

**Final**

**Site Investigation Report  
Former Mortar Firing Point, Parcel 105Q-X and  
Former Defendamm Range (Eastern), Parcel 225Q**

**Fort McClellan  
Calhoun County, Alabama**

**Prepared for:**

**U.S. Army Corps of Engineers, Mobile District  
109 St. Joseph Street  
Mobile, Alabama 36602**

**Prepared by:**

**Shaw Environmental, Inc.  
312 Directors Drive  
Knoxville, Tennessee 37923**

**Task Order CK10  
Contract No. DACA21-96-D-0018  
Shaw Project No. 796887**

**November 2006**

**Revision 0**

# Table of Contents

---

	<i>Page</i>
List of Appendices .....	iii
List of Tables .....	iv
List of Figures .....	iv
Executive Summary .....	ES-1
1.0 Introduction .....	1-1
1.1 Project Description .....	1-1
1.2 Purpose and Objectives .....	1-2
1.3 Site Description and History.....	1-2
2.0 Previous Investigations .....	2-1
3.0 Current Site Investigation Activities.....	3-1
3.1 UXO Avoidance .....	3-1
3.2 Environmental Sampling.....	3-1
3.2.1 Surface and Depositional Soil Sampling.....	3-1
3.2.2 Subsurface Soil Sampling .....	3-2
3.2.3 Surface Water Sampling.....	3-3
3.2.4 Sediment Sampling.....	3-3
3.3 Surveying of Sample Locations.....	3-3
3.4 Analytical Program.....	3-4
3.5 Sample Preservation, Packaging, and Shipping .....	3-4
3.6 Investigation-Derived Waste Management and Disposal.....	3-4
3.7 Variances/Nonconformances.....	3-5
3.8 Data Quality.....	3-5
4.0 Site Characterization .....	4-1
4.1 Regional and Site Geology.....	4-1
4.1.1 Regional Geology.....	4-1
4.1.2 Site Geology .....	4-5
4.2 Site Surface Hydrology.....	4-6
5.0 Summary of Analytical Results.....	5-1
5.1 Surface and Depositional Soil Analytical Results.....	5-1
5.2 Subsurface Soil Analytical Results.....	5-3
5.3 Surface Water Analytical Results.....	5-4

**Table of Contents** (Continued)

---

	<b>Page</b>
5.4 Sediment Analytical Results.....	5-5
5.5 Statistical and Geochemical Evaluation of Site Metals Data .....	5-6
5.6 Preliminary Ecological Risk Assessment .....	5-6
6.0 Summary, Conclusions, and Recommendations .....	6-1
7.0 References .....	7-1

Attachment 1 – List of Abbreviations and Acronyms

## ***List of Appendices***

---

Appendix A – Sample Collection Logs and Analysis Request/Chain-of-Custody Records

Appendix B – Boring Logs

Appendix C – Survey Data

Appendix D – Variance Report

Appendix E – Summary of Validated Analytical Data

Appendix F – Quality Assurance Reports for Analytical Data

Appendix G – Statistical and Geochemical Evaluation of Site Metals Data

Appendix H – Preliminary Ecological Risk Assessment

## **List of Tables**

---

<b>Table</b>	<b>Title</b>	<b>Follows Page</b>
3-1	Sampling Locations and Rationale	3-1
3-2	Soil Sample Designations and Analytical Parameters	3-1
3-3	Surface Water and Sediment Sample Designations and Analytical Parameters	3-3
3-4	Surface Water Field Parameters	3-3
5-1	Surface and Depositional Soil Analytical Results	5-1
5-2	Subsurface Soil Analytical Results	5-1
5-3	Surface Water Analytical Results	5-1
5-4	Sediment Analytical Results	5-1

## **List of Figures**

---

<b>Figure</b>	<b>Title</b>	<b>Follows Page</b>
1-1	Site Location Map	1-2
1-2	Site Map	1-3
1-3	Range Location Map, ASR Plate 5	1-3
1-4	Range Location Map, ASR Plate 6	1-3
1-5	1940 Aerial Photograph	1-4
1-6	1949 Aerial Photograph	1-4
1-7	1961 Aerial Photograph	1-5
1-8	1976 Aerial Photograph	1-5
3-1	Sample Location Map	3-1

## ***Executive Summary***

---

In accordance with Contract Number DACA21-96-D-0018, Task Order CK10, Shaw Environmental, Inc. (Shaw) completed a site investigation (SI) at the Former Mortar Firing Point, Parcel 105Q-X, and Former Defendam Range (Eastern), Parcel 225Q, at Fort McClellan in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site as a result of historical Army activities. The SI consisted of the collection and analysis of 20 surface soil samples, 3 depositional soil samples, 20 subsurface soil samples, 3 surface water samples, and 3 sediment samples.

Chemical analysis of samples collected at the site indicates that metals, volatile organic compounds (VOC), and pesticides were detected in site media. Herbicides, explosive compounds, and semivolatile organic compounds were not detected in site media. To evaluate whether the detected constituents pose an unacceptable risk to human health or the environment, analytical results were compared to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for Fort McClellan. Site metals data were also evaluated using statistical and geochemical methods to determine if the metals were present at naturally occurring levels. In addition, a preliminary ecological risk assessment (PERA) was performed to further evaluate potential risks to ecological receptors.

Constituents detected at concentrations exceeding SSSLs and background values (where available) were identified as chemicals of potential concern (COPC) in site media. COPCs were limited to three metals (aluminum, chromium, and manganese) in surface soil and six metals (aluminum, antimony, chromium, iron, manganese, thallium, and vanadium) in subsurface soil. However, these metals were determined to be present at naturally occurring levels based on the statistical/geochemical evaluation. Therefore, these metals are not expected to pose a site-related threat to human health. Detected concentrations of VOCs and pesticides in site media were all below SSSLs.

The PERA did not identify any constituents of potential ecological concern in site media based on comparison of detected constituent concentrations to established ESVs for FTMC, the results of the statistical/geochemical evaluation, and consideration of other lines of evidence (e.g., frequency of detection, comparison to alternative ESVs).

Based on the results of the SI, past operations at Parcels 105Q-X and 225Q have not adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health and the environment. Therefore, Shaw recommends "No Further Action" and unrestricted land reuse with regard to CERCLA-related hazardous substances for the area of investigation at the Former Mortar Firing Point, Parcel 105Q-X, and Former Defend Range (Eastern), Parcel 225Q.

## **1.0 Introduction**

---

The U.S. Army has selected Fort McClellan (FTMC), located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE contracted Shaw Environmental, Inc. (Shaw), formerly IT Corporation (IT), to perform a site investigation (SI) to determine the presence or absence of contamination at the Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q, under Contract Number DACA21-96-D-0018, Task Order CK10.

This report presents specific information and results compiled from the SI conducted at the Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q. For the sake of brevity, the site is sometimes referred to herein as Parcels 105Q-X and 225Q and only includes those portions of the parcels within the area of investigation unless otherwise indicated.

### **1.1 Project Description**

Parcels 105Q-X and 225Q were identified as areas to be investigated prior to property transfer. The parcels were classified as Category 1 Qualified parcels in the *Final Environmental Baseline Survey, Fort McClellan, Alabama* (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 1 Qualified parcels are areas that have no evidence of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-related hazardous substance or petroleum product storage, release, or disposal but that do have other environmental or safety concerns. Parcels 105Q-X and 225Q were qualified because chemicals of potential concern and/or unexploded ordnance (UXO) may be present as a result of historical range activities.

A site-specific work plan, comprised of a field sampling plan, safety and health plan, and UXO safety plan, was finalized in April 2002 (IT, 2002a). The work plan was prepared to provide technical guidance for sample collection and analysis at Parcels 105Q-X and 225Q. The site-

specific work plan was used as an attachment to the Installation-Wide Work Plan (IT, 1998) and the Installation-Wide Sampling and Analysis Plan (SAP) (IT, 2000a; 2002b). The SAP includes the Installation-Wide Safety and Health Plan and Quality Assurance Plan.

The SI included fieldwork to collect 20 surface soil samples, 20 subsurface soil samples, 3 depositional soil samples, 3 surface water samples, and 3 sediment samples to determine whether potential site-specific chemicals are present at the site.

## **1.2 Purpose and Objectives**

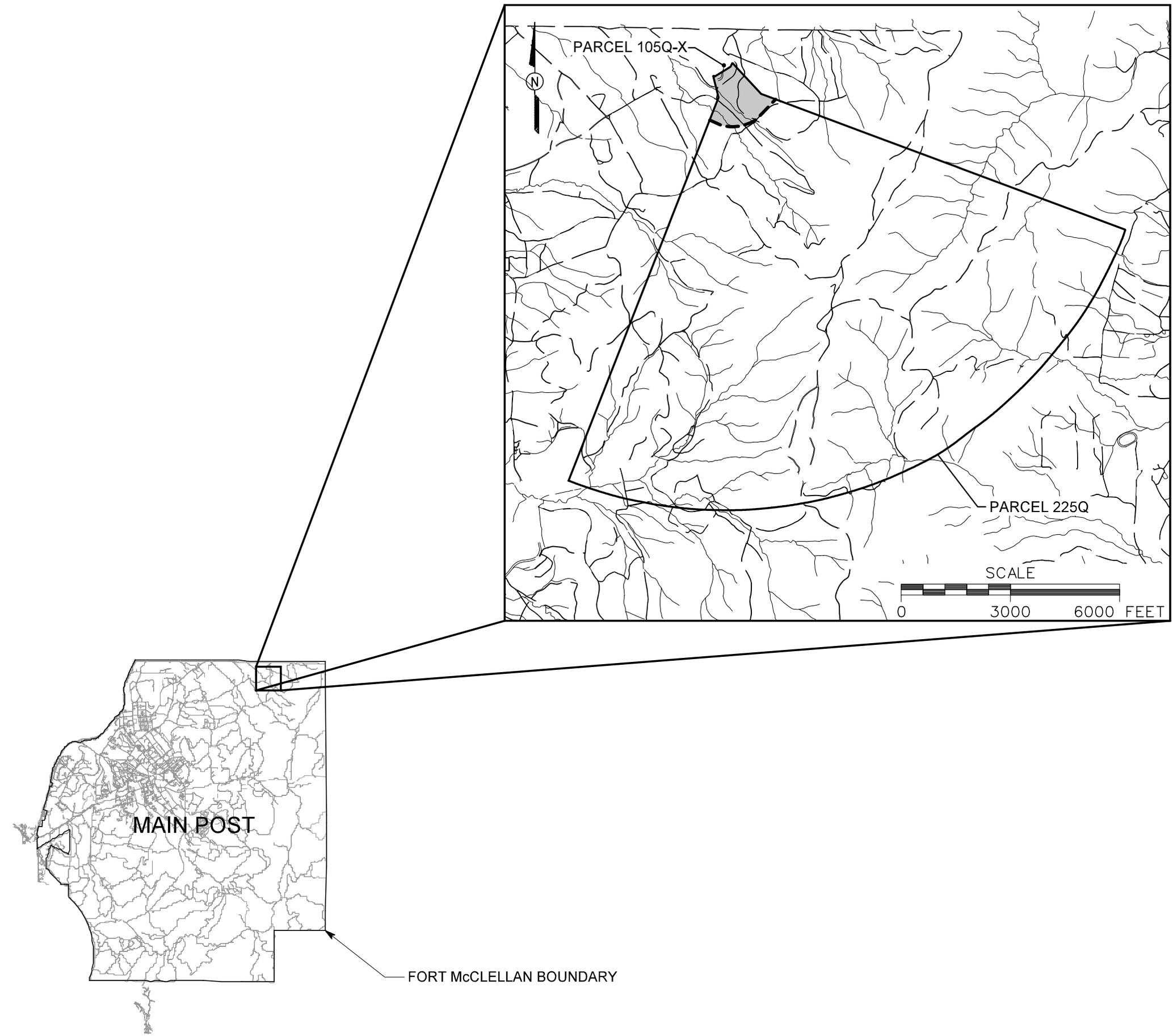
The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine the presence or absence of contamination at the Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC. The SSSLs and ESVs were developed as part of human health and ecological risk evaluations associated with environmental investigations performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs and ESVs are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation, 1998). Site metals data were also evaluated using statistical and geochemical methods to select site-related metals (Shaw, 2005). In addition, a preliminary ecological risk assessment (PERA) was performed to further characterize potential risks to ecological receptors.

Based on the conclusions presented in this SI report, the BRAC Cleanup Team will decide either to propose “No Further Action” or to conduct additional work at the site.

## **1.3 Site Description and History**

The Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q, are located in the northeastern portion of the Main Post of FTMC (Figure 1-1). Including its extensive range safety fan, Parcel 225Q occupies approximately 2,500 acres; however, the area of this investigation was limited to an area of approximately 40 acres encompassing only the firing line and the possible impact area. Parcel 105Q-X, identified as a point with no acreage in the EBS, is located just north of the firing line area for Parcel 225Q.

10/26/2006 2:54:57 PM 796887es.597  
 STARTING DATE: 10/30/02 DRAWN BY: D. BOMAR  
 DATE LAST REV.: DRAWN BY:  
 DRAFT, CHCK. BY: ENGR. CHCK. BY: S. MORAN  
 INITIATOR: J. BOND PROJ. MGR.: S. MORAN  
 DWG. NO.: 796887es.597 PROJ. NO.: 796887



- LEGEND**
- — UNIMPROVED ROAD
  - — PAVED ROAD AND PARKING
  - ▭ PARCEL BOUNDARY
  - ▨ AREA OF INVESTIGATION
  - — SURFACE DRAINAGE / CREEK

**FIGURE 1-1**  
 SITE LOCATION MAP  
 FORMER MORTAR FIRING POINT  
 PARCEL 105Q-X  
 FORMER DEFENDAM RANGE  
 (EASTERN), PARCEL 225Q

U. S. ARMY CORPS OF ENGINEERS  
 MOBILE DISTRICT  
 FORT McCLELLAN  
 CALHOUN COUNTY, ALABAMA  
 Contract No. DACA21-96-D-0018



**Parcel 105Q-X.** According to the EBS, the Former Mortar Firing Point, Parcel 105Q-X, is located at French Hill Quarry on the Main Post. Dates of operation and types of ordnance fired are not known (ESE, 1998). Mortars were not observed during SI site reconnaissance conducted in January 2002. Two weapons suspected to be either 40-millimeter (mm) or 57mm guns were observed just north of the parcel during the site walks (Figure 1-2). Two trenches, approximately 3 to 5 feet deep, were noted just north of Parcel 105Q-X, in the area of the guns. A berm was present along the south side of the southernmost trench. Excavated cells, with possible M-16 rifle blank ammunition on the cell floors, were visible along the southeastern slope of the berm.

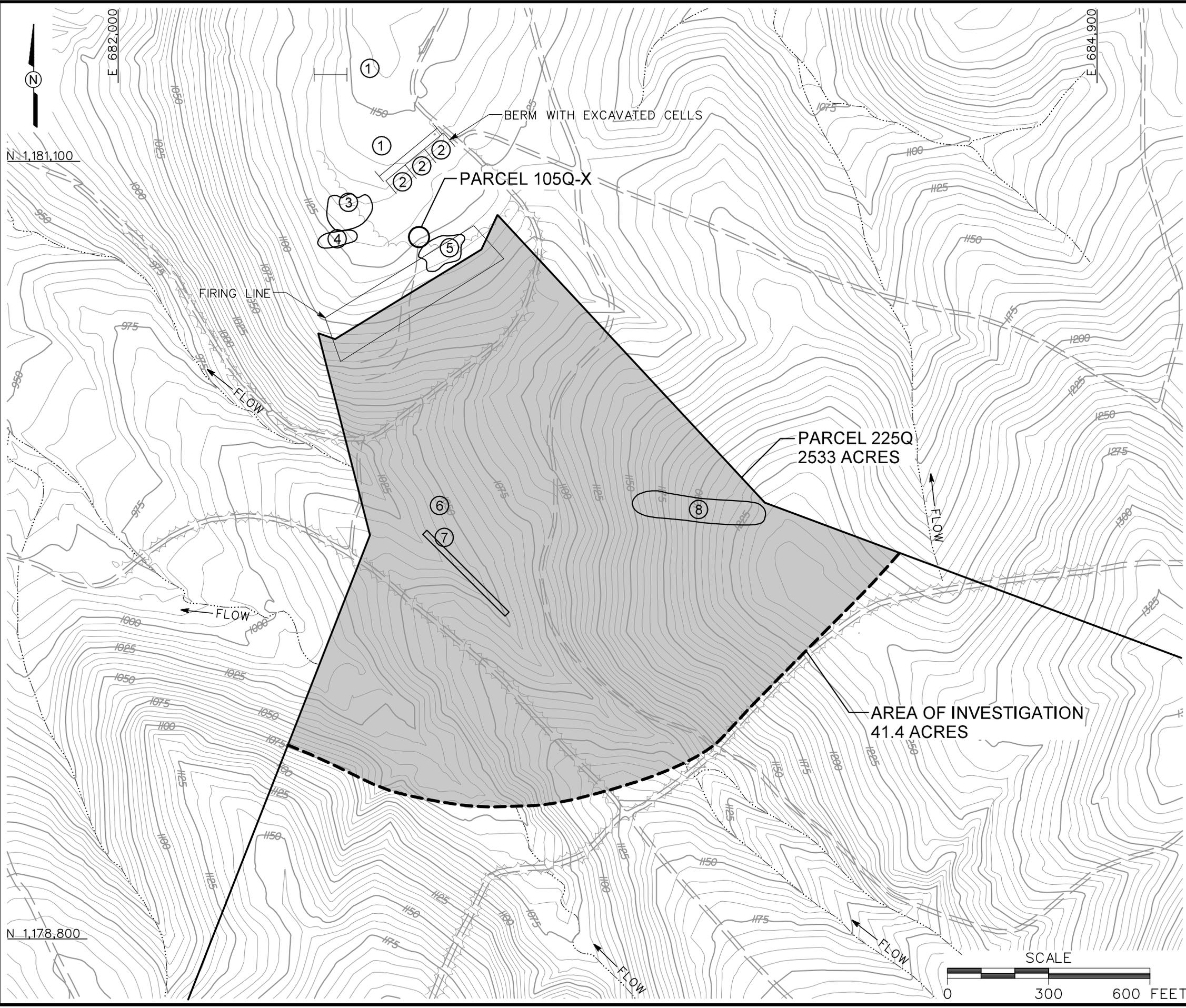
Additional information provided by the U.S. Fish and Wildlife Service indicates that this area was originally a chert or rock pit prior to the 1980s. In the early 1980s it was reclaimed with a strip-mining seed mixture. Presently, weeping love grass dominates the surface. During the late 1980s, the Alabama Army National Guard established a camp training area on this site to simulate a base camp like those constructed in Vietnam. Several coils of barbed wire were strung around the camp. Bunkers and gun emplacements were located within the wires. However, most of the wire and some of the guns were removed at the time of Base closure in 1999. Reportedly, live-fire training exercises did not occur at this location during the 1980s and 1990s (U.S. Fish and Wildlife Service, 2003).

**Parcel 225Q.** The Former Defendamm Range (Eastern), Parcel 225Q, and its range safety fan, appear on the 1946 Reservation Map near the northern post boundary and the western slope of the Choccolocco Mountains (ESE, 1998). The orientation of the range suggests that the direction of fire was to the south-southeast (Figure 1-2). According to the EBS, the manner in which the firing line is depicted and the wide field of fire suggests that this was a machine-gun range. With the exception of the 1946 Reservation Map, no other information was available regarding this range, dates of use, or operation (ESE, 1998).

The Former Defendamm Range (Eastern), Parcel 225Q, is shown on Plate 5 (World War II to 1950 Range Use) and Plate 10 (Cumulative Map of All Ranges) of the *Archives Search Report, Maps, Fort McClellan, Anniston, Alabama* (ASR) (USACE, 2001a). It is identified as “Range” (OA-19) in the ASR. The range fan shown on ASR Plate 5 generally matches the EBS Parcel 225Q range fan (Figure 1-3). The ASR states that the range was abandoned by 1958 and that the types of ordnance used at this range are unknown (USACE, 2001a).

