or portions of areas, as high or low UXO density, as necessary.

6.0 TIMING OF EE/CA ACTIVITIES

Two major factors that affect the order in which EE/CA activities will occur are: 1) the desirability of a parcel or parcels for re-use in the near term, and 2) the ease, speed, and cost for a given area to be characterized and cleared, if necessary. Based on these criteria and discussions with the Army and the US Army Engineering and Support Center–Huntsville, FWENC will perform three EE/CAs covering OE issues at Fort McClellan. These are referred to as Alpha Area, Bravo Area, and Charlie Area EE/CAs. The following breakdown of EE/CA activities is recommended.

7.0 ALPHA AREA EE/CA - REDEVELOPMENT AREA

Based on historical information and field reconnaissance, FWENC anticipates that Parcels M1.01, M1.13, M5, and M6 will require less OE clearance than other parcels in the immediate vicinity of the Redevelopment Area. These parcels are also desirable for commercial or industrial reuse as soon as possible. These parcels and the sampling sectors associated with them would be investigated in the first of the three EE/CAs.

8.0 BRAVO AREA EE/CA – REDEVELOPMENT AREA

This area generally consists of the northern portion of Parcel M3 and Parcel M4. This area is located in the Redevelopment Area, and is therefor desirable for commercial or industrial reuse in the near term. However, historical use of OE has resulted in significant OE contamination that will likely be more time-consuming and costly to clear than Alpha Area. Another of the three EE/CAs will cover portions of these parcels and the associated sampling sectors.

9.0 CHARLIE AREA EE/CA – CHOCCOLOCCO MOUNTAINS/ CHOCCOLOCCO CORRIDOR

This EE/CA will address unnamed parcels in the Choccolocco Mountains east of the Redevelopment Area, and portions of the Choccolocco Corridor east of the mountains. These areas are slated for future use by the Fish and Wildlife Service. FWENC expects the steep terrain and remote nature of much of this area, as well as significant suspected OE contamination in some areas, to result in a relatively time-consuming characterization and clearance for these parcels. Thus this EE/CA would be the last of the three EE/CAs completed.

The order of EE/CA activities proposed above applies to the expected initiation dates for the EE/CAs. However, FWENC will overlap task durations for the three EE/CAs such that a period of only several months should separate the completion dates of the three documents.

10.0 SUMMARY AND CONCLUSIONS

FWENC performed a two-phase site reconnaissance at Fort McClellan, Alabama in order to gather more information concerning past OE or UXO activities. The reconnaissance, consisting of a records review phase and a field phase, was done in order to aid in developing the conceptual approach and scope of work for the geophysical sampling to be performed during the upcoming EE/CA activities.

Reconnaissance confirmed the presence of OE at the site, and helped define areas of probable high, medium, and low OE density in and around known historical ordnance firing ranges. These areas of probable homogeneous OE density, together with information concerning the Army's parcel boundaries and future use of those parcels, formed the basis for defining the sampling sectors to be used during geophysical and intrusive sampling activities.

The Scopes of Work being proposed consists of three EE/CAs, two in the Redevelopment Area and one in the Choccolocco Mountains and Choccolocco Corridor. Appendices A and B contain the Scopes of Work for the Alpha Area EE/CA and the Bravo Area EE/CA, both of which are in the Redevelopment Area. Appendix C contains the Scope of Work for the Charlie Area EE/CA, located in the Choccolocco Mountains and Corridor. The separation of activities into three EE/CAs allows commercially desirable parcels that can be characterized and cleared more quickly to be dealt with in the first EE/CA, with more time-consuming parcels slated for later turnover to be addressed in the second and third EE/CAs. Since tasks for the three EE/CAs are proposed to overlap, the three EE/CAs should be completed within several months of each other, as shown in the attached schedule.