Plate 6 of the ASR shows a range named “Mock Fire Base” (OA-17) just north of Parcels 105Q-X and 225Q (Figure 1-4). According to the ASR, the Mock Fire Base appears to have been built

10/26/2006 2:46:16 PM  
 DWG. NO.: 796887es.598  
 PROJ. NO.: 796887  
 INITIATOR: J. BOND  
 PROJ. MGR.: J. YACOB  
 DRAFT. CHK. BY: ENGR. CHK. BY: S. MORAN  
 DATE LAST REV.:  
 DRAWN BY:  
 STARTING DATE: 10/30/02  
 DRAWN BY: D. BOMAR



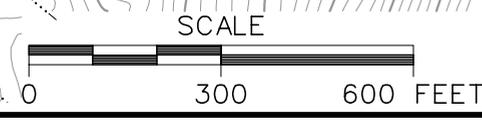
- LEGEND**
- UNIMPROVED ROAD
  - PAVED ROAD AND PARKING
  - TOPOGRAPHIC CONTOUR (CONTOUR INTERVAL - 5 FOOT)
  - TREES / TREELINE
  - AREA OF INVESTIGATION
  - FIRING LINE
  - SURFACE DRAINAGE / CREEK
  - TRENCH

**APPROXIMATE LOCATION OF OBSERVED FEATURES**

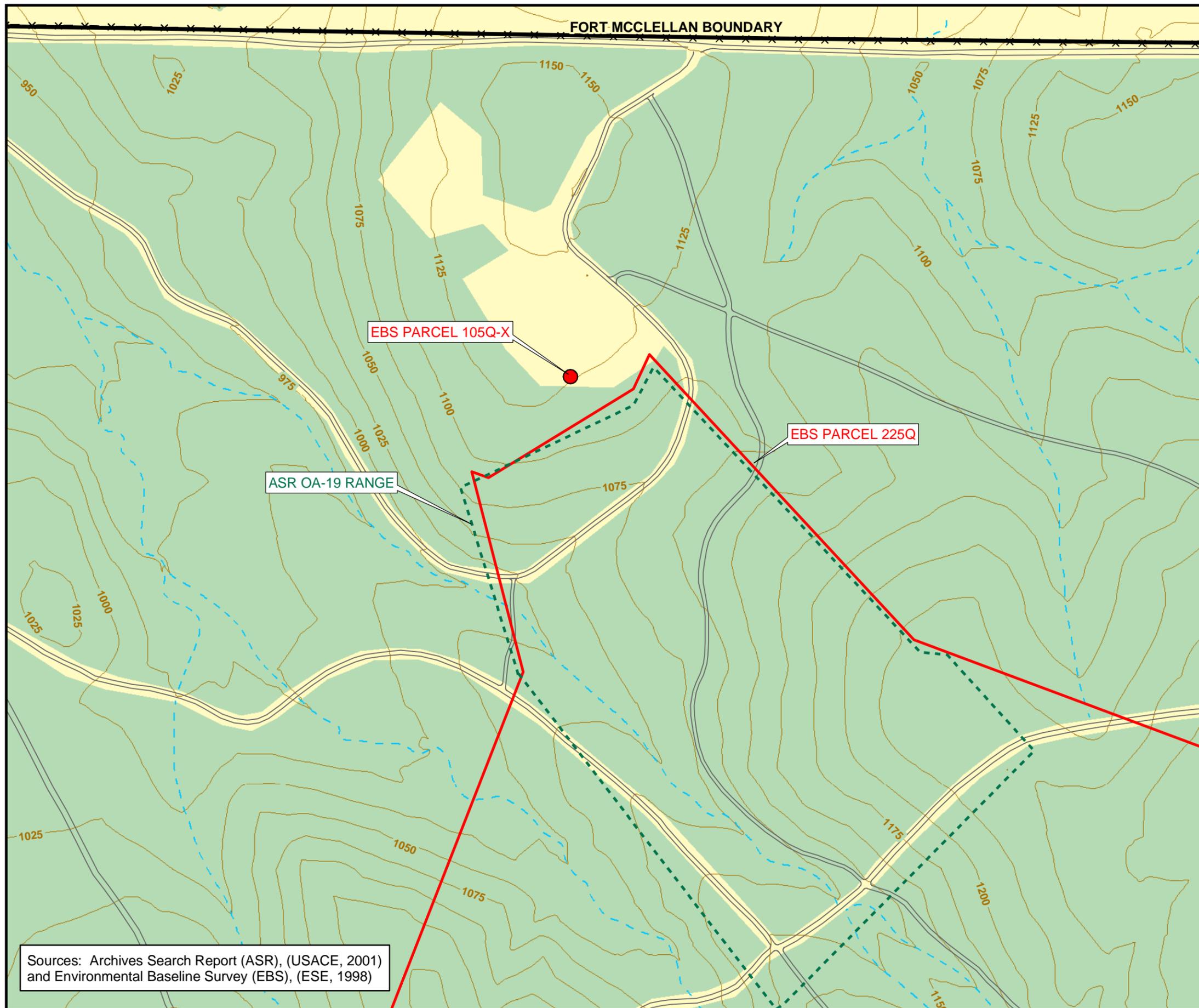
- ① 40mm/57mm GUN
- ② SUSPECTED M16 BLANKS
- ③ 5 MOUNDS 3-5' HIGH, CONCRETE SLAB PIECES
- ④ 5 PITS, 2 SURROUNDED BY ROCKS
- ⑤ SOIL DISTURBANCE, CRESCENT-SHAPED MOUND, CABLE EMBEDDED IN GROUND
- ⑥ SURFACE DEPRESSION/IMPACT CRATER
- ⑦ VEHICLE PARTS USED AS TARGETS
- ⑧ 81mm MORTARS (UNFUZED, PRACTICE)

**FIGURE 1-2**  
 SITE MAP  
 FORMER MORTAR FIRING POINT  
 PARCEL 105Q-X  
 FORMER DEFENDAM RANGE  
 (EASTERN), PARCEL 225Q

U. S. ARMY CORPS OF ENGINEERS  
 MOBILE DISTRICT  
 FORT McCLELLAN  
 CALHOUN COUNTY, ALABAMA  
 Contract No. DACA21-96-D-0018



dbomar  
 796887es.598



Sources: Archives Search Report (ASR), (USACE, 2001) and Environmental Baseline Survey (EBS), (ESE, 1998)

# Figure 1-3

## Range Location Map, ASR Plate 5

Former Mortar Firing Point, Parcel 105Q-X and Former Defendamm Range (Eastern), Parcel 225Q Fort McClellan, Alabama

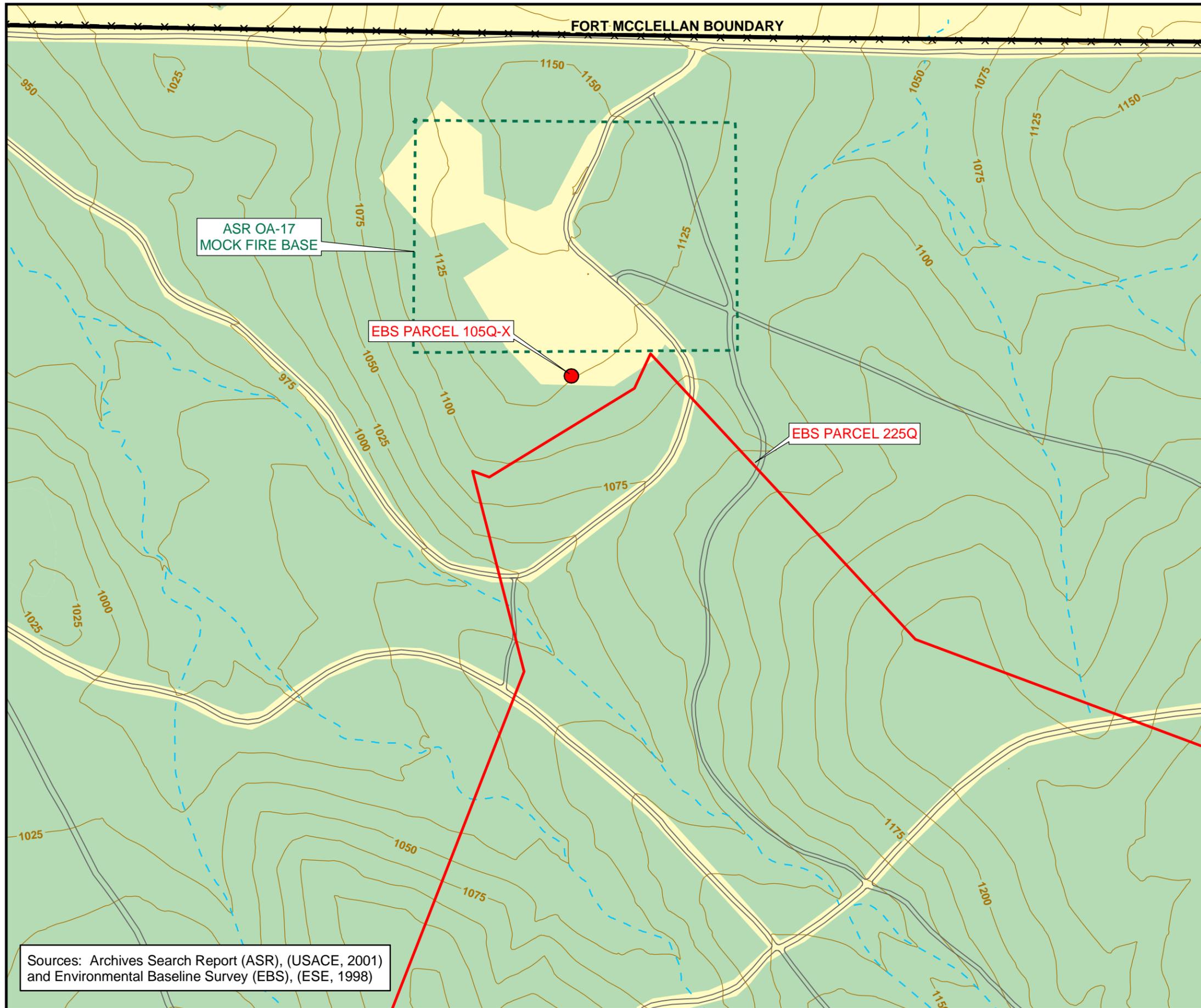
**Legend**

- ASR Range
- EBS Parcel
- Wooded
- Not Wooded
- Roads
- Surface Drainage Feature (Dashed where intermittent)
- Topographic Contour (25-foot interval)
- Fenceline
- Fort McClellan Boundary



NAD83 State Plane Coordinates





Sources: Archives Search Report (ASR), (USACE, 2001) and Environmental Baseline Survey (EBS), (ESE, 1998)

# Figure 1-4

## Range Location Map, ASR Plate 6

Former Mortar Firing Point, Parcel 105Q-X and Former Defendam Range (Eastern), Parcel 225Q Fort McClellan, Alabama

### Legend

-  ASR Range
-  EBS Parcel
-  Wooded
-  Not Wooded
-  Roads
-  Surface Drainage Feature (Dashed where intermittent)
-  Topographic Contour (25-foot interval)
-  Fenceline
-  Fort McClellan Boundary

300 0 300 Feet



NAD83 State Plane Coordinates



U.S. Army Corps of Engineers Mobile District

during the Vietnam War. Training debris found during a site visit by the ASR team included expended rifle blanks and pyrotechnic devices, such as smoke grenades (USACE, 2001a).

During SI site reconnaissance conducted in January 2002, numerous physical features and training aids were observed at the Former Defendamm Range (Eastern), Parcel 225Q (Figure 1-2). Along the former firing line, a total of six mounds and five pits were observed. An area of soil disturbance containing a crescent-shaped mound and a cable embedded in the ground were seen near the northeastern end of the former firing line. Near the center of the former firing line, an area of five mounds, approximately 3 to 5 feet high, and concrete slab pieces were observed. Five pits were observed just south of the five mounds.

In the eastern portion of the area of investigation (in Parcel 225Q), 12 items identified by UXO personnel as 81mm mortars were found on the ground surface (Figure 1-2). The mortars appeared to be unfuzed and were suspected to be practice mortars. Numerous vehicle-body parts were observed west of the mortars along an intermittent stream that runs northwest through Parcel 225Q. The vehicle parts cover an area approximately 300 feet long and contain some bullet holes or possibly mortar fragment holes.

***Aerial Photographs.*** Available aerial photographs were reviewed to reveal historical land-use activity within the area of investigation.

**1937.** The 1937 aerial photograph shows the area of investigation as an unaltered, heavily forested area.

**1940.** The 1940 aerial photograph (Figure 1-5) shows most of the area of investigation to be covered with trees and vegetation, with the exception of a long, cleared area of land running north to south along the western boundary of Parcel 225Q. It is unknown what the area was used for at this time.

**1949.** The 1949 aerial photograph (Figure 1-6) shows the area west of Parcel 105Q-X and part of the northern area of Parcel 225Q to be sparsely vegetated, indicating possible heavy use activity. Three bare circular areas are visible near the southern portion of the study area. The cleared area of land seen in the 1940 photograph has become almost fully reclaimed by vegetation. Two separate portions of the cleared area remain, one just northwest of the Former Mortar Firing Point, Parcel 105Q-X, and the second (running northwest to southeast) near the western border of Parcel 225Q.



e:/ftmc/mxd/p225/fig1\_5\_1940aerial 07/19/16

# Figure 1-5

## 1940 Aerial Photograph

Former Mortar Firing Point,  
Parcel 105Q-X and Former Defendam  
Range (Eastern), Parcel 225Q  
Fort McClellan, Alabama

### Legend

 EBS Parcel

300 0 300 Feet



NAD83 State Plane Coordinates

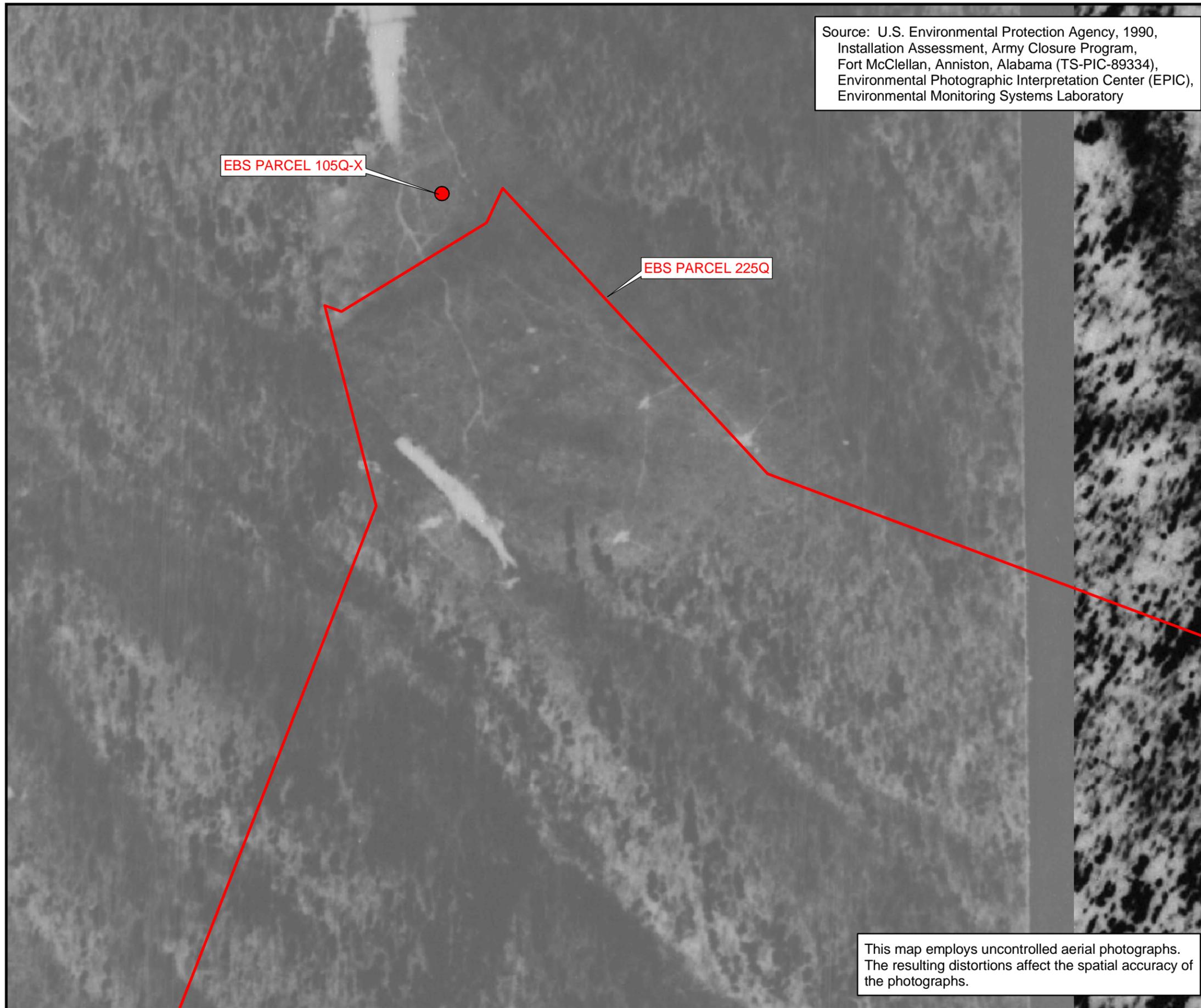


 Shaw Environmental, Inc.



U.S. Army Corps  
of Engineers  
Mobile District

Contract No. DACA21-96-D-0018



# Figure 1-6

## 1949 Aerial Photograph

Former Mortar Firing Point, Parcel 105Q-X and Former Defendam Range (Eastern), Parcel 225Q Fort McClellan, Alabama

### Legend

 EBS Parcel

300 0 300 Feet



NAD83 State Plane Coordinates



Contract No. DACA21-96-D-0018

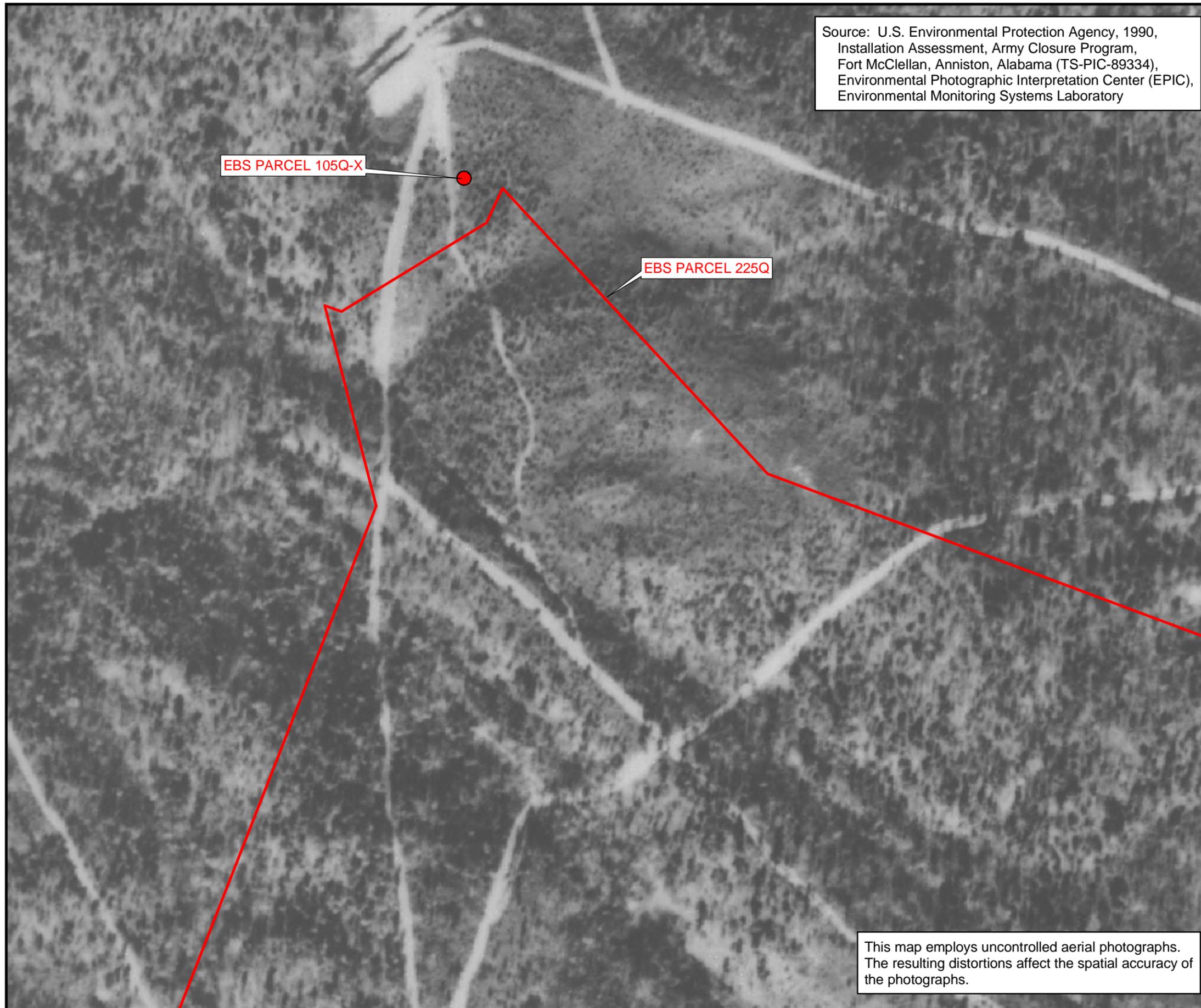
**1954.** Activity in the 1954 aerial photograph appears similar to the 1949 photograph. Due to the lack of clarity of this photograph, it is difficult to determine if land-use activity in the study area has changed.

**1961.** The 1961 aerial photograph (Figure 1-7) shows considerably more activity in the area north of Parcel 105Q-X. Two parallel surface features, oriented northeast-southwest, appear just north of Parcel 105Q-X and several dirt roads are prominent throughout the area of investigation.

**1969.** The 1969 aerial photograph appears similar to the 1961 photograph. The two northeast-southwest-trending surface features remain visible as well as the dirt roads seen previously. Most of Parcel 225Q appears to have been completely reclaimed by vegetation.

**1976.** The 1976 aerial photograph (Figure 1-8) shows the area northwest of Parcel 105Q-X to be almost void of vegetation from land use.

**1982, 1994, and 1998.** The 1982, 1994, and 1998 aerial photographs show little activity within the area of investigation. Most of the study area appears to have been completely reclaimed by vegetation. However, the cleared area observed on the 1976 aerial photograph is visible on all three photographs.



e:/ftmc/mxd/p225/fig1\_7\_1961aerial 07/18/16

# Figure 1-7

## 1961 Aerial Photograph

Former Mortar Firing Point, Parcel 105Q-X and Former Defendam Range (Eastern), Parcel 225Q Fort McClellan, Alabama

### Legend

 EBS Parcel

300 0 300 Feet



NAD83 State Plane Coordinates

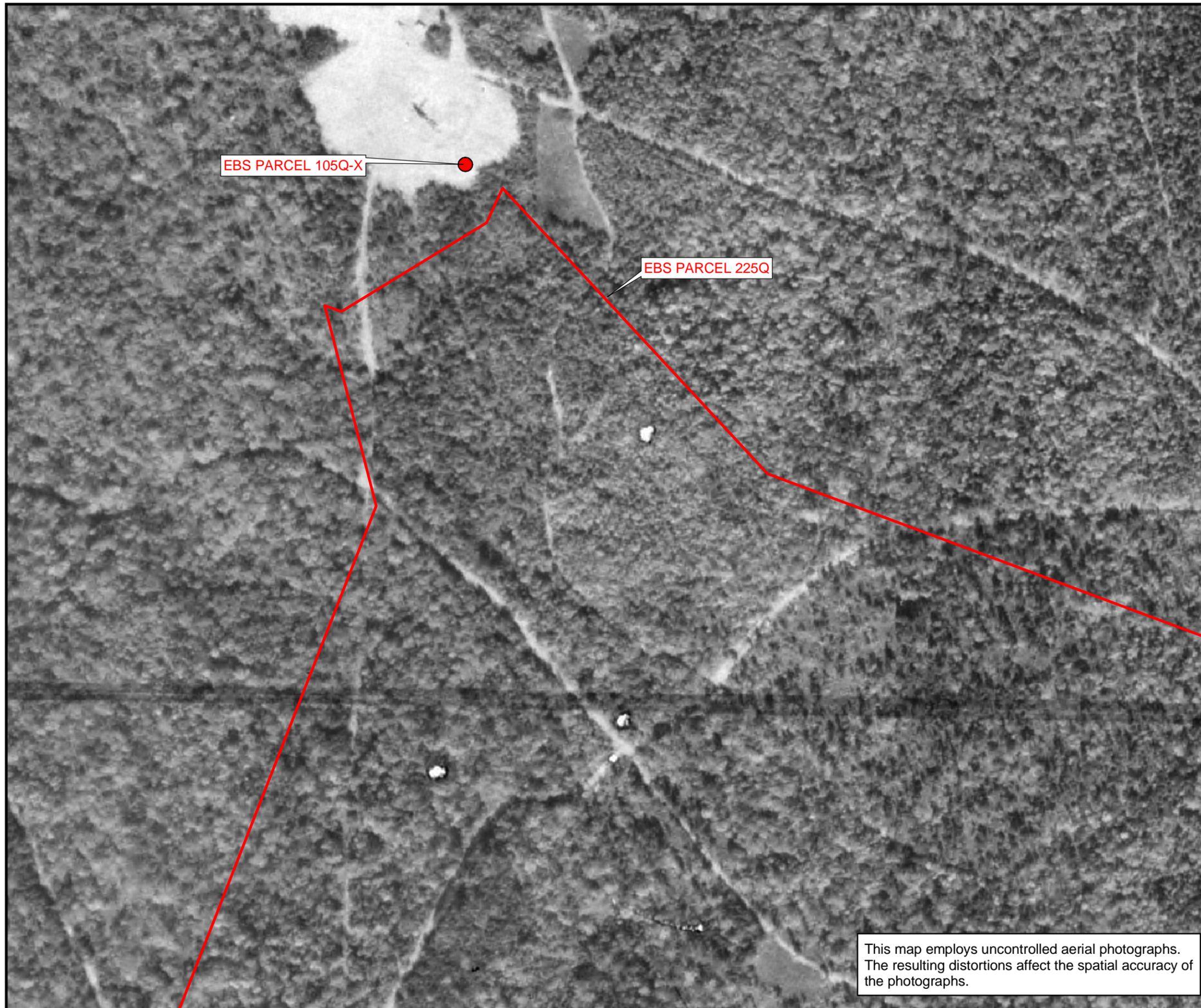


 Shaw Environmental, Inc.



U.S. Army Corps of Engineers Mobile District

Contract No. DACA21-96-D-0018



# Figure 1-8

## 1976 Aerial Photograph

Former Mortar Firing Point,  
Parcel 105Q-X and Former Defendam  
Range (Eastern), Parcel 225Q  
Fort McClellan, Alabama

### Legend

 EBS Parcel

300 0 300 Feet



NAD83 State Plane Coordinates



## 2.0 Previous Investigations

---

An EBS was conducted in the mid to late 1990s to document the baseline environmental conditions of all FTMC property (ESE, 1998). The objective of the study was to identify sites that, based on available information, have no history of contamination and comply with DOD guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria:

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas).
2. Areas where only release or disposal of petroleum products has occurred.
3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response.
4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken.
5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken.
6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented.
7. Areas that are not evaluated or require additional evaluation.

For non-CERCLA environmental or safety issues, the parcel label includes the following components: a unique non-CERCLA issue number, the letter "Q" designating the parcel as a Community Environmental Response Facilitation Act (CERFA) Category 1 Qualified parcel, and the code of the specific non-CERCLA issue(s) present (ESE, 1998). The non-CERCLA issue codes used are:

- A = Asbestos (in buildings)
- L = Lead-based paint (in buildings)
- P = Polychlorinated biphenyls
- R = Radon (in buildings)
- RD = Radionuclides/radiological issues

- X = UXO
- CWM = Chemical warfare material.

The EBS was conducted in accordance with CERFA protocols (Public Law 102-426) and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, the Alabama Department of Environmental Management (ADEM), the U.S. Environmental Protection Agency (EPA) Region 4, and Calhoun County, as well as a database search of CERCLA-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historical maps and aerial photographs were reviewed to document historical land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

Parcels 105Q-X and 225Q are areas where no known or recorded storage, release, or disposal (including migration) of hazardous substances or petroleum products has occurred. The parcels, however, were qualified because chemicals of potential concern and/or UXO may be present as a result of historical range activities. Therefore, Parcels 105Q-X and 225Q required additional evaluation to determine their environmental condition.

## **3.0 Current Site Investigation Activities**

---

This chapter summarizes SI activities conducted by Shaw at the Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q, including UXO avoidance and environmental sampling and analysis activities.

### **3.1 UXO Avoidance**

UXO avoidance was performed at Parcels 105Q-X and 225Q following methodology outlined in the SAP. Shaw UXO personnel used a low-sensitivity magnetometer to perform a surface sweep of the area of investigation prior to site access. After the site was cleared for access, sample locations were monitored by UXO personnel following procedures outlined in the SAP.

### **3.2 Environmental Sampling**

Environmental sampling performed during the SI at Parcels 105Q-X and 225Q consisted of the collection of surface and depositional soil samples, subsurface soil samples, surface water samples, and sediment samples for chemical analysis. Sample locations were determined by observing site physical characteristics during site reconnaissance and by reviewing historical documents and aerial photographs pertaining to activities conducted at the site. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figure 3-1. Samples were submitted for laboratory analysis of potential site-related parameters listed in Section 3.4. Most of the samples were only analyzed for potential range-related constituents (i.e., metals and explosives). However, approximately 10 percent of the samples were analyzed for a broader suite of parameters, including volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and pesticides/herbicides, to provide additional site characterization data.

#### **3.2.1 Surface and Depositional Soil Sampling**

Twenty surface soil samples and three depositional soil samples were collected at Parcels 105Q-X and 225Q, at the locations shown on Figure 3-1. Soil sampling locations and rationale are presented in Table 3-1. Sample designations and analytical parameters are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on UXO avoidance activities, sampling rationale, presence of surface structures, and site topography.

**Table 3-1**

**Sampling Locations and Rationale  
Former Mortar Firing Point, Parcel 105Q-X and Former Defendamm Range (Eastern), Parcel 225Q  
Fort McClellan, Alabama**

(Page 1 of 2)

Sample Location	Sample Media	Sample Location Rationale
HR-105Q-GP01	Surface soil Subsurface soil	Surface and subsurface soil samples were collected in the northernmost trench in the cleared area north of Parcel 105Q-X to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-105Q-GP02	Surface soil Subsurface soil	Surface and subsurface soil samples were collected at the northernmost gun in the cleared area north of Parcel 105Q-X to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-105Q-GP03	Surface soil Subsurface soil	Surface and subsurface soil samples were collected at the southernmost gun in the cleared area north of Parcel 105Q-X to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-105Q-GP04	Surface soil Subsurface soil	Surface and subsurface soil samples were collected in the center of the southernmost trench, in the cleared area north of Parcel 105Q-X to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-105Q-GP05	Surface soil Subsurface soil	Surface and subsurface soil samples were collected at the center of the Former Mortar Firing Point, Parcel 105Q-X to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-105Q-GP06	Surface soil Subsurface soil	Surface and subsurface soil samples were collected from the floor of the berm with excavated cells to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP01	Surface soil Subsurface soil	Surface and subsurface soil samples were collected on one of the five mounds north of the former firing line for Parcel 225Q to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP02	Surface soil Subsurface soil	Surface and subsurface soil samples were collected on the crescent-shaped mound along the former firing line at Parcel 225Q to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP03	Surface soil Subsurface soil	Surface and subsurface soil samples were collected approximately 200 feet south of the former firing line at Parcel 225Q, in an area of heavy use observed on aerial photographs, to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP04	Surface soil Subsurface soil	Surface and subsurface soil samples were collected approximately 450 feet downslope of the former firing line at Parcel 225Q, in an area of heavy use observed on aerial photographs, to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP05	Surface soil Subsurface soil	Surface and subsurface soil samples were collected approximately 450 feet southeast of the former firing line at Parcel 225Q to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP06	Surface soil Subsurface soil	Surface and subsurface soil samples were collected approximately 600 feet south of the former firing line at Parcel 225Q, in an area of heavy use observed on aerial photographs and downslope of a surface depression/impact crater, to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP07	Surface soil Subsurface soil	Surface and subsurface soil samples were collected approximately 675 feet southeast of the former firing line at Parcel 225Q to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP08	Surface soil Subsurface soil	Surface and subsurface soil samples were collected in the central portion of the area of investigation, in an area with numerous vehicle body parts used as targets, to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP09	Surface soil Subsurface soil	Surface and subsurface soil samples were collected in the central portion of the area of investigation, in the area of practice 81mm mortars, to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.

**Table 3-1**

**Sampling Locations and Rationale  
Former Mortar Firing Point, Parcel 105Q-X and Former Defendam Range (Eastern), Parcel 225Q  
Fort McClellan, Alabama**

(Page 2 of 2)

Sample Location	Sample Media	Sample Location Rationale
HR-225Q-GP10	Surface soil Subsurface soil	Surface and subsurface soil samples were collected in the central portion of the area of investigation, in the area of practice 81mm mortars, to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP11	Surface soil Subsurface soil	Surface and subsurface soil samples were collected in the southwestern corner of the area of investigation to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP12	Surface soil Subsurface soil	Surface and subsurface soil samples were collected in the southwestern portion of the area of investigation to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP13	Surface soil Subsurface soil	Surface and subsurface soil samples were collected along a slope in the southeastern portion of the area of investigation to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-GP14	Surface soil Subsurface soil	Surface and subsurface soil samples were collected along the base of a slope in the southeastern portion of the area of investigation to determine if contaminant releases into the environment have occurred from the use of this area and if contaminated soils exist at this site.
HR-225Q-DEP01	Depositional soil	A depositional soil sample was collected in a dry streambed along the western boundary of the area of investigation to determine if contaminant releases into the environment have occurred from use of this area and if contaminated soils exist at this site.
HR-225Q-DEP02	Depositional soil	A depositional soil sample was collected in a dry streambed in Parcel 225Q, near numerous vehicle parts used as targets, to determine if contaminant releases into the environment have occurred from use of this area and if contaminated soils exist at this site.
HR-225Q-DEP03	Depositional soil	A depositional soil sample was collected in a dry streambed at the southern boundary of the area of investigation to determine if contaminant releases into the environment have occurred from use of this area and if contaminated soils exist at this site.
HR-225Q-SW/SD01	Surface Water Sediment	Surface water and sediment samples were collected from a stream in the southwestern portion of the area of investigation, upstream of the site, to determine if contaminated media exist at this site.
HR-225Q-SW/SD02	Surface Water Sediment	Surface water and sediment samples were collected from a stream in the southwestern portion of the area of investigation to determine if contaminated media exist at this site.
HR-225Q-SW/SD03	Surface Water Sediment	Surface water and sediment samples were collected from a stream near the southwestern portion of the area of investigation, downstream of the site, to determine if contaminated media exist at this site.

Table 3-2

**Soil Sample Designations and Analytical Parameters  
Former Mortar Firing Point, Parcel 105Q-X and Former Defendamm Range (Eastern), Parcel 225Q  
Fort McClellan, Alabama**

(Page 1 of 2)

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Parameters
			Field Duplicates	MS/MSD	
HR-105Q-GP01	HR-105Q-GP01-SS-RR0001-REG HR-105Q-GP01-DS-RR0002-REG	0-1 1.5-2.5		HR-105Q-GP01-SS-RR0001-MS/MSD	Metals, VOCs, SVOCs, Pesticides, Herbicides, and Explosives
HR-105Q-GP02	HR-105Q-GP02-SS-RR0003-REG HR-105Q-GP02-DS-RR0004-REG	0-1 1-2			Metals and Explosives
HR-105Q-GP03	HR-105Q-GP03-SS-RR0005-REG HR-105Q-GP03-DS-RR0006-REG	0-1 2.5-3.5			Metals and Explosives
HR-105Q-GP04	HR-105Q-GP04-SS-RR0007-REG HR-105Q-GP04-DS-RR0008-REG	0-1 1-2	HR-105Q-GP04-DS-RR0009-FD		Metals, VOCs, SVOCs, Pesticides, Herbicides, and Explosives
HR-105Q-GP05	HR-105Q-GP05-SS-RR0010-REG HR-105Q-GP05-DS-RR0011-REG	0-1 1-1.5			Metals and Explosives
HR-105Q-GP06	HR-105Q-GP06-SS-RR0012-REG HR-105Q-GP06-DS-RR0013-REG	0-1 2-3			Metals and Explosives
HR-225Q-GP01	HR-225Q-GP01-SS-RM0001-REG HR-225Q-GP01-DS-RM0002-REG	0-1 2-3			Metals and Explosives
HR-225Q-GP02	HR-225Q-GP02-SS-RM0003-REG HR-225Q-GP02-DS-RM0004-REG	0-1 3-4			Metals and Explosives
HR-225Q-GP03	HR-225Q-GP03-SS-RM0005-REG HR-225Q-GP03-DS-RM0006-REG	0-1 2-3			Metals and Explosives
HR-225Q-GP04	HR-225Q-GP04-SS-RM0007-REG HR-225Q-GP04-DS-RM0008-REG	0-1 2-3			Metals and Explosives
HR-225Q-GP05	HR-225Q-GP05-SS-RM0009-REG HR-225Q-GP05-DS-RM0010-REG	0-1 2-3			Metals and Explosives
HR-225Q-GP06	HR-225Q-GP06-SS-RM0011-REG HR-225Q-GP06-DS-RM0012-REG	0-1 1-2			Metals and Explosives
HR-225Q-GP07	HR-225Q-GP07-SS-RM0013-REG HR-225Q-GP07-DS-RM0014-REG	0-1 1.5-2.5			Metals and Explosives
HR-225Q-GP08	HR-225Q-GP08-SS-RM0015-REG HR-225Q-GP08-DS-RM0016-REG	0-1 2-3			Metals and Explosives
HR-225Q-GP09	HR-225Q-GP09-SS-RM0017-REG HR-225Q-GP09-DS-RM0018-REG	0-1 1-2			Metals and Explosives

Table 3-2

**Soil Sample Designations and Analytical Parameters  
Former Mortar Firing Point, Parcel 105Q-X and Former Defendamm Range (Eastern), Parcel 225Q  
Fort McClellan, Alabama**

(Page 2 of 2)

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Parameters
			Field Duplicates	MS/MSD	
HR-225Q-GP10	HR-225Q-GP10-SS-RM0019-REG HR-225Q-GP10-DS-RM0021-REG	0-1 1-2	HR-225Q-GP10-SS-RM0020-FD		Metals and Explosives
HR-225Q-GP11	HR-225Q-GP11-SS-RM0022-REG HR-225Q-GP11-DS-RM0023-REG	0-1 1-2			Metals and Explosives
HR-225Q-GP12	HR-225Q-GP12-SS-RM0024-REG HR-225Q-GP12-DS-RM0025-REG	0-1 3-4			Metals and Explosives
HR-225Q-GP13	HR-225Q-GP13-SS-RM0026-REG HR-225Q-GP13-DS-RM0027-REG	0-1 2-3			Metals and Explosives
HR-225Q-GP14	HR-225Q-GP14-SS-RM0028-REG HR-225Q-GP14-DS-RM0029-REG	0-1 2-3	HR-225Q-GP14-DS-RM0030-FD		Metals and Explosives
HR-225Q-DEP01	HR-225Q-DEP01-DEP-RM0031-REG	0-0.5			Metals and Explosives
HR-225Q-DEP02	HR-225Q-DEP02-DEP-RM0032-REG	0-0.5		HR-225Q-DEP02-DEP-RM0032-MS/MSD	Metals, VOCs, SVOCs, Pesticides, Herbicides, and Explosives
HR-225Q-DEP03	HR-225Q-DEP03-DEP-RM0033-REG	0-0.5			Metals and Explosives

DEP - Depositional soil.

DS - Deep (subsurface) soil.

FD - Field duplicate.

MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

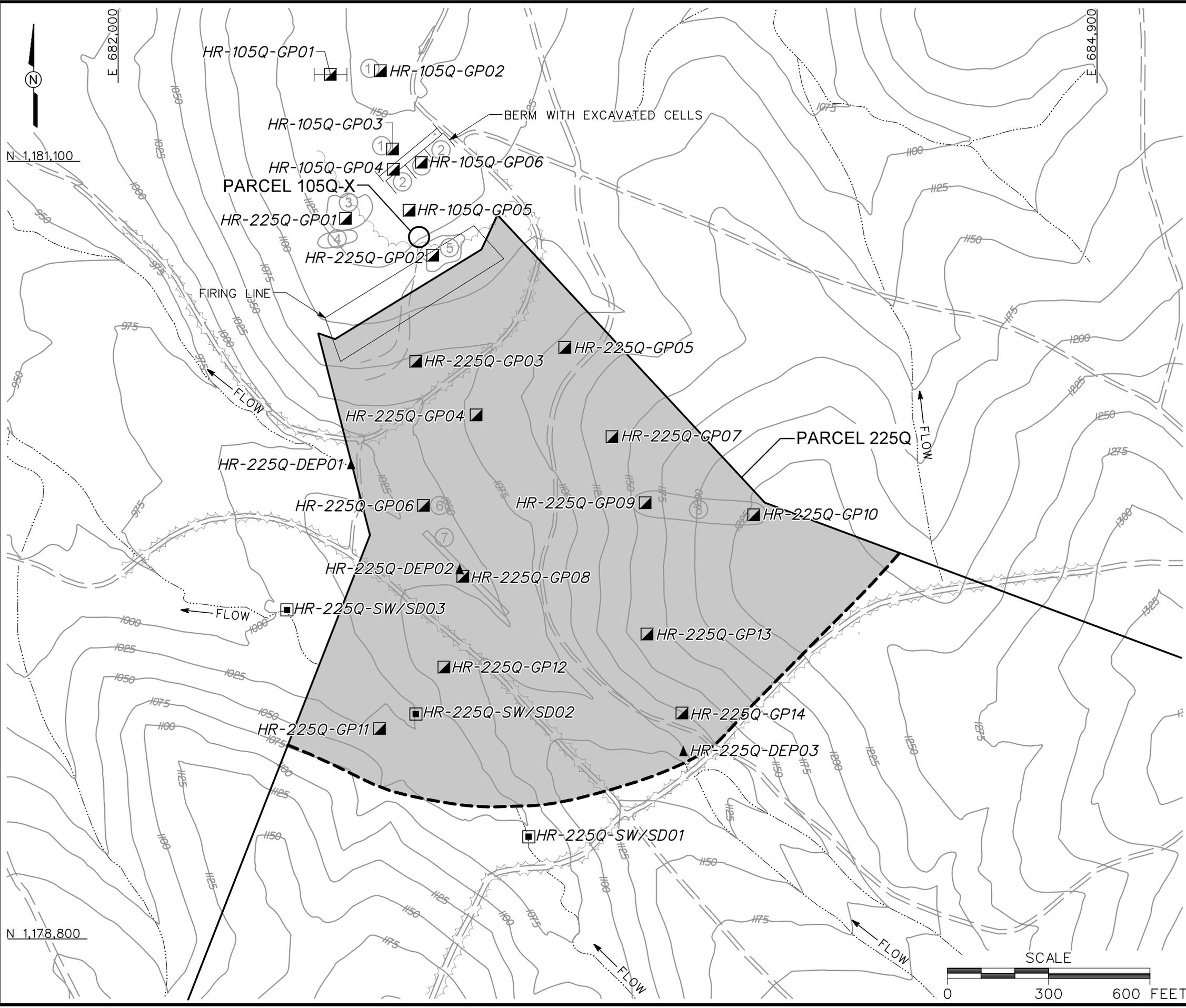
REG - Regular field sample.