APPENDIX A

FORT MCCLELLAN, ALABAMA
PROPOSED SCOPE OF WORK FOR EE/CA SAMPLING
ALPHA AREA EE/CA

APPROACH

Foster Wheeler Environmental Corporation (FWENC) will perform three EE/CAs at Fort McClellan, Alabama to address ordnance contamination at the site. During performance of the sampling phase of the EE/CA process, FWENC will conduct sector sampling in the following manner. Prior to geophysical data collection, FWENC will survey the corners of sample grid locations and select transect pathways in each of the sectors. Minimum underbrush will then be cleared from sampling grids and pathways as necessary. FWENC's field crews will collect geophysical data. This data will be correlated with navigational data so that anomalies can be examined using digital geophysical mapping and data analysis procedures and the selected targets can be reacquired. Selected anomalies will be excavated to determine the type of UXO, OE, scrap, or other object that generated the geophysical anomaly, and to validate the geophysical data collection and analysis performance. Sufficient acreage will be sampled to arrive at logical and statistically defensible determinations of OE or UXO density in each homogeneous sampling sector.

During performance of the analysis phase of the EE/CA process, FWENC will define and evaluate various feasible options for further action, based upon the risk posed by UXO present and anticipated future land use of a given area. All feasible alternatives for UXO removal actions will be evaluated. The data and analysis, descriptions of alternatives, cost and risk analysis of each alternative, and rationale for selection of the proposed remedial options will be contained in the EE/CA.

PROPOSED SCOPE OF WORK- ALPHA AREA EE/CA

Background

The area included in the Alpha Area EE/CA comprises all or portions of Parcels M1.01, M1.13, M5, and M6. Based on historical information and field reconnaissance, CEHNC anticipates that these parcels will require less OE clearance than other parcels in the immediate vicinity of the Redevelopment Area. These parcels are also desirable for commercial or industrial reuse as soon as possible. These parcels and the sampling sectors associated with them will be investigated in the Alpha Area EE/CA.

There are 6 sampling sectors within the Alpha portion of the Redevelopment Area totaling approximately 1,356 acres of area to be investigated for ordnance. These sectors are shown in Table A1, and do not include areas already investigated in connection with the Chemical

Table A1
Sampling Sectors - Alpha Area EE/CA

Parcel	Sector	Level of Contamination	Total Area (acres)	Investigation Area (acres)	Sample Area (acres)	Vegetation (acres)				Terrain (acres)		
						Open	Light Woods	Moderate Woods	Heavy Woods	Flat	Hills	Mountains
M1.01	1M	Medium	25	25	15.5	-	-	7.5	8	-	15.5	-
	1H	High	41	25	15.5	-	-	-	15.5	6	9.5	-
M1.13	1L	Low	495	495	22.5	2	-	5.5	15	18	4.5	-
M5	1L	Low	249	249	22	-	8	7	7	2	20	-
M6*	1L	Low	64	64	19.5	3	-	7	9.5	15.5	4	-
	1M	Medium	563	498	23	1.5	3	9	9.5	4.5	14	4.5
TOTALS:			1,437	1,356	118	6.5	11	36	64.5	46	67.5	4.5

* Includes Parcel M8

Warfare Agent EE/CA, the Eastern Bypass, or the buffer area surrounding the Chemical Decontamination Training Facility (CDTF). In addition, the core of the Redevelopment Area containing numerous structures, parking areas, and other facilities, is not included in EE/CA sampling since no historical impact areas are known to be present, and a high level of human activity, including construction, has taken place in that portion of the Installation for many years. However, some OE training items have been recovered there over the years, and UXO support may be prudent during excavation or construction activities.

Task 1 – Work Plan

FWENC shall prepare and submit a Work Plan for this project in accordance with DID OT-FMC-005-01. The Work Plan shall propose site locations and the anticipated work that shall be conducted. The Work Plan shall include all necessary sub-plans in accordance with DID OT-FMC-005-01 and each required sub-plan's corresponding DID. The work conducted under this Work Plan shall also be performed in accordance with the technical requirements as outlined in each DID. Specific requirements determined by FWENC as not applicable will be clearly identified by FWENC in the Work Plan.