SS - Surface soil.

SVOC - Semivolatile organic compound.

VOC - Volatile organic compound.

DWG. NO.: 796887.es.599  
 PROJ. NO.: 796887  
 INITIATOR: J. BOND  
 PROJ. MGR.: J. YACOB  
 DRAFT. CHK. BY:  
 ENGR. CHK. BY: S. MORAN  
 DATE LAST REV.:  
 DRAWN BY:  
 STARTING DATE: 10/30/02  
 DRAWN BY: D. BOMAR  
 10/26/2006  
 2:47:29 PM  
 abomar  
 796887.es.599



**LEGEND**

- UNIMPROVED ROAD
- PAVED ROAD AND PARKING
- TOPOGRAPHIC CONTOUR (CONTOUR INTERVAL - 25 FOOT)
- TREES / TREELINE
- AREA OF INVESTIGATION
- FIRING LINE
- SURFACE DRAINAGE / CREEK
- TRENCH
- SURFACE WATER/SEDIMENT SAMPLE LOCATION
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- DEPOSITIONAL SOIL SAMPLE LOCATION

- APPROXIMATE LOCATION OF OBSERVED FEATURES**
- ① 40mm/57mm GUN
  - ② SUSPECTED M16 BLANKS
  - ③ 5 MOUNDS 3-5' HIGH, CONCRETE SLAB PIECES
  - ④ 5 PITS, 2 SURROUNDED BY ROCKS
  - ⑤ SOIL DISTURBANCE, CRESCENT-SHAPED MOUND, CABLE EMBEDDED IN GROUND
  - ⑥ SURFACE DEPRESSION/IMPACT CRATER
  - ⑦ VEHICLE PARTS USED AS TARGETS
  - ⑧ 81mm MORTARS (UNFUZED, PRACTICE)

**FIGURE 3-1**  
**SAMPLE LOCATION MAP**  
**FORMER MORTAR FIRING POINT**  
**PARCEL 105Q-X**  
**FORMER DEFENDAM RANGE**  
**(EASTERN), PARCEL 225Q**

U. S. ARMY CORPS OF ENGINEERS  
 MOBILE DISTRICT  
 FORT McCLELLAN  
 CALHOUN COUNTY, ALABAMA  
 Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

**Sample Collection.** Surface soil samples were collected from the uppermost foot of soil using a stainless-steel hand auger, following the methodology specified in the SAP. Depositional soil samples were collected from the upper six inches of soil with a stainless-steel spoon. Surface and depositional soil samples were collected by first removing surface debris (e.g., rocks, bullets/shell casings, and vegetation) from the immediate sample area. After the soil was collected with the sampling device, it was screened for volatile organic vapors with a photoionization detector (PID) in accordance with procedures outlined in the SAP. As necessary, the soil fraction for VOC analysis was collected directly from the sample device using three EnCore<sup>®</sup> samplers. The remaining soil was then transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using the analytical methods specified in Section 3.4.

### **3.2.2 Subsurface Soil Sampling**

Subsurface soil samples were collected from 20 soil borings at Parcels 105Q-X and 225Q, as shown on Figure 3-1. Subsurface soil sampling locations and rationale are presented in Table 3-1. Sample designations, depths, and analytical parameters are listed in Table 3-2. Soil boring locations were determined in the field by the on-site geologist based on the sampling rationale, UXO avoidance activities, presence of surface structures, and site topography.

**Sample Collection.** Subsurface soil samples were collected from soil borings at depths greater than one foot below ground surface (bgs) in the unsaturated zone. The soil borings were advanced and soil samples collected using a stainless-steel hand auger following procedures specified in the SAP, except at one location (HR-105Q-GP05). At sample location HR-105Q-GP05, the sample was collected using direct-push technology in accordance with procedures presented in the SAP. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.4.

Subsurface soil samples were collected continuously to 4 feet bgs or until refusal was encountered. Samples were field screened using a PID to measure volatile organic vapors. The sample displaying the highest reading was selected and sent to the laboratory for analysis; however, at those locations where PID readings were below background, the deepest sample interval was submitted for analysis. As necessary, the soil fraction for VOC analysis was collected directly from the sample device using three EnCore samplers. The remaining soil was then transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The on-site geologist constructed a detailed boring log for each soil boring.

The boring logs are included in Appendix B. At the completion of soil sampling, boreholes were abandoned with bentonite pellets and hydrated with potable water following borehole abandonment procedures summarized in the SAP.

### **3.2.3 Surface Water Sampling**

Three surface water samples were collected from intermittent streams at Parcels 105Q-X and 225Q at the locations shown on Figure 3-1. The surface water sample locations and rationale are listed in Table 3-1. Sample designations and analytical parameters are listed in Table 3-3. The actual sampling locations were determined based on field observations.

**Sample Collection.** The surface water samples were collected by dipping a stainless-steel pitcher in the intermittent stream and pouring the water into the sample containers, following procedures in the SAP. The samples were collected after field parameters had been measured using a calibrated water quality meter. Surface water field parameters are summarized in Table 3-4. The sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-3 using methods outlined in Section 3.4.

### **3.2.4 Sediment Sampling**

Three sediment samples were collected at the same locations as the surface water samples, as shown on Figure 3-1. The sediment sample locations and rationale are presented in Table 3-1. Sample designations and analytical parameters are listed in Table 3-3. The actual sediment sample locations were determined based on field observations.

**Sample Collection.** The sediment samples were collected in accordance with procedures specified in the SAP. Sediments were collected with a stainless-steel spoon and placed in a clean stainless-steel bowl. The samples were then homogenized and placed in the appropriate sample containers. The sample collection logs are included in Appendix A. The sediment samples were analyzed for the parameters listed in Table 3-3 using methods outlined in Section 3.4.

## **3.3 Surveying of Sample Locations**

Sample locations were surveyed using global positioning system and conventional civil survey techniques described in the SAP. Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix C.

Table 3-3

**Surface Water and Sediment Sample Designations and Analytical Parameters  
Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q  
Fort McClellan, Alabama**

Sample Location	Sample Designation	Sample Media	QA/QC Samples		Analytical Parameters
			Field Duplicates	MS/MSD	
HR-225Q-SW/SD01	HR-225Q-SW/SD01-SW-RM2001-REG	SW			Metals and Explosives
	HR-225Q-SW/SD01-SD-RM1001-REG	SED	HR-225Q-SW/SD01-SD-RM1002-FD		Metals, Explosives, TOC, and Grain Size
HR-225Q-SW/SD02	HR-225Q-SW/SD02-SW-RM2002-REG	SW		HR-225Q-SW/SD02-SW-RM2002-MS/MSD	Metals, VOCs, SVOCs, Pesticides, Herbicides, and Explosives
	HR-225Q-SW/SD02-SD-RM1003-REG	SED			Metals, Explosives, TOC, and Grain Size
HR-225Q-SW/SD03	HR-225Q-SW/SD03-SW-RM2003-REG	SW			Metals and Explosives
	HR-225Q-SW/SD03-SD-RM1004-REG	SED	HR-225Q-SW/SD03-SD-RM1005-FD		Metals, Explosives, TOC, and Grain Size

FD - Field duplicate.

MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

REG - Regular field sample.

SED - Sediment.

SVOC - Semivolatile organic compound.

SW - Surface water.

TOC - Total organic carbon

VOC - Volatile organic compound.

**Table 3-4**

**Surface Water Field Parameters  
Former Mortar Firing Point, Parcel 105Q-X, and Former Defend Range (Eastern), Parcel 225Q  
Fort McClellan, Alabama**

<b>Sample Location</b>	<b>Sample Date</b>	<b>Specific Conductivity (mS/cm)</b>	<b>Dissolved Oxygen (mg/L)</b>	<b>ORP (mV)</b>	<b>Temperature (°C)</b>	<b>Turbidity (NTU)</b>	<b>pH (SU)</b>
HR-225Q-SW/SD01	23-Jul-02	0.011	7.87	215	21.2	5.7	5.19
HR-225Q-SW/SD02	23-Jul-02	0.010	8.41	190	21.9	5.6	5.79
HR-225Q-SW/SD03	23-Jul-02	0.011	7.84	235	22.3	7.3	5.60

°C - Degrees Celsius.

mg/L - Milligrams per liter.

mS/cm - Millisiemens per centimeter.

mV - Millivolts.

NTU - Nephelometric turbidity units.

ORP - Oxidation-reduction potential.

SU - Standard units.

### **3.4 Analytical Program**

In accordance with the approved site-specific work plan, samples collected during the SI were analyzed for various chemical parameters based on potential site-specific chemicals and on EPA, ADEM, FTMC, and USACE requirements. Samples collected at Parcels 105Q-X and 225Q were analyzed for the following parameters using EPA SW-846 methods, including Update III methods where applicable:

- Target analyte list metals – EPA Methods 6010B/7470A/7471A
- Nitroaromatic/nitramine explosives – EPA Method 8330.

Approximately ten percent of the samples were analyzed for the following additional parameters:

- Target compound list VOCs – EPA Method 8260B
- Target compound list SVOCs – EPA Method 8270C
- Chlorinated herbicides – EPA Method 8151A
- Chlorinated pesticides – EPA Method 8081A
- Organophosphorous pesticides – EPA Method 8141A.

In addition, the sediment samples were analyzed for total organic carbon (TOC) content (Walkley-Black Method) and grain size (American Society for Testing and Materials Method D422).

### **3.5 Sample Preservation, Packaging, and Shipping**

Sample preservation, packaging, and shipping followed requirements specified in the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in the SAP. Sample documentation and chain-of-custody records were completed as specified in the SAP.

Completed analysis request and chain-of-custody records (Appendix A) were included with each shipment of sample coolers to EMAX Laboratories, Inc. in Torrance, California.

### **3.6 Investigation-Derived Waste Management and Disposal**

Investigation-derived waste (IDW) was managed and disposed as outlined in the SAP. The IDW generated during the SI at Parcels 105Q-X and 225Q was segregated as follows:

- Soil boring cuttings
- Decontamination fluids
- Personal protective equipment.

Solid IDW was stored in lined roll-off bins inside the fenced area surrounding Buildings 335 and 336 prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analyses. Based on the results, soil boring cuttings and personal protective equipment generated during the SI were disposed as nonhazardous waste at the Three Corners Landfill located in Piedmont, Alabama.

Liquid IDW was contained in the 20,000-gallon sump associated with the Building T-338 vehicle washrack. Liquid IDW was characterized by VOC, SVOC, and metals analyses. Based on the analyses, liquid IDW was discharged as nonhazardous waste to the FTMC wastewater treatment plant on the Main Post.

### **3.7 Variances/Nonconformances**

One variance to the site-specific work plan was recorded during completion of the SI at Parcels 105Q-X and 225Q. Depositional soil samples were not collected at proposed locations HR-225Q-DEP04, HR-225Q-DEP05, and HR-225Q-DEP06. Instead, surface water and sediment samples were collected at these locations because water was present in the intermittent stream at the time of sample collection. This variance did not alter the intent of the investigation or the sampling rationale presented in the work plan. The variance report is included in Appendix D.

No nonconformances to the work plan were recorded during completion of the SI at Parcels 105Q-X and 225Q.

### **3.8 Data Quality**

The field sample analytical data are presented in tabular form in Appendix E. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan, the FTMC SAP and quality assurance plan, and standard, accepted methods and procedures. Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 2001b) and the stipulated requirements for the generation of definitive data presented in the SAP. Chemical data were reported by the laboratory via hard-copy data packages using Contract Laboratory Program-like forms.

**Data Validation.** The reported analytical data were validated in accordance with EPA National Functional Guidelines by Level III criteria. The data validation results are summarized by parcel in quality assurance reports, which include data validation summary reports (Appendix F). Selected results were qualified based on the implementation of accepted data validation procedures and practices. The qualified parameters are highlighted in the reports. The validation-assigned qualifiers were added to the FTMC ShawView™ database for tracking and reporting. The qualified data were used in comparisons to the SSSLs and ESVs. Rejected data (assigned an "R" qualifier) were not used in the comparisons to the SSSLs and ESVs. The data presented in this report, except where qualified, meet the principle data quality objective for this SI.

## **4.0 Site Characterization**

---

This chapter presents site characterization information for the Former Mortar Firing Point, Parcel 105Q-X, and Former Defendiam Range (Eastern), Parcel 225Q, including regional and site geology and site surface hydrology.

### **4.1 Regional and Site Geology**

#### **4.1.1 Regional Geology**

Calhoun County includes parts of two physiographic provinces: the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold-and-thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted, with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992) and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County it is either undifferentiated or divided into the Cochran and Nichols Formations and an upper, undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and

conglomerate with interbeds of greenish gray siltstone and mudstone. Massive to laminated greenish gray and black mudstone makes up the Nichols Formation, with thin interbeds of siltstone and very fine-grained sandstone (Osborne et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appears to dominate the unit and consists primarily of coarse-grained, vitreous quartzite and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consists of sandy and micaceous shale and silty, micaceous mudstone, which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east, and southwest of the Main Post and consists of interlayered bluish gray or pale yellowish gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline, porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post, as mapped by Warman and Causey (1962) and Osborne and Szabo (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated, thinly interbedded grayish red-purple mudstone, shale, siltstone, and greenish red and light gray sandstone, with locally occurring limestone and dolomite. Weaver Cave, located approximately one mile west of the northwest boundary of the Main Post, is situated in gray dolomite and limestone mapped as the Rome Formation (Osborne et al., 1997). The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962; Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga Formation is composed of dark gray, finely to coarsely crystalline, medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weather to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped as undifferentiated at FTMC and in other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded “window” in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites, and limestones and are mapped as one, undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Osborne et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark to light gray limestone with abundant chert nodules and greenish gray to grayish red phosphatic shale, with increasing amounts of calcareous chert towards the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin

intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale based on fossil data.

The Pennsylvanian Parkwood Formation overlies the Floyd Shale and consists of a medium to dark gray, silty clay, shale, and mudstone with interbedded light to medium gray, very fine to fine grained, argillaceous, micaceous sandstone. Locally the Parkwood Formation also contains beds of medium to dark gray, argillaceous, bioclastic to cherty limestone and beds of clayey coal up to a few inches thick (Raymond et al., 1988). The Parkwood Formation in Calhoun County is generally found within a structurally complex area known as the Coosa deformed belt. In the deformed belt, the Parkwood Formation and Floyd Shale are mapped as undifferentiated because their lithologic similarity and significant deformation make it impractical to map the contact (Thomas and Drahovzal, 1974; Osborne et al., 1988). The undifferentiated Parkwood Formation and Floyd Shale are found throughout the western quarter of Pelham Range.

The Jacksonville thrust fault is the most significant structural geological feature in the vicinity of the Main Post of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama, and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City fault (Osborne and Szabo, 1984). The Ordovician sequence that makes up the Eden thrust sheet is exposed at FTMC through an eroded window, or fenster, in the overlying thrust sheet. Rocks within the window display complex folding, with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation; north by the Conasauga Formation; northeast, east, and southwest by the Shady Dolomite; and southeast and southwest by the Chilhowee Group (Osborne et al., 1997). Two small klippen of the Shady Dolomite, bounded by the Jacksonville fault, have been recognized adjacent to the Pell City fault at the FTMC window (Osborne et al., 1997).

The Pell City fault serves as a fault contact between the bedrock within the FTMC window and the Rome and Conasauga Formations. The trace of the Pell City fault is also exposed approximately nine miles west of the FTMC window on Pelham Range, where it traverses northeast to southwest across the western quarter of Pelham Range. Here, the trace of the Pell City fault marks the boundary between the Pell City thrust sheet and the Coosa deformed belt.

The eastern three-quarters of Pelham Range is located within the Pell City thrust sheet, while the remaining western quarter of Pelham Range is located within the Coosa deformed belt. The Pell City thrust sheet is a large-scale thrust sheet containing Cambrian and Ordovician rocks and is relatively less structurally complex than the Coosa deformed belt (Thomas and Neathery, 1982). The Pell City thrust sheet is exposed between the traces of the Jacksonville and Pell City faults along the western boundary of the FTMC window and along the trace of the Pell City fault on Pelham Range (Thomas and Neathery, 1982; Osborne et al., 1988). The Coosa deformed belt is a narrow northeast-to-southwest-trending linear zone of complex structure (approximately 5 to 20 miles wide and approximately 90 miles in length) consisting mainly of thin imbricate thrust slices. The structure within these imbricate thrust slices is often internally complicated by small-scale folding and additional thrust faults (Thomas and Drahovzal, 1974).

#### **4.1.2 Site Geology**

Soils within the area of investigation at Parcels 105Q-X and 225Q are characterized as Stony Rough Land sandstone (Ss) (U.S. Department of Agriculture [USDA], 1961). This miscellaneous soil type consists of rough, mountainous areas with outcrops of sandstone and quartzite bedrock, loose rock fragments, and scattered patches of sandy soil material. It also includes rock escarpments on higher parts of the Choccolocco and Coldwater Mountains, where quartzite of the Weisner Formation is common (USDA, 1961).

Stony Rough Land sandstone consists of well-drained, shallow or stony, friable, medium to strongly acidic soils. Slopes generally are more than 25 percent. Erosion has been slight to severe, and some of the slopes have lost all of their original surface soil. The soil material is generally shallow over bedrock. Runoff is high, permeability is moderate to rapid, infiltration is slow, and the capacity for available moisture is low. The depth to bedrock is typically less than 2.5 feet, with depth to water exceeding 20 feet bgs (USDA, 1961).

The Former Mortar Firing Point, Parcel 105Q-X, and Former Defendam Range (Eastern), Parcel 225Q are bisected by an unnamed splay fault. The fault trace and geologic contacts strike parallel to the Jacksonville Fault (generally northeast to southwest) with transport direction of the thrust sheet to the northwest. Due to the occurrence of the splay fault just south of the Jacksonville Fault, the stratigraphic sequence is repeated within the area of investigation. Bedrock is mapped as the undifferentiated Chilhowee Group and the Shady Dolomite to the north of the splay fault. South of the splay fault, the undifferentiated Chilhowee Group is again exposed at ground surface (Osborne et al., 1997).

The undifferentiated Cambrian Chilhowee Group consists of a basal unit of mudstone, overlain by a unit of greenish gray mudstone with minor siltstone and sandstone. The sequence grades upward into a white to moderate reddish orange friable sandstone and conglomerate containing interbedded gray silty mudstone (Raymond et al., 1988). The undifferentiated Cambrian Chilhowee Group is overlain by the Cambrian Shady Dolomite. The Shady Dolomite is typically bluish gray thick bedded, medium crystalline limestone and light to dark gray, argillaceous to sandy, massive to laminated dolomite with a local unit silty clay and clayey siltstone at the base (Raymond et al., 1988).

Residuum encountered during soil boring activities at Parcels 105Q-X and 225Q consisted of light brown to brown to yellowish orange silt and sand with sandstone and quartz gravel, and little clay. Bedrock was not encountered during SI sampling activities.

#### **4.2 Site Surface Hydrology**

Precipitation in the form of rainfall averages about 53 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates (U.S. Department of Commerce, 1998). The major surface water features at the Main Post of FTMC include Remount Creek, Cane Creek, and Cave Creek. These waterways generally flow in a northwesterly to westerly direction towards the Coosa River on the western boundary of Calhoun County.

Ground elevation within the area of investigation ranges from approximately 1,000 to 1,225 feet above mean sea level. There are no perennial streams in the vicinity of the area of investigation. During periods of heavy precipitation surface water runoff in the area of Parcels 105Q-X and 225Q primarily drains into two northwesterly-flowing intermittent streams that transect the southern and western portions of the area of investigation (Figure 3-1). A third intermittent stream located just east of the area of investigation may receive runoff from the extreme eastern portion of the area of investigation, although this is expected to be minimal based on site topography.

## **5.0 Summary of Analytical Results**

---

The results of chemical analysis of the samples collected at the Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q, indicate that metals, VOCs, and pesticides were detected in site media. SVOCs, explosives, and herbicides were not detected in any of the samples collected. To evaluate whether the detected constituents present a potential risk to human health and the environment, analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed for human health and ecological risk evaluations as part of environmental investigations performed under the BRAC Environmental Restoration Program at FTMC. Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to metals background screening values to determine if the metals concentrations are within natural background concentrations (Science Applications International Corporation, 1998). Site metals data were also evaluated using statistical and geochemical methods (Appendix G) to select site-related metals (Shaw, 2005). In addition, a PERA was performed to further characterize potential risks to ecological receptors.

The following sections and Tables 5-1 through 5-4 summarize the results of the comparison of detected constituent concentrations to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix E.

### **5.1 Surface and Depositional Soil Analytical Results**

Twenty surface soil samples and three depositional soil samples were collected for chemical analysis at Parcels 105Q-X and 225Q. Surface soil samples were collected from the uppermost foot of soil, and depositional soil samples were collected from the uppermost six inches of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-1.

**Metals.** A total of 20 metals were detected in the surface and depositional soil samples. The concentrations of six metals (aluminum, arsenic, chromium, iron, manganese, and thallium) exceeded their respective SSSLs. Of these, only aluminum (at HR-105Q-GP01), chromium (HR-105Q-GP01), and manganese (HR-225Q-GP05, HR-225Q-GP06, and HR-225Q-GP11) also exceeded their respective background concentrations.

Eleven metals were detected at concentrations exceeding their respective ESVs: aluminum, barium, beryllium, chromium, cobalt, iron, lead, manganese, selenium, thallium, and vanadium.

Table 5-1

**Surface and Depositional Soil Analytical Results  
Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q  
Fort McClellan, Alabama**

(Page 1 of 8)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-105Q-GP01 RR0001 8-Jul-02 0-1					HR-105Q-GP02 RR0003 10-Jul-02 0-1					HR-105Q-GP03 RR0005 8-Jul-02 0-1				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	1.76E+04		YES	YES	YES	4.22E+03				YES	1.06E+04			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	5.78E+00			YES		2.60E+00			YES		4.28E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	3.93E+01					1.61E+01					4.25E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					ND					ND				
Calcium	mg/kg	1.72E+03	NA	NA	1.44E+02					5.78E+01	J				1.76E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	3.75E+01		YES	YES	YES	8.13E+00				YES	1.45E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	1.63E+00	J				1.13E+00	J				2.93E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	7.90E+00					2.17E+00					5.45E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	2.43E+04			YES	YES	6.37E+03			YES	YES	1.23E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	6.07E+00					4.12E+00					7.91E+00				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	6.37E+02					1.35E+02					3.37E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	9.46E+01					7.04E+01					1.98E+02				YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	6.31E-02	J				ND					3.58E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	5.34E+00					1.94E+00	J				4.74E+00				
Potassium	mg/kg	8.00E+02	NA	NA	5.81E+02	J				1.81E+02	J				4.62E+02	J			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	1.35E+00	B	YES		YES	7.41E-01	B	YES			6.33E-01	B	YES		
Sodium	mg/kg	6.34E+02	NA	NA	3.31E+01	J				2.41E+01	J				2.63E+01	J			
Thallium	mg/kg	3.43E+00	5.08E-01	1.00E+00	ND					ND					ND				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	4.94E+01				YES	1.34E+01				YES	2.36E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.30E+01	J				6.39E+00	J				1.12E+01	J			
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
Acetone	mg/kg	NA	7.76E+02	2.50E+00	1.10E-01					NR					NR				
<b>PESTICIDES</b>																			
Aldrin	mg/kg	NA	3.65E-02	2.50E-03	ND					NR					NR				
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	ND					NR					NR				

Table 5-1

**Surface and Depositional Soil Analytical Results**  
**Former Mortar Firing Point, Parcel 105Q-X, and Former Defend Range (Eastern), Parcel 225Q**  
**Fort McClellan, Alabama**

(Page 2 of 8)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-105Q-GP04 RR0007 9-Jul-02 0-1					HR-105Q-GP05 RR0010 10-Jul-02 0-1					HR-105Q-GP06 RR0012 8-Jul-02 0-1					
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	
<b>METALS</b>																				
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	6.63E+03				YES	5.56E+03				YES	8.86E+03				YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	2.17E+00			YES		4.90E+00			YES		3.50E+00				YES	YES
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	2.33E+01					3.68E+01					3.15E+01					
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					ND					ND					
Calcium	mg/kg	1.72E+03	NA	NA	5.62E+01	J				4.67E+01	J				7.13E+01	J				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.63E+01				YES	7.48E+00				YES	9.79E+00					YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	2.10E+00	J				6.26E+00					3.44E+00					
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	4.48E+00					6.29E+00					4.51E+00					
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.12E+04			YES	YES	1.30E+04			YES	YES	8.88E+03				YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	5.75E+00					5.52E+00					5.21E+00					
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	2.09E+02					2.07E+02					2.82E+02					
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.14E+02				YES	3.71E+02			YES	YES	1.87E+02					YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	ND					ND					ND					
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	2.56E+00					7.68E+00					5.20E+00					
Potassium	mg/kg	8.00E+02	NA	NA	5.50E+02	J				3.32E+02	J				3.23E+02	J				
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	6.46E-01	B	YES			9.45E-01	B	YES		YES	5.91E-01	B	YES			
Sodium	mg/kg	6.34E+02	NA	NA	3.44E+01	J				ND					2.03E+01	J				
Thallium	mg/kg	3.43E+00	5.08E-01	1.00E+00	ND					ND					ND					
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	2.16E+01				YES	1.70E+01				YES	1.69E+01					YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	4.76E+00	J				1.02E+01	J				9.71E+00	J				
<b>VOLATILE ORGANIC COMPOUNDS</b>																				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	ND					NR					NR					
<b>PESTICIDES</b>																				
Aldrin	mg/kg	NA	3.65E-02	2.50E-03	ND					NR					NR					
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	6.20E-04	J				NR					NR					

Table 5-1

**Surface and Depositional Soil Analytical Results**  
**Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q**  
**Fort McClellan, Alabama**

(Page 3 of 8)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-225Q-DEP01 RM0031 19-Jul-02 0-1					HR-225Q-DEP02 RM0032 22-Jul-02 0-.5					HR-225Q-DEP03 RM0033 19-Jul-02 0-.5				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	3.06E+03				YES	5.79E+03				YES	4.16E+03				YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	3.76E+00			YES		1.83E+00			YES		2.14E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	5.92E+01					1.78E+01					1.30E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	4.42E-01	J				ND					ND				
Calcium	mg/kg	1.72E+03	NA	NA	7.84E+01	J				5.73E+01	J				6.73E+01	J			
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	6.99E+00			YES		8.38E+00				YES	6.68E+00				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	8.94E+00					1.56E+00	J				ND				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	4.54E+00					8.34E+00					3.00E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.05E+04			YES	YES	8.31E+03			YES	YES	8.12E+03			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.92E+01					1.99E+01					3.12E+00				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	1.24E+02					1.50E+02					1.03E+02	J			
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	5.21E+02			YES	YES	1.48E+02				YES	4.41E+01				
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	ND					ND					ND				
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	5.75E+00					1.86E+00	J				1.53E+00	J			
Potassium	mg/kg	8.00E+02	NA	NA	1.25E+02	J				1.52E+02	J				ND				
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	5.40E-01	J	YES			5.15E-01	J	YES			ND				
Sodium	mg/kg	6.34E+02	NA	NA	ND					ND					ND				
Thallium	mg/kg	3.43E+00	5.08E-01	1.00E+00	ND					ND					ND				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.02E+01				YES	1.46E+01				YES	1.26E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.45E+01	J				8.20E+00	J				4.22E+00	J			
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					1.50E-01	J				NR				
<b>PESTICIDES</b>																			
Aldrin	mg/kg	NA	3.65E-02	2.50E-03	NR					1.00E-03	J				NR				
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	NR					ND					NR				

Table 5-1

**Surface and Depositional Soil Analytical Results**  
**Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q**  
**Fort McClellan, Alabama**

(Page 4 of 8)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-225Q-GP01 RM0001 8-Jul-02 0-1					HR-225Q-GP02 RM0003 8-Jul-02 0-1					HR-225Q-GP03 RM0005 10-Jul-02 0-1				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	7.38E+03				YES	1.09E+04			YES	YES	1.36E+04			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	3.31E+00		YES			5.46E+00			YES		5.73E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	3.45E+01					5.55E+01					5.90E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					ND					6.27E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	1.36E+02					8.03E+01	J				1.75E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.30E+01			YES		1.29E+01				YES	1.08E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	1.18E+00	J				1.31E+01					1.58E+01		YES		
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	3.21E+00					8.39E+00					7.52E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	7.91E+03			YES	YES	1.41E+04			YES	YES	1.38E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	5.50E+00	J				1.91E+01	J				1.94E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	2.40E+02					3.35E+02					3.15E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	9.17E+01					1.10E+03			YES	YES	5.13E+02			YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	ND					5.63E-02	J				4.81E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	3.30E+00					1.07E+01		YES			1.29E+01	J	YES		
Potassium	mg/kg	8.00E+02	NA	NA	1.77E+02	J				2.46E+02	J				1.25E+02	B			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	5.60E-01	B	YES			1.17E+00	B	YES		YES	ND				
Sodium	mg/kg	6.34E+02	NA	NA	2.41E+01	J				2.61E+01	J				2.26E+01	J			
Thallium	mg/kg	3.43E+00	5.08E-01	1.00E+00	ND					ND					ND				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.56E+01				YES	2.02E+01				YES	1.93E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.12E+01					2.07E+01					2.13E+01				
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR					NR				
<b>PESTICIDES</b>																			
Aldrin	mg/kg	NA	3.65E-02	2.50E-03	NR					NR					NR				
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	NR					NR					NR				

Table 5-1

**Surface and Depositional Soil Analytical Results**  
**Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q**  
**Fort McClellan, Alabama**

(Page 5 of 8)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-225Q-GP04 RM0007 10-Jul-02 0-1					HR-225Q-GP05 RM0009 9-Jul-02 0-1					HR-225Q-GP06 RM0011 9-Jul-02 0-1					
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	
<b>METALS</b>																				
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	1.03E+04				YES	YES	1.42E+04			YES	YES	1.55E+04			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	3.03E+00				YES		3.34E+00			YES		5.11E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	6.20E+01						2.12E+02		YES	YES	1.12E+02					
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	4.86E-01	J					9.88E-01	J	YES		9.98E-01	J	YES			
Calcium	mg/kg	1.72E+03	NA	NA	1.04E+02	J					1.62E+02				1.52E+02					
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.03E+01				YES		2.62E+01			YES	YES	1.48E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	1.13E+01						3.92E+01		YES	YES	1.66E+01		YES			
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	3.35E+00						1.72E+01		YES		6.32E+00					
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.18E+04				YES	YES	2.96E+04			YES	YES	1.66E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	2.04E+01						3.42E+01				3.33E+01	J				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	3.15E+02						8.22E+02				5.63E+02					
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	9.00E+02				YES	YES	3.01E+03		YES	YES	3.27E+03		YES	YES	YES	
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	4.79E-02	J					6.70E-02	J			7.44E-02	J				
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	6.01E+00	J					1.40E+01	J	YES		1.27E+01		YES			
Potassium	mg/kg	8.00E+02	NA	NA	2.02E+02	B					6.84E+02				2.77E+02	J				
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	7.44E-01	B	YES				1.71E+00		YES	YES	1.37E+00	B	YES		YES	
Sodium	mg/kg	6.34E+02	NA	NA	2.80E+01	J					3.19E+01	J			2.41E+01	J				
Thallium	mg/kg	3.43E+00	5.08E-01	1.00E+00	ND						1.93E+00	J		YES	YES	1.09E+00	J		YES	YES
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.87E+01				YES		3.49E+01			YES	3.01E+01					YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.83E+01						4.18E+01		YES		3.47E+01					
<b>VOLATILE ORGANIC COMPOUNDS</b>																				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR						NR				NR					
<b>PESTICIDES</b>																				
Aldrin	mg/kg	NA	3.65E-02	2.50E-03	NR						NR				NR					
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	NR						NR				NR					

Table 5-1

**Surface and Depositional Soil Analytical Results**  
**Former Mortar Firing Point, Parcel 105Q-X, and Former Defend Range (Eastern), Parcel 225Q**  
**Fort McClellan, Alabama**

(Page 6 of 8)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-225Q-GP07 RM0013 9-Jul-02 0-1					HR-225Q-GP08 RM0015 9-Jul-02 0-1					HR-225Q-GP09 RM0017 9-Jul-02 0-1				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	6.45E+03				YES	6.69E+03				YES	9.39E+03			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	1.72E+00			YES		4.11E+00			YES		2.38E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	5.26E+01					4.03E+01					7.65E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					7.28E-01	J				6.03E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	1.23E+02					5.36E+01	J				1.82E+02				
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	6.77E+00			YES		1.48E+01				YES	5.06E+00				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	1.98E+00	J				3.89E+00					3.78E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	1.07E+01					1.54E+01		YES			1.37E+01		YES		
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	9.22E+03			YES	YES	2.08E+04			YES	YES	6.53E+03			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	2.00E+02		YES		YES	2.79E+01	J				1.97E+02		YES		YES
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	2.21E+02					2.25E+02					3.48E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	2.77E+02			YES		1.87E+02				YES	9.84E+02			YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	ND					4.04E-02	J				4.15E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	2.17E+00	J				6.59E+00					5.19E+00	J			
Potassium	mg/kg	8.00E+02	NA	NA	ND					3.50E+02	J				2.21E+02	J			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	ND					8.11E-01	B	YES		YES	ND				
Sodium	mg/kg	6.34E+02	NA	NA	2.34E+01	J				3.21E+01	J				2.78E+01	J			
Thallium	mg/kg	3.43E+00	5.08E-01	1.00E+00	ND					ND					ND				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.33E+01				YES	3.75E+01				YES	1.10E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	9.40E+00					2.92E+01					1.90E+01				
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR					NR				
<b>PESTICIDES</b>																			
Aldrin	mg/kg	NA	3.65E-02	2.50E-03	NR					NR					NR				
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	NR					NR					NR				

Table 5-1

**Surface and Depositional Soil Analytical Results**  
**Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q**  
**Fort McClellan, Alabama**

(Page 7 of 8)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-225Q-GP10 RM0019 9-Jul-02 0-1					HR-225Q-GP11 RM0022 9-Jul-02 0-1					HR-225Q-GP12 RM0024 9-Jul-02 0-1					
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	
<b>METALS</b>																				
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	6.03E+03				YES	1.36E+04				YES	YES	9.29E+03			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	1.17E+00	B		YES		3.15E+00				YES		4.69E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	1.85E+01					8.32E+01						6.05E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					1.18E+00		YES		YES		ND				
Calcium	mg/kg	1.72E+03	NA	NA	4.74E+01	J				6.35E+01	J					8.91E+01	J			
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	4.89E+00	J			YES	7.60E+00				YES		1.26E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	ND					1.96E+01		YES				1.92E+00	J			
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	1.96E+00	J				8.61E+00						8.55E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	5.54E+03			YES	YES	1.32E+04				YES	YES	2.26E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.39E+01					2.73E+01						5.20E+01		YES		YES
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	1.51E+02					4.64E+02						3.03E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.30E+01					2.09E+03		YES	YES	YES		1.86E+02				YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	ND					9.32E-02	J	YES				4.42E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	1.61E+00	J				9.34E+00	J					4.02E+00	J			
Potassium	mg/kg	8.00E+02	NA	NA	ND					1.73E+02	J					1.18E+02	B			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	ND					9.43E-01	B	YES		YES		6.48E-01	B	YES		
Sodium	mg/kg	6.34E+02	NA	NA	2.19E+01	J				3.02E+01	J					2.87E+01	J			
Thallium	mg/kg	3.43E+00	5.08E-01	1.00E+00	ND					ND						ND				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	7.99E+00				YES	2.00E+01				YES		2.11E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	6.04E+00					3.81E+01						2.34E+01				
<b>VOLATILE ORGANIC COMPOUNDS</b>																				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR						NR				
<b>PESTICIDES</b>																				
Aldrin	mg/kg	NA	3.65E-02	2.50E-03	NR					NR						NR				
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	NR					NR						NR				

Table 5-1

**Surface and Depositional Soil Analytical Results**  
**Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q**  
**Fort McClellan, Alabama**

(Page 8 of 8)

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-225Q-GP13 RM0026 9-Jul-02 0-1					HR-225Q-GP14 RM0028 9-Jul-02 0-1				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>														
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	8.30E+03			YES	YES	5.50E+03				YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	3.94E+00			YES		2.77E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	3.79E+01					1.11E+02				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					ND				
Calcium	mg/kg	1.72E+03	NA	NA	7.86E+01	J				5.67E+01	J			
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	7.62E+00				YES	4.48E+00				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	4.06E+00					ND				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	6.06E+00					3.35E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.30E+04			YES	YES	6.12E+03			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	5.08E+01		YES		YES	2.09E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	3.15E+02					2.46E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.58E+02				YES	2.08E+01				
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	3.86E-02	J				3.56E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	4.67E+00	J				2.68E+00	J			
Potassium	mg/kg	8.00E+02	NA	NA	9.44E+01	B				1.67E+02	B			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	ND					ND				
Sodium	mg/kg	6.34E+02	NA	NA	2.45E+01	J				2.61E+01	J			
Thallium	mg/kg	3.43E+00	5.08E-01	1.00E+00	ND					ND				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.87E+01				YES	9.88E+00				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.86E+01					8.27E+00				
<b>VOLATILE ORGANIC COMPOUNDS</b>														
Acetone	mg/kg	NA	7.76E+02	2.50E+00	NR					NR				
<b>PESTICIDES</b>														
Aldrin	mg/kg	NA	3.65E-02	2.50E-03	NR					NR				
beta-BHC	mg/kg	NA	3.50E-01	1.00E-03	NR					NR				

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

<sup>a</sup> BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Background Metals Survey Report, Fort McClellan, Alabama*.

<sup>b</sup> Residential human health site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan*,

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

NR - Not requested.

Qual - Data validation qualifier.