Task 2 – Geophysical and Intrusive Sampling

The purpose of the geophysical and intrusive sampling shall be to delineate the magnitude and extent of OE contamination for the area identified in the 'Background' section above, and in Table A1. This characterization shall produce sufficient information for FWENC to identify target anomalies, prepare risk assessments, evaluate alternatives for remediation, prepare cost analyses for each alternative, and recommend remediation alternatives.

Within the Alpha Area, FWENC will perform geophysical sampling over areas totaling up to 118 acres throughout the 1,356-acre investigation area contained within the 6 sampling sectors delineated. The sampling acreage required for each sector is shown in Table A1. These are the minimum acreage necessary in each sector that must be investigated without finding any energetic ordnance items in order to demonstrate with a 90% confidence level that a UXO density of 0.1 UXO/acre is not exceeded. This UXO target density was selected for the Redevelopment Area in anticipation of future use as commercial or industrial property.

Within the 118 acres to be sampled, FWENC estimates that approximately 39 percent of the terrain is flat, 57 percent is hilly, and 4 percent is mountainous. CEHNC anticipates that these percentages will apply to the grids and transects to be sampled. In areas where terrain is flat or moderately sloping, FWENC geophysical teams will collect data using an EM-61 in one-acre oversize grids. Grid locations will be randomly selected for 80 percent of the grids in a given sector, and 20 percent of the grids will be located at the discretion of FWENC based on information gathered to date. Random grid placement within sectors will be accomplished by dividing the entire sector into equal sized squares, numbering each square, and utilizing a random number generator to pick which of the squares will contain sampling grids. Discretionary grids will be located positioned by FWENC to assure uniform grid coverage of a given sector, to confirm the location of sector boundaries of different OE density, or to address areas of special concern related to past activities or specific proposed future use.

Field teams will collect navigation data within grids using USRADS 2200. Following geophysical data collection and identification of anomalies, FWENC will excavate selected anomalies during the intrusive phase of the sampling to determine what type of UXO or OE items, if any, are present. Selected anomalies will be excavated to determine the type of UXO, OE, scrap, or other objects that generated the geophysical anomaly, and to validate the geophysical data collection and analysis performance. In order to maximize the probability of finding UXO items during the intrusive phase, the anomalies selected first for excavation will be those which give a geophysical response larger than the smallest target munition believed to be present in that area. In addition, some smaller anomalies will be excavated in order to calibrate the geophysical responses to the range of items present. Intrusive activities will be performed at approximately 10 percent of the grids investigated, with the remaining 90 percent of the grids characterized by geophysical response.

In terrain within the Alpha Area that is too steep to investigate using grids, FWENC field teams will collect data using hand-held metal detectors or magnetometers carried along a series of transects through that sector. The data will be collected along a series of approximately 3-foot swaths over steep or difficult terrain until the necessary sampling acreage is achieved. FWENC will collect navigation data along transects using Differential Global Positioning Systems (DGPS) with special techniques for determining transect paths.

In areas suspected of containing a high UXO density, FWENC may be able to sample fewer grids (less acreage) while still demonstrating a UXO target density greater than 5/acre. It is assumed that in areas with more than 5 UXO/acre, further action will be necessary during the remediation phase. In such high-density areas, FWENC may terminate sampling of grids once a 5 UXO/acre density is verified, but a minimum of 10 grids will be sampled in each sector regardless of density in order to provide sufficient sample to verify statistical significance of the sample data.

In areas of suspected medium UXO density (more than 0.1 UXO per acre and less than 5 UXO per acre), sufficient acreage will be sampled to quantify the UXO density present. Depending upon the findings, FWENC will consider redesignating those areas, or portions of areas, as high or low UXO density, as necessary.

Task 3 – Data Management

FWENC will manage all data in accordance with DID OT-FMC-005-14. This shall include incorporation of all reports, drawings, or data generated during performance of this SOW onto the Fort McClellan database.

Task 4 – Prepare EE/CA Report

FWENC shall prepare and submit an EE/CA Report in accordance with DID EE/CA-FMC-090. The report shall include FWENC's conclusions as to the nature and extent of OE contamination, risk assessments for each area of concern, and provide recommendations for future work at Fort McClellan within those areas. The area of concern should be sufficiently characterized in the EE/CA. The textual portions of the report shall be fully supported with

accompanying maps, charts, and tables as necessary to fully describe and document all work performed and all conclusions and recommendations presented.

Evaluate Land-Use Controls – As part of Task 4, the EE/CA Report shall fully evaluate physical removal and land-use controls as possible action alternatives. Basic data for the analysis of land-use controls will be collected on forms provided to FWENC by the Government. The survey data will be collected by a professional Urban Planner or equivalent. Personal or telephone contact insures obtaining quality information. The survey forms will not be mailed. All gathered data shall be safeguarded and protected from unofficial use.

Task 5 – Prepare Action Memorandum

The EE/CA will be provided to the public for their review and comments. FWENC shall evaluate any public comments provided by the Contracting Officer and shall incorporate them where directed by the Contracting Officer. Afterwards, FWENC shall prepare an Action Memorandum describing the selected alternative.

Task 6 – Meetings/ Public Affairs

FWENC shall attend and participate in four meetings with DoD, regulatory, and civilian agencies as directed by the Contracting Officer. The meetings shall last one day each and be held at Fort McClellan, Alabama. FWENC shall assist USAESCH Public Affairs Office (PAO) and the Corps of Engineers, Mobile PAO in developing and executing a Public Affairs program to include public meetings and Restoration Advisory Board (RAB) meetings.

APPENDIX B

FORT MCCLELLAN, ALABAMA
PROPOSED SCOPE OF WORK FOR EE/CA SAMPLING
BRAVO AREA EE/CA

APPROACH

Foster Wheeler Environmental Corporation (FWENC) will perform three EE/CAs at Fort McClellan, Alabama to address ordnance contamination at the site. During performance of the sampling phase of the EE/CA process, FWENC will conduct sector sampling in the following manner. Prior to geophysical data collection, FWENC will survey the corners of sample grid locations and select transect pathways in each of the sectors. Minimum underbrush will then be cleared from sampling grids and pathways as necessary. FWENC's field crews will collect geophysical data. This data will be correlated with navigational data so that anomalies can be examined using digital geophysical mapping and data analysis procedures and the selected targets can be reacquired. Selected anomalies will be excavated to determine the type of UXO, OE, scrap, or other object that generated the geophysical anomaly, and to validate the geophysical data collection and analysis performance. Sufficient acreage will be sampled to arrive at logical and statistically defensible determinations of OE or UXO density in each homogeneous sampling sector.

During performance of the analysis phase of the EE/CA process, FWENC will define and evaluate various feasible options for further action, based upon the risk posed by UXO present and anticipated future land use of a given area. All feasible alternatives for UXO removal actions will be evaluated. The data and analysis, descriptions of alternatives, cost and risk analysis of each alternative, and rationale for selection of the proposed remedial options will be contained in the EE/CA.

PROPOSED SCOPE OF WORK- BRAVO AREA EE/CA

Background

The area included in the Bravo Area EE/CA comprises the northern portion of Parcel M3 and Parcel M4. This area is located in the Redevelopment Area, and is therefore desirable for commercial or industrial reuse in the near term. However, historical use of OE has resulted in significant OE contamination that will be time-consuming and costly to characterize and clear. These parcels and the sampling sectors associated with them will be investigated in the Bravo Area EE/CA.