Table 5-2

**Subsurface Soil Analytical Results  
Former Mortar Firing Point, Parcel 105Q-X, and Former Defend Range (Eastern), Parcel 225Q  
Fort McClellan, Alabama**

(Page 1 of 5)

Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-105Q-GP01 RR0002 8-Jul-02 1.5- 2.5				HR-105Q-GP02 RR0004 10-Jul-02 1 - 2				HR-105Q-GP03 RR0006 8-Jul-02 2.5- 3.5				HR-105Q-GP04 RR0008 9-Jul-02 1 - 2			
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
<b>METALS</b>																			
Aluminum	mg/kg	1.36E+04	7.80E+03	1.81E+04		YES	YES	3.66E+03				6.59E+03				9.82E+03			YES
Antimony	mg/kg	1.31E+00	3.11E+00	ND				ND				ND				ND			
Arsenic	mg/kg	1.83E+01	4.26E-01	9.57E+00			YES	1.87E+00			YES	2.83E+00			YES	4.13E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	2.70E+01				1.32E+01				2.82E+01				3.82E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	ND				ND				ND				ND			
Calcium	mg/kg	6.37E+02	NA	1.31E+02	J			5.82E+01	J			1.17E+02				6.69E+01	J		
Chromium	mg/kg	3.83E+01	2.32E+01	4.42E+01		YES	YES	5.89E+00				1.15E+01				1.19E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	ND				ND				2.97E+00				1.21E+01	J		
Copper	mg/kg	1.94E+01	3.13E+02	8.30E+00				1.45E+00	J			3.75E+00				6.87E+00			
Iron	mg/kg	4.48E+04	2.34E+03	2.67E+04			YES	4.48E+03			YES	7.21E+03			YES	1.10E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	6.59E+00				3.01E+00				4.72E+00				6.97E+00			
Magnesium	mg/kg	7.66E+02	NA	6.37E+02				1.23E+02				2.10E+02				2.86E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	1.72E+01				5.23E+01				1.50E+02				4.32E+02	J		YES
Mercury	mg/kg	7.00E-02	2.33E+00	1.05E-01	J	YES		ND				ND				3.25E-02	J		
Nickel	mg/kg	1.29E+01	1.54E+02	5.37E+00				1.13E+00	J			4.52E+00				6.88E+00			
Potassium	mg/kg	7.11E+02	NA	9.87E+02			YES	1.96E+02	J			3.08E+02	J			2.77E+02	J		
Selenium	mg/kg	4.70E-01	3.91E+01	2.05E+00	B	YES		ND				ND				7.83E-01	B	YES	
Sodium	mg/kg	7.02E+02	NA	4.06E+01	J			2.46E+01	J			2.57E+01	J			2.30E+01	J		
Thallium	mg/kg	1.40E+00	5.08E-01	1.14E+00	B		YES	ND				ND				ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	6.90E+01			YES	8.63E+00				1.45E+01				2.02E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	8.92E+00	J			4.47E+00	J			7.32E+00	J			1.34E+01	J		
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
Acetone	mg/kg	NA	7.76E+02	ND				NR				NR				2.10E-01	J		
Toluene	mg/kg	NA	1.55E+03	ND				NR				NR				1.40E-03	J		
<b>PESTICIDES</b>																			
alpha-BHC	mg/kg	NA	1.00E-01	ND				NR				NR				4.40E-04	J		
beta-BHC	mg/kg	NA	3.50E-01	ND				NR				NR				7.60E-04	J		

Table 5-2

**Subsurface Soil Analytical Results**  
**Former Mortar Firing Point, Parcel 105Q-X, and Former Defendam Range (Eastern), Parcel 225Q**  
**Fort McClellan, Alabama**

(Page 2 of 5)

Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-105Q-GP05 RR0011 18-Sep-02 1- 1.5				HR-105Q-GP06 RR0013 8-Jul-02 2- 3				HR-225Q-GP01 RM0002 8-Jul-02 2- 3				HR-225Q-GP02 RM0004 8-Jul-02 3- 4			
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
<b>METALS</b>																			
Aluminum	mg/kg	1.36E+04	7.80E+03	4.52E+03				9.69E+03			YES	5.96E+03				8.50E+03			YES
Antimony	mg/kg	1.31E+00	3.11E+00	ND				ND				ND				ND			YES
Arsenic	mg/kg	1.83E+01	4.26E-01	3.16E+00		YES		3.51E+00		YES		2.33E+00		YES		5.00E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	2.12E+01				4.12E+01				3.69E+01				4.14E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	ND				ND				ND				ND			
Calcium	mg/kg	6.37E+02	NA	5.43E+01	J			5.95E+01	J			9.21E+01	J			6.35E+01	J		
Chromium	mg/kg	3.83E+01	2.32E+01	6.03E+00				9.57E+00				5.22E+00				1.51E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	7.27E+00				4.37E+00				ND				1.19E+01			
Copper	mg/kg	1.94E+01	3.13E+02	5.31E+00				4.70E+00				4.30E+00				7.42E+00			
Iron	mg/kg	4.48E+04	2.34E+03	7.35E+03		YES		8.97E+03		YES		4.14E+03		YES		1.04E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	4.34E+00				5.96E+00				9.15E+00	J			9.12E+00	J		
Magnesium	mg/kg	7.66E+02	NA	1.38E+02				3.03E+02				2.03E+02				2.51E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	3.15E+02				2.55E+02				3.04E+02				6.08E+02			YES
Mercury	mg/kg	7.00E-02	2.33E+00	ND				2.92E-02	J			3.53E-02	J			2.88E-02	J		
Nickel	mg/kg	1.29E+01	1.54E+02	8.42E+00				5.54E+00				2.72E+00				9.44E+00			
Potassium	mg/kg	7.11E+02	NA	2.33E+02	J			3.20E+02	J			2.07E+02	J			1.95E+02	J		
Selenium	mg/kg	4.70E-01	3.91E+01	ND				5.79E-01	B	YES		7.10E-01	B	YES		5.42E-01	B	YES	
Sodium	mg/kg	7.02E+02	NA	5.51E+01	J			2.24E+01	J			2.37E+01	J			2.40E+01	J		
Thallium	mg/kg	1.40E+00	5.08E-01	ND				ND				ND				ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	1.10E+01				1.69E+01				8.63E+00				1.68E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	8.63E+00				1.06E+01	J			1.06E+01				1.29E+01			
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
Acetone	mg/kg	NA	7.76E+02	NR				NR				NR				NR			
Toluene	mg/kg	NA	1.55E+03	NR				NR				NR				NR			
<b>PESTICIDES</b>																			
alpha-BHC	mg/kg	NA	1.00E-01	NR				NR				NR				NR			
beta-BHC	mg/kg	NA	3.50E-01	NR				NR				NR				NR			

Table 5-2

**Subsurface Soil Analytical Results  
Former Mortar Firing Point, Parcel 105Q-X, and Former Defendam Range (Eastern), Parcel 225Q  
Fort McClellan, Alabama**

(Page 3 of 5)

Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-225Q-GP03 RM0006 10-Jul-02 2 - 3				HR-225Q-GP04 RM0008 10-Jul-02 2 - 3				HR-225Q-GP05 RM0010 9-Jul-02 2 - 3				HR-225Q-GP06 RM0012 9-Jul-02 1 - 2			
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
<b>METALS</b>																			
Aluminum	mg/kg	1.36E+04	7.80E+03	1.50E+04		YES	YES	3.03E+04		YES	YES	1.62E+04		YES	YES	1.38E+04		YES	YES
Antimony	mg/kg	1.31E+00	3.11E+00	ND				6.24E+00	J	YES	YES	ND				ND			
Arsenic	mg/kg	1.83E+01	4.26E-01	7.09E+00			YES	7.48E+00			YES	1.03E+00	B		YES	3.69E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	2.88E+01				5.18E+01				4.88E+02		YES		8.01E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	4.20E-01	J			5.33E-01	J			1.02E+00	J	YES		5.34E-01	J		
Calcium	mg/kg	6.37E+02	NA	1.03E+02	J			7.13E+01	J			6.73E+01	J			7.25E+01	J		
Chromium	mg/kg	3.83E+01	2.32E+01	1.28E+01				1.92E+01				2.82E+01			YES	1.18E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	5.30E+00				1.07E+01				3.14E+01		YES		1.28E+01			
Copper	mg/kg	1.94E+01	3.13E+02	1.23E+01				8.97E+00				4.27E+01		YES		6.12E+00			
Iron	mg/kg	4.48E+04	2.34E+03	2.10E+04			YES	2.78E+04			YES	4.56E+04		YES	YES	1.31E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.30E+01				2.20E+01				3.27E+01				1.85E+01	J		
Magnesium	mg/kg	7.66E+02	NA	3.28E+02				5.09E+02				1.07E+03		YES		5.70E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	1.28E+02				6.06E+02			YES	2.95E+03		YES	YES	1.13E+03			YES
Mercury	mg/kg	7.00E-02	2.33E+00	3.96E-02	J			1.29E-01		YES		4.75E-02	J			5.83E-02	J		
Nickel	mg/kg	1.29E+01	1.54E+02	9.87E+00	J			1.02E+01	J			1.67E+01	J	YES		1.03E+01			
Potassium	mg/kg	7.11E+02	NA	2.03E+02	B			3.42E+02	J			1.74E+03		YES		4.35E+02	B		
Selenium	mg/kg	4.70E-01	3.91E+01	8.60E-01	B	YES		6.78E-01	B	YES		1.27E+00	B	YES		1.16E+00		YES	
Sodium	mg/kg	7.02E+02	NA	2.76E+01	J			2.36E+01	J			3.32E+01	J			2.21E+01	J		
Thallium	mg/kg	1.40E+00	5.08E-01	ND				ND				1.93E+00	J	YES	YES	ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	2.82E+01				5.30E+01				5.89E+01		YES		2.35E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	1.63E+01				2.06E+01				3.45E+01				2.35E+01			
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
Acetone	mg/kg	NA	7.76E+02	NR				NR				NR				NR			
Toluene	mg/kg	NA	1.55E+03	NR				NR				NR				NR			
<b>PESTICIDES</b>																			
alpha-BHC	mg/kg	NA	1.00E-01	NR				NR				NR				NR			
beta-BHC	mg/kg	NA	3.50E-01	NR				NR				NR				NR			

Table 5-2

**Subsurface Soil Analytical Results  
Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q  
Fort McClellan, Alabama**

(Page 4 of 5)

Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-225Q-GP07 RM0014 9-Jul-02 1.5- 2.5				HR-225Q-GP08 RM0016 9-Jul-02 2 - 3				HR-225Q-GP09 RM0018 10-Jul-02 1 - 2				HR-225Q-GP10 RM0021 9-Jul-02 1 - 2			
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
<b>METALS</b>																			
Aluminum	mg/kg	1.36E+04	7.80E+03	7.66E+03				5.64E+03				7.94E+03			YES	8.72E+03			YES
Antimony	mg/kg	1.31E+00	3.11E+00	ND				ND				ND				ND			
Arsenic	mg/kg	1.83E+01	4.26E-01	1.98E+00			YES	3.60E+00			YES	2.41E+00			YES	1.64E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	5.21E+01				3.58E+01				2.83E+01				2.23E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	ND				6.03E-01	J			ND				ND			
Calcium	mg/kg	6.37E+02	NA	1.27E+02				5.03E+01	J			6.73E+01	J			6.38E+01	J		
Chromium	mg/kg	3.83E+01	2.32E+01	9.55E+00				1.34E+01				2.26E+01				1.07E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	1.56E+00	J			3.23E+00				3.23E+00				ND			
Copper	mg/kg	1.94E+01	3.13E+02	8.46E+00				1.64E+01				2.65E+00				4.89E+00			
Iron	mg/kg	4.48E+04	2.34E+03	9.55E+03			YES	1.90E+04			YES	1.48E+04			YES	1.03E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.51E+02		YES		3.13E+01	J			1.88E+01				3.98E+01		YES	
Magnesium	mg/kg	7.66E+02	NA	2.75E+02				1.97E+02				2.44E+02				2.16E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	1.57E+02				2.69E+02				1.38E+02				2.43E+01			
Mercury	mg/kg	7.00E-02	2.33E+00	3.21E-02	J			2.98E-02	J			ND				ND			
Nickel	mg/kg	1.29E+01	1.54E+02	3.30E+00	J			6.59E+00				2.96E+00	J			2.94E+00	J		
Potassium	mg/kg	7.11E+02	NA	1.30E+02	B			4.04E+02	J			1.89E+02	J			ND			
Selenium	mg/kg	4.70E-01	3.91E+01	ND				8.84E-01	B	YES		ND				ND			
Sodium	mg/kg	7.02E+02	NA	2.90E+01	J			2.71E+01	J			2.35E+01	J			2.48E+01	J		
Thallium	mg/kg	1.40E+00	5.08E-01	ND				ND				ND				ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	1.59E+01				3.04E+01				2.09E+01				1.67E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	1.19E+01				2.76E+01				1.05E+01				7.67E+00			
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
Acetone	mg/kg	NA	7.76E+02	NR				NR				NR				NR			
Toluene	mg/kg	NA	1.55E+03	NR				NR				NR				NR			
<b>PESTICIDES</b>																			
alpha-BHC	mg/kg	NA	1.00E-01	NR				NR				NR				NR			
beta-BHC	mg/kg	NA	3.50E-01	NR				NR				NR				NR			

Table 5-2

**Subsurface Soil Analytical Results**  
**Former Mortar Firing Point, Parcel 105Q-X, and Former Defend Range (Eastern), Parcel 225Q**  
**Fort McClellan, Alabama**

(Page 5 of 5)

Sample Location Sample Number Sample Date Sample Depth (Feet)				HR-225Q-GP11 RM0023 9-Jul-02 1 - 2				HR-225Q-GP12 RM0025 9-Jul-02 3 - 4				HR-225Q-GP13 RM0027 9-Jul-02 2 - 3				HR-225Q-GP14 RM0029 9-Jul-02 2 - 3			
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	Result	Qual	>BKG	>SSSL												
<b>METALS</b>																			
Aluminum	mg/kg	1.36E+04	7.80E+03	1.34E+04			YES	2.08E+04		YES	YES	7.31E+03				3.55E+03			
Antimony	mg/kg	1.31E+00	3.11E+00	ND															
Arsenic	mg/kg	1.83E+01	4.26E-01	3.23E+00			YES	3.86E+00			YES	3.89E+00			YES	1.54E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	7.27E+01				2.84E+01				6.69E+01				5.49E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	7.49E-01	J			ND				ND				ND			
Calcium	mg/kg	6.37E+02	NA	5.90E+01	J			4.42E+01	J			1.33E+02				3.84E+01	J		
Chromium	mg/kg	3.83E+01	2.32E+01	8.31E+00				2.41E+01			YES	7.80E+00				3.14E+00			
Cobalt	mg/kg	1.75E+01	4.68E+02	2.58E+01		YES		2.82E+00				4.01E+00				ND			
Copper	mg/kg	1.94E+01	3.13E+02	8.75E+00				1.23E+01				5.70E+00				1.93E+00	J		
Iron	mg/kg	4.48E+04	2.34E+03	1.39E+04			YES	3.79E+04			YES	1.38E+04		YES	YES	3.43E+03			YES
Lead	mg/kg	3.85E+01	4.00E+02	3.05E+01				1.84E+01				6.64E+01		YES		6.23E+00			
Magnesium	mg/kg	7.66E+02	NA	5.28E+02				6.61E+02				3.09E+02				1.19E+02	J		
Manganese	mg/kg	1.36E+03	3.63E+02	1.81E+03		YES	YES	4.27E+01				3.22E+02				7.98E+00			
Mercury	mg/kg	7.00E-02	2.33E+00	7.24E-02	J	YES		6.78E-02	J			ND				ND			
Nickel	mg/kg	1.29E+01	1.54E+02	9.71E+00	B			5.21E+00	J			4.93E+00	J			9.78E-01	J		
Potassium	mg/kg	7.11E+02	NA	1.97E+02	B			2.72E+02	B			1.61E+02	B			1.90E+02	J		
Selenium	mg/kg	4.70E-01	3.91E+01	8.86E-01	B	YES		7.23E-01	B	YES		6.14E-01	B	YES		ND			
Sodium	mg/kg	7.02E+02	NA	3.03E+01	J			3.00E+01	J			2.96E+01	J			2.20E+01	J		
Thallium	mg/kg	1.40E+00	5.08E-01	ND				1.55E+00	J	YES	YES	ND				ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	2.23E+01				4.62E+01				1.98E+01				6.90E+00			
Zinc	mg/kg	3.49E+01	2.34E+03	4.04E+01		YES		3.36E+01				2.23E+01				3.38E+00			
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
Acetone	mg/kg	NA	7.76E+02	NR															
Toluene	mg/kg	NA	1.55E+03	NR															
<b>PESTICIDES</b>																			
alpha-BHC	mg/kg	NA	1.00E-01	NR															
beta-BHC	mg/kg	NA	3.50E-01	NR															

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

<sup>a</sup>BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Background Metals Survey Report, Fort McClellan, Alabama*.<sup>b</sup>Residential human health site-specific screening level (SSSL) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

NR - Not requested.

Qual - Data validation qualifier.

Table 5-3

**Surface Water Analytical Results**  
**Former Mortar Firing Point, Parcel 105Q-X, and Former Defend Range (Eastern), Parcel 225Q**  
**Fort McClellan, Alabama**

Sample Location Sample Number Sample Date					HR-225Q-SW/SD01 RM2001 23-Jul-02					HR-225Q-SW/SD02 RM2002 23-Jul-02					HR-225Q-SW/SD03 RM2003 23-Jul-02				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>																			
Aluminum	mg/L	5.26E+00	1.53E+01	8.70E-02	1.07E-01	J			YES	2.74E-01				YES	1.83E-01	J			YES
Arsenic	mg/L	2.17E-03	7.30E-04	1.90E-01	2.36E-03	B	YES	YES		ND					2.17E-03	B	YES	YES	
Barium	mg/L	7.54E-02	1.10E+00	3.90E-03	1.96E-02				YES	2.21E-02				YES	1.96E-02				YES
Calcium	mg/L	2.52E+01	NA	1.16E+02	2.49E-01	B				2.39E-01	B				2.25E-01	B			
Chromium	mg/L	1.11E-02	4.08E-02	1.10E-02	ND					1.91E-02	J	YES		YES	ND				
Iron	mg/L	1.96E+01	4.70E+00	1.00E+00	2.20E-01	J				5.75E-01	J				6.37E-01	J			
Magnesium	mg/L	1.10E+01	NA	8.20E+01	2.09E-01	B				1.97E-01	B				1.89E-01	B			
Manganese	mg/L	5.65E-01	6.40E-01	8.00E-02	2.01E-02	J				2.89E-02	J				3.21E-02	J			
Potassium	mg/L	2.56E+00	NA	5.30E+01	1.22E+00	B				8.37E-01	B				9.43E-01	B			
Sodium	mg/L	3.44E+00	NA	6.80E+02	9.09E-01	J				9.09E-01	J				9.09E-01	J			
<b>VOLATILE ORGANIC COMPOUNDS</b>																			
Methylene chloride	mg/L	NA	1.42E-01	1.93E+00	NR					2.00E-04	B				NR				

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

<sup>a</sup> BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Background Metals Survey Report, Fort McClellan, Alabama*.

<sup>b</sup> Recreational site user site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama, July*.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

NR - Not requested.

Qual - Data validation qualifier.

Table 5-4

**Sediment Analytical Results**  
**Former Mortar Firing Point, Parcel 105Q-X, and Former Defendang Range (Eastern), Parcel 225Q**  
**Fort McClellan, Alabama**

Sample Location Sample Number Sample Date Sample Depth (Feet)					HR-225Q-SW/SD01 RM1001 23-Jul-02 0- 0.5					HR-225Q-SW/SD02 RM1003 23-Jul-02 0- 0.5					HR-225Q-SW/SD03 RM1004 23-Jul-02 0- 1				
Parameter	Units	BKG <sup>a</sup>	SSSL <sup>b</sup>	ESV <sup>b</sup>	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
<b>METALS</b>																			
Aluminum	mg/kg	8.59E+03	1.15E+06	NA	7.00E+03					4.48E+03					4.45E+03	J			
Arsenic	mg/kg	1.13E+01	5.58E+01	7.24E+00	2.93E+00					5.30E+00					5.75E+00	J			
Barium	mg/kg	9.89E+01	8.36E+04	NA	8.85E+01	J				3.21E+01					5.28E+01	J			
Beryllium	mg/kg	9.70E-01	1.50E+02	NA	ND					4.18E-01	J				9.12E-01	J			
Calcium	mg/kg	1.11E+03	NA	NA	2.38E+02	J				8.26E+01	J				1.05E+02	J			
Chromium	mg/kg	3.12E+01	2.79E+03	5.23E+01	1.16E+01					2.56E+01					2.51E+01	J			
Cobalt	mg/kg	1.10E+01	6.72E+04	5.00E+01	3.62E+00					3.57E+00					7.65E+00	J			
Copper	mg/kg	1.71E+01	4.74E+04	1.87E+01	7.34E+00					4.13E+00					5.28E+00	J			
Iron	mg/kg	3.53E+04	3.59E+05	NA	1.49E+04					2.43E+04					3.33E+04	J			
Lead	mg/kg	3.78E+01	4.00E+02	3.02E+01	1.41E+01	J				1.06E+01					2.01E+01	J			
Magnesium	mg/kg	9.06E+02	NA	NA	2.20E+02					9.08E+01	J				9.81E+01	J			
Manganese	mg/kg	7.12E+02	4.38E+04	NA	2.50E+02	J				1.87E+02					4.90E+02	J			
Nickel	mg/kg	1.30E+01	1.76E+04	1.59E+01	2.72E+00	J				1.93E+00	J				2.58E+00				
Potassium	mg/kg	1.01E+03	NA	NA	2.42E+02	J				2.22E+02	J				3.55E+02	J			
Selenium	mg/kg	7.20E-01	5.96E+03	NA	8.70E-01	J	YES			1.92E+00		YES			1.96E+00	J	YES		
Sodium	mg/kg	6.92E+02	NA	NA	2.85E+01	J				ND					ND				
Vanadium	mg/kg	4.09E+01	4.83E+03	NA	2.06E+01					4.14E+01		YES			3.96E+01	J			
Zinc	mg/kg	5.27E+01	3.44E+05	1.24E+02	1.02E+01	J				6.16E+00	J				1.02E+01	J			
<b>TOTAL ORGANIC CARBON</b>																			
Total Organic Carbon	mg/kg	NA	NA	NA	3.73E+04	J				2.50E+03					1.30E+03				

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

<sup>a</sup> BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Background Metals Survey Report, Fort McClellan, Alabama*.

<sup>b</sup> Recreational site user site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama, July*.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

NR - Not requested.

Qual - Data validation qualifier.