There are 10 sampling sectors within the Bravo portion of the Redevelopment Area totaling approximately 3,485 acres of area to be investigated for ordnance. These sectors are shown in Table B1, and do not include areas already investigated in connection with the Eastern Bypass. In addition, the core of the Redevelopment Area containing numerous structures, parking areas,

Table B1
Sampling Sectors - Bravo Area EE/CA

Parcel	Sector	Level of Contamination	Total Area (acres)	Investigation Area (acres)	Sample Area (acres)	Vegetation (acres)				Terrain (acres)		
						Open	Light Woods	Moderate Woods	Heavy Woods	Flat	Hills	Mountains
M3	1L	Low	2,202	2,116	43	3	10	10	20	1	1	41
	1M	Medium	430	311	22.5	0.5	3	6.5	12.5	-	2	20.5
	2M	Medium	129	129	21.5	1.5	5	5	10	3.5	9	9
	1H	High	78	73	20	-	1.5	3	15.5	-	7.5	12.5
	2H	High	199	88	20.5	-	3.5	7	10	-	-	20.5
	3H	High	54	54	19	1.5	7	3.5	7	-	2	17
M4	1L	Low	77	77	20	1.5	6	6	6.5	16	4	-
	1M	Medium	356	356	22.5	2	4.5	4.5	11.5	4.5	18	-
	1H	High	152	152	21.5	2.5	3	3	13	6.5	15	-
	2H	High	129	129	21.5	1	5	5.5	10	6.5	15	-
TOTALS:			3,806	3,485	232	13.5	48.5	54	116	38	73.5	120.5

and other facilities will not be included in this EE/CA sampling since no historical impact areas are known to be present. In addition, a high level of human activity, including construction, has taken place in that portion of the Installation for many years. However, some OE training items have been recovered there over the years, and UXO support may be prudent during excavation or construction activities.

Task 1 – Work Plan

FWENC shall prepare and submit a Work Plan for this project in accordance with DID OT-FMC-005-01. The Work Plan shall propose site locations and the anticipated work that shall be conducted. The Work Plan shall include all necessary sub-plans in accordance with DID OT-FMC-005-01 and each required sub-plan's corresponding DID. The work conducted under this Work Plan shall also be performed in accordance with the technical requirements as outlined in each DID. Specific requirements determined by FWENC as not applicable will be clearly identified by FWENC in the Work Plan.

Task 2 – Geophysical and Intrusive Sampling

The purpose of the geophysical and intrusive sampling shall be to delineate the magnitude and extent of OE contamination for the area identified in the 'Background' section above, and in Table B1. This characterization shall produce sufficient information for FWENC to identify target anomalies, prepare risk assessments, evaluate alternatives for remediation, prepare cost analyses for each alternative, and recommend remediation alternatives.

Within the Bravo Area, FWENC will perform geophysical sampling over areas totaling up to 232 acres throughout the 3,485-acre investigation area contained within the 10 sampling sectors delineated. The sampling acreage required for each sector is shown in Table B1. These are the minimum acreage necessary in each sector that must be investigated without finding any energetic ordnance items in order to demonstrate with a 90% confidence level that a UXO density of 0.1 UXO/acre is not exceeded. This UXO target density was selected for the Redevelopment Area in anticipation of future use as commercial or industrial property.

Within the 232 acres to be sampled, FWENC estimates that approximately 16 percent is flat, 32 percent is hilly, and 52 percent is mountainous. CEHNC anticipates that these percentages will apply to the grids and transects to be sampled. In areas where terrain is flat or moderately sloping, FWENC geophysical teams will collect data using an EM-61 in one-acre oversize grids. Grid locations will be randomly selected for 80% of the grids in a given sector, and 20% of the grids will be located at the discretion of FWENC based on information gathered to date. Random grid placement within sectors will be accomplished by dividing the entire sector into equal sized squares, numbering each square, and utilizing a random number generator to pick which of the squares will contain sampling grids. Discretionary grids will be positioned by FWENC to assure uniform grid coverage of a given sector, to confirm the location of sector boundaries of different OE density, or to address areas of special concern related to past activities or specific proposed future use.

Field teams will collect navigation data within grids using USRADS 2200. Following geophysical data collection and identification of anomalies, FWENC will excavate selected

anomalies during the intrusive phase of the sampling to determine what type of UXO or OE items, if any, are present. Selected anomalies will be excavated to determine the type of UXO, OE, scrap, or other objects that generated the geophysical anomaly, and to validate the geophysical data collection and analysis performance. In order to maximize the probability of finding UXO items during the intrusive phase, the anomalies selected first for excavation will be those which give a geophysical response larger than the smallest target munition believed to be present in that area. In addition, some smaller anomalies will be excavated in order to calibrate the geophysical responses to the range of items present. Intrusive activities will be performed at approximately 10 percent of the grids investigated, with the remaining 90 percent of the grids characterized by geophysical response.

Much of the terrain in Bravo Area is very steep and not suitable for data collection using grids. Data in very steep areas will be collected using a hand-held metal detector or magnetometer carried along a series of transects through each sector. This method allows data to be collected along a series of approximately 3-foot swaths over steep or difficult terrain until the necessary sampling acreage is achieved. FWENC will collect navigation data along transects using Differential Global Positioning Systems (DGPS) with special techniques for determining transect paths. For areas where transects are utilized, the intrusive phase of the sampling will be conducted as follows. In areas of low anomaly density (less than 1 anomaly per 100 feet of transect), all anomalies will be investigated. In areas of anomaly density greater than 1 anomaly per 100 feet, selected anomalies, as determined by analysis of the geophysical data, will be investigated.

In areas suspected of containing a high UXO density, FWENC may be able to sample less acreage while still demonstrating a UXO target density greater than 5/acre. It is assumed that in areas with more than 5 UXO/acre, further action will be necessary during the remediation phase. In such high-density areas, FWENC may terminate sampling of grids once a 5 UXO/acre density is verified, but a minimum of 10 grids, or equivalent coverage using transects, will be sampled in each sector regardless of density in order to provide sufficient sample to verify statistical significance of the sample data.

In areas of suspected medium UXO density (more than 0.1 UXO per acre and less than 5 UXO per acre), sufficient acreage will be sampled to quantify the UXO density present. Depending upon the findings, FWENC will consider redesignating those areas, or portions of areas, as high or low UXO density, as necessary.

Task 3 – Data Management

FWENC will manage all data in accordance with DID OT-FMC-005-14. This shall include incorporation of all reports, drawings, or data generated during performance of this SOW onto the Fort McClellan database.

Task 4 – Prepare EE/CA Report

FWENC shall prepare and submit an EE/CA Report in accordance with DID EE/CA-FMC-090. The report shall include FWENC's conclusions as to the nature and extent of OE contamination, risk assessments for each area of concern, and provide recommendations for

future work at Fort McClellan within those areas. The area of concern should be sufficiently characterized in the EE/CA. The textual portions of the report shall be fully supported with accompanying maps, charts, and tables as necessary to fully describe and document all work performed and all conclusions and recommendations presented.

Evaluate Land-Use Controls – As part of Task 4, the EE/CA Report shall fully evaluate physical removal and land-use controls as possible action alternatives. Basic data for the analysis of land-use controls will be collected on forms provided to FWENC by the Government. The survey data will be collected by a professional Urban Planner or equivalent. Personal or telephone contact insures obtaining quality information. The survey forms will not be mailed. All gathered data shall be safeguarded and protected from unofficial use.

Task 5 – Prepare Action Memorandum

The EE/CA will be provided to the public for their review and comments. FWENC shall evaluate any public comments provided by the Contracting Officer and shall incorporate them where directed by the Contracting Officer. Afterwards, FWENC shall prepare an Action Memorandum describing the selected alternative.

Task 6 – Meetings/ Public Affairs

FWENC shall attend and participate in four meetings with DoD, regulatory, and civilian agencies as directed by the Contracting Officer. The meetings shall last one day each and be held at Fort McClellan, Alabama. FWENC shall assist USAESCH Public Affairs Office (PAO) and the Corps of Engineers, Mobile PAO in developing and executing a Public Affairs program to include public meetings and Restoration Advisory Board (RAB) meetings.