Of these, eight metals also exceeded their respective background concentrations in one or more samples:

- Aluminum (17,600 mg/kg) exceeded its ESV (50 mg/kg) and background (16,306 mg/kg) at sample location HR-105Q-GP01.
- Barium (212 mg/kg) exceeded its ESV (165 mg/kg) and background (124 mg/kg) at sample location HR-225Q-GP05.
- Beryllium (1.18 mg/kg) exceeded its ESV (1.1 mg/kg) and background (0.8 mg/kg) at sample location HR-225Q-GP11.
- Chromium (37.5 mg/kg) exceeded its ESV (0.4 mg/kg) and background (37 mg/kg) at sample location HR-105Q-GP01.
- Cobalt (39.2 mg/kg) exceeded its ESV (20 mg/kg) and background (15 mg/kg) at sample location HR-225Q-GP05.
- Lead (50.8 to 200 mg/kg) exceeded its ESV (50 mg/kg) and background (40 mg/kg) at four sample locations (HR-225Q-GP07, HR-225Q-GP09, HR-225Q-GP12, and HR-225Q-GP13).
- Manganese (2,090 to 3,270 mg/kg) exceeded its ESV (100 mg/kg) and background (1,579 mg/kg) at three sample locations (HR-225Q-GP05, HR-225Q-GP06, and HR-225Q-GP11).
- Selenium (0.81 to 1.71 mg/kg) exceeded its ESV (0.81 mg/kg) and background (0.48 mg/kg) at seven sample locations (HR-105Q-GP01, HR-105Q-GP05, HR-225Q-GP02, HR-225Q-GP05, HR-225Q-GP06, and HR-225Q-GP08). Six of the seven selenium results were flagged with a “B” data qualifier, indicating that selenium was also detected in an associated laboratory or field blank sample.

**Volatile Organic Compounds.** Three surface and depositional soil samples (locations HR-105Q-GP01, HR-105Q-GP04, and HR-225Q-DEP01) were analyzed for VOCs. Acetone was detected in two of the samples at concentrations below its SSSL and ESV.

**Semivolatile Organic Compounds.** Three surface and depositional soil samples (locations HR-105Q-GP01, HR-105Q-GP04, and HR-225Q-DEP01) were analyzed for SVOCs. SVOCs were not detected in the samples.

**Pesticides.** Three surface and depositional soil samples (locations HR-105Q-GP01, HR-105Q-GP04, and HR-225Q-DEP01) were analyzed for pesticides. Two pesticides (aldrin and

beta-hexachlorocyclohexane [BHC]) were detected in one sample each at estimated concentrations below their respective SSSLs and ESVs.

**Herbicides.** Three surface and depositional soil samples (locations HR-105Q-GP01, HR-105Q-GP04, and HR-225Q-DEP01) were analyzed for herbicides. Herbicides were not detected in the samples.

**Explosives.** All of the surface and depositional soil samples were analyzed for explosives. Explosives were not detected in the samples.

## **5.2 Subsurface Soil Analytical Results**

Twenty subsurface soil samples were collected for chemical analysis at Parcels 105Q-X and 225Q. Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-2.

**Metals.** A total of 21 metals were detected in the subsurface soil samples. The concentrations of eight metals (aluminum, antimony, arsenic, chromium, iron, manganese, thallium, and vanadium) exceeded their respective SSSLs. Of these, aluminum, antimony, chromium, iron, manganese, thallium, and vanadium also exceeded their respective background concentrations in one or more samples:

- Aluminum (13,800 to 30,300 mg/kg) exceeded its SSSL (7,803 mg/kg) and background (13,591 mg/kg) at six sample locations (HR-105Q-GP01, HR-225Q-GP03, HR-225Q-GP04, HR-225Q-GP05, HR-225Q-GP06, and HR-225Q-GP12).
- Antimony (6.24 mg/kg) exceeded its SSSL (3.11 mg/kg) and background (1.31 mg/kg) at sample location HR-225Q-GP04.
- Chromium (44.2 mg/kg) exceeded its SSSL (23.2 mg/kg) and background (38.3 mg/kg) at sample location HR-105Q-GP01.
- Iron (45,600 mg/kg) exceeded its SSSL (2,345 mg/kg) and background (44,817 mg/kg) at sample location HR-225Q-GP05.
- Manganese (1,810 and 2,950 mg/kg) exceeded its SSSL (363 mg/kg) and background (1,355 mg/kg) at sample locations HR-225Q-GP05 and HR-225Q-GP11.
- Thallium (1.55 and 1.93 mg/kg) exceeded its SSSL (0.51 mg/kg) and background (1.4 mg/kg) at sample locations HR-225Q-GP05 and HR-225Q-GP12.

- Vanadium (69 mg/kg) exceeded its SSSL (53.1 mg/kg) and background (64.9 mg/kg) at sample location HR-105Q-GP01.

**Volatile Organic Compounds.** Two subsurface soil samples (locations HR-105Q-GP01 and HR-105Q-GP04) were analyzed for VOCs. Two VOCs (acetone and toluene) were detected at one location (HR-105Q-GP04) at estimated concentrations below their respective SSSLs.

**Semivolatile Organic Compounds.** Two subsurface soil samples (locations HR-105Q-GP01 and HR-105Q-GP04) were analyzed for SVOCs. SVOCs were not detected in the samples.

**Pesticides.** Two subsurface soil samples (locations HR-105Q-GP01 and HR-105Q-GP04) were analyzed for pesticides. Two pesticides (alpha-BHC and beta-BHC) were detected at one location (HR-105Q-GP04) at estimated concentrations below their respective SSSLs.

**Herbicides.** Two subsurface soil samples (locations HR-105Q-GP01 and HR-105Q-GP04) were analyzed for herbicides. Herbicides were not detected in the samples.

**Explosives.** All of the subsurface soil samples were analyzed for explosives. Explosives were not detected samples.

### **5.3 Surface Water Analytical Results**

Three surface water samples were collected for chemical analysis at Parcels 105Q-X and 225Q at the locations shown on Figure 3-1. Analytical results were compared to recreational site user SSSLs, ESVs, and metals background concentrations, as presented in Table 5-3. It should be noted that the assumptions for residential and recreational site user exposure to surface water are identical.

**Metals.** A total of ten metals were detected in the surface water samples. The metals results were below SSSLs except for arsenic (0.00217 and 0.00236 milligrams per liter [mg/L]), which exceeded its SSSL (0.00073 mg/L) and equaled or marginally exceeded its background concentration (0.00217 mg/L) in two samples. However, both arsenic results were flagged with a “B” data qualifier, indicating that arsenic was also detected in a laboratory or field blank sample.

The concentrations of three metals (aluminum, barium, and chromium) exceeded their respective ESVs. These metals results, however, were below their respective background concentrations except for chromium in one sample. Chromium (0.019 mg/L) exceeded its ESV (0.011 mg/L) and equaled its background concentration (0.011 mg/L) at sample location HR-225Q-SW/SD02. The chromium result was flagged with a “J” data qualifier, indicating that the metal was detected at an estimated concentration below the method reporting limit.

***Volatile Organic Compounds.*** One surface water sample (location HR-225Q-SW/SD02) was analyzed for VOCs. Methylene chloride was detected in the sample at a concentration below its SSSL and ESV.

***Semivolatile Organic Compounds.*** One surface water sample (location HR-225Q-SW/SD02) was analyzed for SVOCs. SVOCs were not detected in the sample.

***Pesticides.*** One surface water sample (location HR-225Q-SW/SD02) was analyzed for pesticides. Pesticides were not detected in the sample.

***Herbicides.*** One surface water sample (location HR-225Q-SW/SD02) was analyzed for herbicides. Herbicides were not detected in the sample.

***Explosives.*** Explosives were not detected in the surface water samples.

#### ***5.4 Sediment Analytical Results***

Three sediment samples were collected for chemical and physical analyses at Parcels 105Q-X and 225Q at the locations shown on Figure 3-1. The sediment samples were analyzed for metals, explosives, TOC, and grain size. Analytical results were compared to recreational site user SSSLs, ESVs, and metals background concentrations, as presented in Table 5-4. It should be noted that the assumptions for residential and recreational site user exposure to sediment are identical.

***Metals.*** A total of 18 metals were detected in the sediment samples at concentrations below SSSLs and ESVs.

***Explosives.*** Explosives were not detected in the sediment samples.

**Total Organic Carbon.** The TOC concentrations in the sediment samples ranged from 1,300 to 37,300 mg/kg.

**Grain Size.** The results of grain size analysis for the sediment samples are included in Appendix E.

### **5.5 Statistical and Geochemical Evaluation of Site Metals Data**

Site metals data were further evaluated using statistical and geochemical methods to determine if the metals detected in site media are site related. This multi-tiered approach is described in the Shaw technical memorandum “Selecting Site-Related Chemicals for Human Health and Ecological Risk Assessments for FTMC: Revision 3” (Shaw, 2005). The statistical and geochemical evaluation determined that the metals detected in site media were all naturally occurring (Appendix G).

### **5.6 Preliminary Ecological Risk Assessment**

A PERA was performed to further characterize the potential threat to ecological receptors from exposure to environmental media within the area of investigation at the Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q. The PERA approach is a shortened version of the screening-level ecological risk assessment protocol that was developed as a means to evaluate numerous sites at FTMC in a uniform and economical way. The fundamentals of the screening-level ecological risk assessment protocol are presented in the Installation-Wide Work Plan (IT, 1998). The PERA for Parcels 105Q-X and 225Q is included in Appendix H. It discusses the ecological habitat, environmental media of interest and data selection, selection of constituents of potential ecological concern (COPEC), risk characterization, and conclusions.

The media of interest within the area of investigation at Parcels 105Q-X and 225Q are surface soil, surface water, and sediment. Exposures to subsurface soil are unlikely for ecological receptors at this study area. In order to determine whether constituents detected in site samples have the potential to pose adverse ecological risks, screening-level hazard quotients were developed via a three-step process as follows:

- 1) Comparison to ESVs
- 2) Identification of essential macronutrients
- 3) Comparison to naturally occurring background concentrations.

The ESVs represent the most conservative values available from various literature sources and have been selected to be protective of the most sensitive ecological assessment endpoints. The ESVs have been developed specifically for FTMC in conjunction with EPA Region 4 and are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). The ESVs are based on no-observed-adverse-effect-levels (NOAEL), when available. If a NOAEL-based ESV was not available for a certain constituent, then the most health-protective value available from the scientific literature was used. If a constituent was detected at a maximum concentration that exceeded its ESV, was not an essential macronutrient, and was greater than the naturally occurring levels at FTMC, then it was selected as a COPEC for further ecological risk characterization.

The detected organic constituents in site media (i.e., VOCs and pesticides) were below their respective ESVs. Although some metals were detected in site media at concentrations exceeding ESVs, all metals were determined to be present at naturally occurring levels based on the statistical/geochemical evaluation. Based on the statistical/geochemical evaluation and consideration of other lines of evidence (e.g., frequency of detection, comparison to alternative ESVs), the PERA did not identify any constituents as COPECs in site media.

## **6.0 Summary, Conclusions, and Recommendations**

---

Shaw completed an SI at the Former Mortar Firing Point, Parcel 105Q-X, and Former Defendam Range (Eastern), Parcel 225Q, at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site as a result of historical Army activities. The SI consisted of the collection and analysis of 20 surface soil samples, 3 depositional soil samples, 20 subsurface soil samples, 3 surface water samples, and 3 sediment samples.

Chemical analysis of samples collected at the site indicates that metals, VOCs, and pesticides were detected in site media. SVOCs, herbicides, and explosive compounds were not detected in any of the samples collected at the site. Analytical results were compared to SSSLs, ESVs, and background screening values developed for human health and ecological risk evaluations as part of investigations performed under the BRAC Environmental Restoration Program at FTMC. Site metals data were also evaluated using statistical/geochemical methods to determine if the metals detected in site media were naturally occurring (Shaw, 2005). In addition, a PERA was performed to further evaluate potential risks to ecological receptors.

Constituents detected at concentrations exceeding SSSLs and available background values were identified as COPCs in site media. COPCs were limited to three metals (aluminum, chromium, and manganese) in surface soil and six metals (aluminum, antimony, chromium, iron, manganese, thallium, and vanadium) in subsurface soil. However, the statistical/geochemical evaluation concluded that these metals were present at naturally occurring levels. Therefore, these metals are not expected to pose a site-related threat to human health. Detected concentrations of VOCs and pesticides in site media were all below SSSLs.

The PERA did not identify any COPECs in site media based on comparison to established ESVs for FTMC, the results of the statistical/geochemical evaluation, and consideration of other lines of evidence.

Based on the results of the SI, past operations at Parcels 105Q-X and 225Q have not adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health and the environment. Therefore, Shaw recommends "No Further Action" and unrestricted land reuse with regard to CERCLA-related hazardous substances for the area of investigation at the Former Mortar Firing Point, Parcel 105Q-X, and Former Defendam Range (Eastern), Parcel 225Q.

## 7.0 References

---

Cloud, P. E., Jr., 1966, *Bauxite Deposits of the Anniston, Fort Payne, and Asheville Areas, Northeast Alabama*, U. S. Geological Survey Bulletin 1199-O, 35p.

Environmental Science and Engineering, Inc. (ESE), 1998, *Final Environmental Baseline Survey, Fort McClellan, Alabama*, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, January.

IT Corporation (IT), 2002a, *Final Site-Specific Field Sampling Plan, Site-Specific Safety and Health Plan, and Site-Specific Unexploded Ordnance Safety Plan Attachments, Former Mortar Firing Point, Parcel 105Q-X, and Former Defendamm Range (Eastern), Parcel 225Q, Fort McClellan, Calhoun County, Alabama*, April.

IT Corporation (IT), 2002b, *Draft Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, Alabama*, Revision 3, prepared for the U.S. Army Corps of Engineers, Mobile District, February.

IT Corporation (IT), 2000a, *Final Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, Alabama*, March.

IT Corporation (IT), 2000b, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

IT Corporation (IT), 1998, *Final Installation-Wide Work Plan, Fort McClellan, Calhoun County, Alabama*, August.

Moser, P. H., and S. S. DeJarnette, 1992, *Ground-water Availability in Calhoun County, Alabama*, Geological Survey of Alabama Special Map 228.

Osborne, W. E., 1999, Personal communication with John Hofer, IT Corporation.

Osborne, W. E., and M. W. Szabo, 1984, *Stratigraphy and Structure of the Jacksonville Fault, Calhoun County, Alabama*, Geological Survey of Alabama Circular 117.

Osborne, W. E., G. D. Irving, and W. E. Ward, 1997, *Geologic Map of the Anniston 7.5' Quadrangle, Calhoun County, Alabama*, Geological Survey of Alabama Preliminary Map, 1 sheet.

Osborne, W. E., M. W. Szabo, C. W. Copeland, Jr., and T. L. Neathery, 1989, *Geologic Map of Alabama*, Geological Survey of Alabama Special Map 221, scale 1:500,000, 1 sheet.

Osborne, W. E., M. W. Szabo, T. L. Neathery, and C. W. Copeland, compilers, 1988, *Geologic Map of Alabama, Northeast Sheet*, Geological Survey of Alabama Special Map 220, Scale 1:250,000.

Raymond, D. E., W. E. Osborne, C. W. Copeland, and T. L. Neathery, 1988, *Alabama Stratigraphy*, Geological Survey of Alabama, Tuscaloosa, Alabama.

Science Applications International Corporation (SAIC), 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

Shaw Environmental, Inc. (Shaw), 2005, "Selecting Site-Related Chemicals for Human Health and Ecological Risk Assessments for FTMC: Revision 3", technical memorandum dated March 14.

Thomas, W. A., and T. L. Neathery, 1982, *Appalachian Thrust Belts in Alabama: Tectonics and Sedimentation*, Geologic Society of America 1982 Annual Meeting, New Orleans, Louisiana, Field Trip, Alabama Geological Society Guidebook 19A.

Thomas, W. A., and J. A. Drahovzal, 1974, *The Coosa Deformed Belt in the Alabama Appalachians*, Alabama Geological Society, 12<sup>th</sup> Annual Field Trip Guidebook 98 p.

U.S. Army Corps of Engineers (USACE), 2001a, *Archives Search Report, Maps, Fort McClellan, Anniston, Alabama*, Revision 1, September.

U.S. Army Corps of Engineers (USACE), 2001b, *Requirements for the Preparation of Sampling and Analysis Plans*, Engineer Manual EM 200-1-3, February.

U.S. Department of Agriculture, 1961, *Soil Survey, Calhoun County, Alabama*, Soil Conservation Service, Series 1958, No. 9, September.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1998, Unedited Local Climatological Data, Anniston, Alabama, January - December 1998.

U.S. Fish and Wildlife Service, 2003, Personal communication from B. Garland, biologist, to Troy Winton (Shaw Environmental, Inc.) re: Parcel 105Q-X site history, January.

Warman, J. C., and L. V. Causey, 1962, *Geology and Ground-water Resources of Calhoun County, Alabama*, Geological Survey of Alabama County Report 7.

## **ATTACHMENT 1**

### **LIST OF ABBREVIATIONS AND ACRONYMS**

## List of Abbreviations and Acronyms

2-ADNT	2-amino-4,6-dinitrotoluene	ASTM	American Society for Testing and Materials	CBR	chemical, biological, and radiological
4-ADNT	4-amino-2,6-dinitrotoluene	AT	averaging time	CCAL	continuing calibration
2,4-D	2,4-dichlorophenoxyacetic acid	atm-m <sup>3</sup> /mol	atmospheres per cubic meter per mole	CCB	continuing calibration blank
2,4,5-T	2,4,5-trichlorophenoxyacetic acid	ATSDR	Agency for Toxic Substances and Disease Registry	CCV	continuing calibration verification
2,4,5-TP	2,4,5-trichlorophenoxypropionic acid	ATV	all-terrain vehicle	CD	compact disc
3D	3D International Environmental Group	AUF	area use factor	CDTF	Chemical Defense Training Facility
AB	ambient blank	AWARE	Associated Water and Air Resources Engineers, Inc.	CEHNC	U.S. Army Engineering and Support Center, Huntsville
AbB3	Anniston gravelly clay loam, 2 to 6 percent slopes, severely eroded	AWQC	ambient water quality criteria	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
AbC3	Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded	AWWSB	Anniston Water Works and Sewer Board	CERFA	Community Environmental Response Facilitation Act
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded	'B'	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)	CESAS	Corps of Engineers South Atlantic Savannah
ABLM	adult blood lead model	BAF	bioaccumulation factor	CF	chloroform
Abs	skin absorption	BBGR	Baby Bains Gap Road	CF	conversion factor
ABS	dermal absorption factor	BCF	blank correction factor; bioconcentration factor	CFC	chlorofluorocarbon
AC	hydrogen cyanide	BCT	BRAC Cleanup Team	CFDP	Center for Domestic Preparedness
ACAD	AutoCadd	BERA	baseline ecological risk assessment	CFR	Code of Federal Regulations
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded	BEHP	bis(2-ethylhexyl)phthalate	CG	phosgene (carbonyl chloride)
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded	BFB	bromofluorobenzene	CGI	combustible gas indicator
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded	BFE	base flood elevation	ch	inorganic clays of high plasticity
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded	BFM	bonded fiber matrix	CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
ACGIH	American Conference of Governmental Industrial Hygienists	BG	Bacillus globigii	CIH	Certified Industrial Hygienist
AdE	Anniston and Allen stony loam, 10 to 25 percent slope	BGR	Bains Gap Road	CK	cyanogen chloride
ADEM	Alabama Department of Environmental Management	bgs	below ground surface	cl	inorganic clays of low to medium plasticity
ADPH	Alabama Department of Public Health	BHC	hexachlorocyclohexane	Cl	chlorinated
AEC	U.S. Army Environmental Center	BHHRA	baseline human health risk assessment	CLP	Contract Laboratory Program
AEDA	ammunition, explosives, and other dangerous articles	BIRTC	Branch Immaterial Replacement Training Center	cm	centimeter
AEL	airborne exposure limit	bkg	background	CN	chloroacetophenone
AET	adverse effect threshold	bls	below land surface	CNB	chloroacetophenone, benzene, and carbon tetrachloride
AF	soil-to-skin adherence factor	BOD	biological oxygen demand	CNS	chloroacetophenone, chloropicrin, and chloroform
AHA	ammunition holding area	Bp	soil-to-plant biotransfer factors	CO	carbon monoxide
AL	Alabama	BRAC	Base Realignment and Closure	CO <sub>2</sub>	carbon dioxide
ALARNG	Alabama Army National Guard	Braun	Braun Intertec Corporation	Co-60	cobalt-60
ALAD	δ-aminolevulinic acid dehydratase	BSAF	biota-to-sediment accumulation factors	CoA	Code of Alabama
ALDOT	Alabama Department of Transportation	BSC	background screening criterion	COC	chain of custody; chemical of concern
amb.	amber	BTAG	Biological Technical Assistance Group	COE	Corps of Engineers
amsl	above mean sea level	BTEX	benzene, toluene, ethyl benzene, and xylenes	Con	skin or eye contact
ANAD	Anniston Army Depot	BTOC	below top of casing	COPC	chemical of potential concern
ANOVA	Analysis of Variance	BTV	background threshold value	COPEC	constituent of potential ecological concern
AOC	area of concern	BW	biological warfare; body weight	CPOM	coarse particulate organic matter
AP	armor piercing	BZ	breathing zone; 3-quinuclidinyl benzilate	CPSS	chemicals present in site samples
APEC	areas of potential ecological concern	C	ceiling limit value	CQCSM	Contract Quality Control System Manager
APT	armor-piercing tracer	Ca	carcinogen	CRDL	contract-required detection limit
AR	analysis request	CaCO <sub>3</sub>	calcium carbonate	CRL	certified reporting limit
ARAR	applicable or relevant and appropriate requirement	CAA	Clean Air Act	CRQL	contract-required quantitation limit
AREE	area requiring environmental evaluation	CAB	chemical warfare agent breakdown products	CRZ	contamination reduction zone
AS/SVE	air sparging/soil vapor extraction	CACM	Chemical Agent Contaminated Media	Cs-137	cesium-137
ASP	Ammunition Supply Point	CAIS	chemical agent identification set	CS	ortho-chlorobenzylidene-malononitrile
ASR	Archives Search Report	CAMU	corrective action management unit	CSEM	conceptual site exposure model
AST	aboveground storage tank			CSM	conceptual site model

## List of Abbreviations and Acronyms (Continued)

CT	central tendency	EBS	environmental baseline survey	FFCA	Federal Facilities Compliance Act
CT	carbon tetrachloride	EBV	EBV Explosives Environmental Co.	FFE	field flame expedient
ctr.	container	EC <sub>20</sub>	effects concentration for 20 percent of a test population	FFS	focused feasibility study
CWA	chemical warfare agent; Clean Water Act	EC <sub>50</sub>	effects concentration for 50 percent of a test population	FI	fraction of exposure
CWM	chemical warfare material; clear, wide mouth	ECBC	Edgewood Chemical Biological Center	Fil	filtered
CX	dichloroformoxime	ED	exposure duration	Flt	filtered
'D'	duplicate; dilution	EDD	electronic data deliverable	FMDC	Fort McClellan Development Commission
D&I	detection and identification	EF	exposure frequency	FML	flexible membrane liner
DAAMS	depot area agent monitoring station	EDQL	ecological data quality level	f <sub>oc</sub>	fraction organic carbon
DAF	dilution-attenuation factor	EE/CA	engineering evaluation and cost analysis	FOMRA	Former Ordnance Motor Repair Area
DANC	decontamination agent, non-corrosive	Eh	oxidation-reduction potential	FOST	Finding of Suitability to Transfer
°C	degrees Celsius	Elev.	elevation	Foster Wheeler	Foster Wheeler Environmental Corporation
°F	degrees Fahrenheit	EM	electromagnetic	FR	Federal Register
DCA	dichloroethane	EMI	Environmental Management Inc.	Frtn	fraction
DCE	dichloroethene	EM31	Geonics Limited EM31 Terrain Conductivity Meter	FS	field split; feasibility study; fuming sulfuric acid
DD	Defense Department	EM61	Geonics Limited EM61 High-Resolution Metal Detector	FSP	field sampling plan
DDD	dichlorodiphenyldichloroethane	EOD	explosive ordnance disposal	ft	feet
DDE	dichlorodiphenyldichloroethene	EODT	explosive ordnance disposal team	ft/day	feet per day
DDT	dichlorodiphenyltrichloroethane	EPA	U.S. Environmental Protection Agency	ft/ft	feet per foot
DEH	Directorate of Engineering and Housing	EPC	exposure point concentration	ft/yr	feet per year
DEHP	di(2-ethylhexyl)phthalate	EPIC	Environmental Photographic Interpretation Center	FTA	Fire Training Area
DEP	depositional soil	EPRI	Electrical Power Research Institute	FTMC	Fort McClellan
DFTPP	decafluorotriphenylphosphine	EPT	Ephemeroptera, Plecoptera, Trichoptera	FTRRA	FTMC Reuse & Redevelopment Authority
DI	deionized	ER	equipment rinsate	g	gram
DID	data item description	ERA	ecological risk assessment	g/m <sup>3</sup>	gram per cubic meter
DIMP	di-isopropylmethylphosphonate	ER-L	effects range-low	G-856	Geometrics, Inc. G-856 magnetometer
DM	dry matter; adamsite	ER-M	effects range-medium	G-858G	Geometrics, Inc. G-858G magnetic gradiometer
DMBA	dimethylbenz(a)anthracene	ESE	Environmental Science and Engineering, Inc.	GAF	gastrointestinal absorption factor
DMMP	dimethylmethylphosphonate	ESL	ecological screening level	gal	gallon
DNAPL	dense nonaqueous-phase liquid	ESMP	Endangered Species Management Plan	gal/min	gallons per minute
DNT	dinitrotoluene	ESN	Environmental Services Network, Inc.	GB	sarin (isopropyl methylphosphonofluoridate)
DO	dissolved oxygen	ESV	ecological screening value	gc	clay gravels; gravel-sand-clay mixtures
DOD	U.S. Department of Defense	ET	exposure time	GC	gas chromatograph
DOJ	U.S. Department of Justice	EU	exposure unit	GCL	geosynthetic clay liner
DOT	U.S. Department of Transportation	Exp.	Explosives	GC/MS	gas chromatograph/mass spectrometer
DP	direct-push	EXTOXNET	Extension Toxicology Network	GCR	geosynthetic clay liner
DPDO	Defense Property Disposal Office	E-W	east to west	GFAA	graphite furnace atomic absorption
DPT	direct-push technology	EZ	exclusion zone	GIS	Geographic Information System
DQO	data quality objective	FAR	Federal Acquisition Regulations	gm	silty gravels; gravel-sand-silt mixtures
DRMO	Defense Reutilization and Marketing Office	FB	field blank	gp	poorly graded gravels; gravel-sand mixtures
DRO	diesel range organics	FBI	Family Biotic Index	gpm	gallons per minute
DS	deep (subsurface) soil	FD	field duplicate	GPR	ground-penetrating radar
DS2	Decontamination Solution Number 2	FDC	Former Decontamination Complex	GPS	global positioning system
DSERTS	Defense Site Environmental Restoration Tracking System	FDA	U.S. Food and Drug Administration	GRA	general response action
DWEL	drinking water equivalent level	Fe <sup>+3</sup>	ferric iron	GS	ground scar
E&E	Ecology and Environment, Inc.	Fe <sup>+2</sup>	ferrous iron	GSA	General Services Administration; Geologic Survey of Alabama
EB	equipment blank	FedEx	Federal Express, Inc.	GSBP	Ground Scar Boiler Plant
EBC	Eastern Bypass Corridor	FEMA	Federal Emergency Management Agency	GSSI	Geophysical Survey Systems, Inc.

## List of Abbreviations and Acronyms (Continued)

GST	ground stain	IR	ingestion rate	MDL	method detection limit
GW	groundwater	IRDMIS	Installation Restoration Data Management Information System	mg	milligrams
gw	well-graded gravels; gravel-sand mixtures	IRIS	Integrated Risk Information Service	mg/kg	milligrams per kilogram
H&S	health and safety	IRP	Installation Restoration Program	mg/kg/day	milligram per kilogram per day
HA	hand auger	IS	internal standard	mg/kgbw/day	milligrams per kilogram of body weight per day
HC	mixture of hexachloroethane, aluminum powder, and zinc oxide (smoke producer)	ISCP	Installation Spill Contingency Plan	mg/L	milligrams per liter
HCl	hydrochloric acid	IT	IT Corporation	mg/m <sup>3</sup>	milligrams per cubic meter
HD	distilled mustard (bis-[dichloroethyl]sulfide)	ITEMS	IT Environmental Management System™	mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
HDPE	high-density polyethylene	'J'	estimated concentration	MHz	megahertz
HE	high explosive	JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded	µg/g	micrograms per gram
HEAST	Health Effects Assessment Summary Tables	JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded	µg/kg	micrograms per kilogram
Herb.	herbicides	JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes	µg/L	micrograms per liter
HHRA	human health risk assessment	JPA	Joint Powers Authority	µmhos/cm	micromhos per centimeter
HI	hazard index	K	conductivity	MEC	munitions and explosives of concern
HN	hydrogen mustard	K <sub>d</sub>	soil-water distribution coefficient	MeV	mega electron volt
H <sub>2</sub> O <sub>2</sub>	hydrogen peroxide	kg	kilogram	min	minimum
HPLC	high-performance liquid chromatography	KeV	kilo electron volt	MINICAMS	miniature continuous air monitoring system
HNO <sub>3</sub>	nitric acid	K <sub>oc</sub>	organic carbon partitioning coefficient	ml	inorganic silts and very fine sands
HQ	hazard quotient	K <sub>ow</sub>	octonal-water partition coefficient	mL	milliliter
HQ <sub>screen</sub>	screening-level hazard quotient	KMnO <sub>4</sub>	potassium permanganate	mm	millimeter
hr	hour	L	liter; Lewisite (dichloro-[2-chloroethyl]sulfide)	MM	mounded material
HRC	hydrogen releasing compound	L/kg/day	liters per kilogram per day	MMBtu/hr	million Btu per hour
HSA	hollow-stem auger	l	liter	MNA	monitored natural attenuation
HSDB	Hazardous Substance Data Bank	LAW	light anti-tank weapon	MnO <sub>4</sub> -	permanganate ion
HTRW	hazardous, toxic, and radioactive waste	lb	pound	MOA	Memorandum of Agreement
'I'	out of control, data rejected due to low recovery	LBP	lead-based paint	MOGAS	motor vehicle gasoline
IASPOW	Impact Area South of POW Training Facility	LC	liquid chromatography	MOUT	Military Operations in Urban Terrain
IATA	International Air Transport Authority	LCS	laboratory control sample	MP	Military Police
ICAL	initial calibration	LC <sub>50</sub>	lethal concentration for 50 percent population tested	MPA	methyl phosphonic acid
ICB	initial calibration blank	LD <sub>50</sub>	lethal dose for 50 percent population tested	MPC	maximum permissible concentration
ICP	inductively-coupled plasma	LEL	lower explosive limit	MPM	most probable munition
ICRP	International Commission on Radiological Protection	LOAEL	lowest-observed-adverse-effects-level	MQL	method quantitation limit
ICS	interference check sample	LOEC	lowest-observable-effect-concentration	MR	molasses residue
ID	inside diameter	LRA	land redevelopment authority	MRL	method reporting limit
IDL	instrument detection limit	LT	less than the certified reporting limit	MS	matrix spike
IDLH	immediately dangerous to life or health	LUC	land-use control	mS/cm	millisiemens per centimeter
IDM	investigative-derived media	LUCAP	land-use control assurance plan	mS/m	millisiemens per meter
IDW	investigation-derived waste	LUCIP	land-use control implementation plan	MSD	matrix spike duplicate; minimum separation distance
IEUBK	Integrated Exposure Uptake Biokinetic	max	maximum	MTBE	methyl tertiary butyl ether
IF	ingestion factor; inhalation factor	MB	method blank	msl	mean sea level
ILCR	incremental lifetime cancer risk	MCL	maximum contaminant level	MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes, severely eroded
IMPA	isopropylmethyl phosphonic acid	MCLG	maximum contaminant level goal	mV	millivolts
IMR	Iron Mountain Road	MCPA	4-chloro-2-methylphenoxyacetic acid	MW	monitoring well
in.	inch	MCPP	2-(2-methyl-4-chlorophenoxy)propionic acid	MWI&MP	Monitoring Well Installation and Management Plan
Ing	ingestion	MCS	media cleanup standard	Na	sodium
Inh	inhalation	MD	matrix duplicate	NA	not applicable; not available
IP	ionization potential	MDC	maximum detected concentration	NAD	North American Datum
IPS	International Pipe Standard	MDCC	maximum detected constituent concentration	NAD83	North American Datum of 1983

## List of Abbreviations and Acronyms (Continued)

NaMnO <sub>4</sub>	sodium permanganate	OH•	hydroxyl radical	PRA	preliminary risk assessment
NAVD88	North American Vertical Datum of 1988	ol	organic silts and organic silty clays of low plasticity	PRG	preliminary remediation goal
NAS	National Academy of Sciences	OP	organophosphorus	PS	chloropicrin
NCEA	National Center for Environmental Assessment	ORC	Oxygen Releasing Compound	PSSC	potential site-specific chemical
NCP	National Contingency Plan	ORP	oxidation-reduction potential	pt	peat or other highly organic silts
NCRP	National Council on Radiation Protection and Measurements	OSHA	Occupational Safety and Health Administration	PVC	polyvinyl chloride
ND	not detected	OSWER	Office of Solid Waste and Emergency Response	QA	quality assurance
NE	no evidence; northeast	OVM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector	QA/QC	quality assurance/quality control
ne	not evaluated	OWS	oil/water separator	QAM	quality assurance manual
NEW	net explosive weight	oz	ounce	QAO	quality assurance officer
NFA	No Further Action	PA	preliminary assessment	QAP	installation-wide quality assurance plan
NG	National Guard	PAH	polynuclear aromatic hydrocarbon	QC	quality control
NGP	National Guardsperson	PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity	QST	QST Environmental, Inc.
ng/L	nanograms per liter	Parsons	Parsons Engineering Science, Inc.	qty	quantity
NGVD	National Geodetic Vertical Datum	Pb	lead	Qual	qualifier
Ni	nickel	PBMS	performance-based measurement system	QuickSilver	QuickSilver Analytics, Inc.
NIC	notice of intended change	PC	permeability coefficient	R	rejected data; resample; retardation factor
NIOSH	National Institute for Occupational Safety and Health	PCB	polychlorinated biphenyl	R&A	relevant and appropriate
NIST	National Institute of Standards and Technology	PCDD	polychlorinated dibenzo-p-dioxins	RA	remedial action
NLM	National Library of Medicine	PCDF	polychlorinated dibenzofurans	RAO	remedial action objective
NO <sub>3</sub> <sup>-</sup>	nitrate	PCE	perchloroethene	RBC	risk-based concentration; red blood cell
NOEC	no-observable-effect-concentration	PCP	pentachlorophenol	RBP	Rapid Bioassessment Protocol
NPDES	National Pollutant Discharge Elimination System	PDS	Personnel Decontamination Station	RBRG	risk-based remedial goal
NPW	net present worth	PEF	particulate emission factor	RCRA	Resource Conservation and Recovery Act
No.	number	PEL	permissible exposure limit	RCWM	Recovered Chemical Warfare Material
NOAA	National Oceanic and Atmospheric Administration	PERA	preliminary ecological risk assessment	RD	remedial design
NOAEL	no-observed-adverse-effects-level	PERC	perchloroethene	RDX	cyclotrimethylenetrinitramine
NR	not requested; not recorded; no risk	PES	potential explosive site	ReB3	Rarden silty clay loams
NRC	National Research Council	Pest.	pesticides	REG	regular field sample
NRCC	National Research Council of Canada	PETN	pentaerythritoltetranitrate	REL	recommended exposure limit
NRHP	National Register of Historic Places	PFT	portable flamethrower	RFA	request for analysis
NRT	near real time	PG	professional geologist	RfC	reference concentration
ns	nanosecond	PID	photoionization detector	RfD	reference dose
N-S	north to south	PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes	RGO	remedial goal option
NS	not surveyed	PM	project manager	RI	remedial investigation
NSA	New South Associates, Inc.	POC	point of contact	RL	reporting limit
nT	nanotesla	POL	petroleum, oils, and lubricants	RME	reasonable maximum exposure
nT/m	nanoteslas per meter	POTW	publicly owned treatment works	ROD	Record of Decision
NTU	nephelometric turbidity unit	POW	prisoner of war	RPD	relative percent difference
nv	not validated	PP	peristaltic pump; Proposed Plan	RR	range residue
O <sub>2</sub>	oxygen	ppb	parts per billion	RRF	relative response factor
O <sub>3</sub>	ozone	ppbv	parts per billion by volume	RRSE	Relative Risk Site Evaluation
O&G	oil and grease	PPE	personal protective equipment	RSD	relative standard deviation
O&M	operation and maintenance	ppm	parts per million	RTC	Recruiting Training Center
OB/OD	open burning/open detonation	PPMP	Print Plant Motor Pool	RTECS	Registry of Toxic Effects of Chemical Substances
OD	outside diameter	ppt	parts per thousand	RTK	real-time kinematic
OE	ordnance and explosives	PR	potential risk	RWIMR	Ranges West of Iron Mountain Road
oh	organic clays of medium to high plasticity			SA	exposed skin surface area

## List of Abbreviations and Acronyms (Continued)

SAD	South Atlantic Division	STB	supertropical bleach	TSS	total suspended solids
SAE	Society of Automotive Engineers	STC	source-term concentration	TWA	time-weighted average
SAIC	Science Applications International Corporation	STD	standard deviation	UCL	upper confidence limit
SAP	installation-wide sampling and analysis plan	STEL	short-term exposure limit	UCR	upper certified range
SARA	Superfund Amendments and Reauthorization Act	STL	Severn-Trent Laboratories	'U'	not detected above reporting limit
sc	clayey sands; sand-clay mixtures	STOLS	Surface Towed Ordnance Locator System®	UIC	underground injection control
Sch.	schedule	Std. units	standard units	UF	uncertainty factor
SCM	site conceptual model	SU	standard unit	URF	unit risk factor
SD	sediment	SUXOS	senior UXO supervisor	USACE	U.S. Army Corps of Engineers
SDG	sample delivery group	SVOC	semivolatile organic compound	USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
SDWA	Safe Drinking Water Act	SW	surface water	USAEC	U.S. Army Environmental Center
SDZ	safe distance zone; surface danger zone	SW-846	U.S. EPA's <i>Test Methods for Evaluating Solid Waste: Physical/Chemical Methods</i>	USAEHA	U.S. Army Environmental Hygiene Agency
SEMS	Southern Environmental Management & Specialties, Inc.	SWMU	solid waste management unit	USACMLS	U.S. Army Chemical School
SF	cancer slope factor	SWPP	storm water pollution prevention plan	USAMPS	U.S. Army Military Police School
SFSP	site-specific field sampling plan	SZ	support zone	USATCES	U.S. Army Technical Center for Explosive Safety
SGF	standard grade fuels	TAL	target analyte list	USATEU	U.S. Army Technical Escort Unit
Shaw	Shaw Environmental, Inc.	TAT	turn around time	USATHAMA	U.S. Army Toxic and Hazardous Material Agency
SHP	installation-wide safety and health plan	TB	trip blank	USC	United States Code
SI	site investigation	TBC	to be considered	USCS	Unified Soil Classification System
SINA	Special Interest Natural Area	TCA	trichloroethane	USDA	U.S. Department of Agriculture
SL	standing liquid	TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin	USEPA	U.S. Environmental Protection Agency
SLERA	screening-level ecological risk assessment	TCDF	tetrachlorodibenzofurans	USFWS	U.S. Fish and Wildlife Service
sm	silty sands; sand-silt mixtures	TCE	trichloroethene	USGS	U.S. Geological Survey
SM	<i>Serratia marcescens</i>	TCL	target compound list	UST	underground storage tank
SMDP	Scientific Management Decision Point	TCLP	toxicity characteristic leaching procedure	UTL	upper tolerance level; upper tolerance limit
s/n	signal-to-noise ratio	TDEC	Tennessee Department of Environment and Conservation	UXO	unexploded ordnance
SO <sub>4</sub> <sup>-2</sup>	sulfate	TDGCL	thiodiglycol	UXOQCS	UXO Quality Control Supervisor
SOD	soil oxidant demand	TDGCLA	thiodiglycol chloroacetic acid	UXOSO	UXO safety officer
SOP	standard operating procedure	TEA	triethylaluminum	V	vanadium
SOPQAM	U.S. EPA's <i>Standard Operating Procedure/Quality Assurance Manual</i>	TeCA	1,1,2,2-tetrachloroethane	VC	vinyl chloride
sp	poorly graded sands; gravelly sands	Tetryl	trinitrophenylmethylnitramine	VOA	volatile organic analyte
SP	submersible pump	TERC	Total Environmental Restoration Contract	VOC	volatile organic compound
SPCC	system performance calibration compound	TEU	Technical Escort Unit	VOH	volatile organic hydrocarbon
SPCS	State Plane Coordinate System	THI	target hazard index	VQlfr	validation qualifier
SPM	sample planning module	THI	target hazard index	VQual	validation qualifier
SQRT	screening quick reference tables	TIC	tentatively identified compound	VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
Sr-90	strontium-90	TLV	threshold limit value	WAC	Women's Army Corps
SRA	streamlined human health risk assessment	TN	Tennessee	Weston	Roy F. Weston, Inc.
SRI	supplemental remedial investigation	TNB	trinitrobenzene	WP	installation-wide work plan
SRM	standard reference material	TNT	trinitrotoluene	WRS	Wilcoxon rank sum
Ss	stony rough land, sandstone series	TOC	top of casing; total organic carbon	WS	watershed
SS	surface soil	TPH	total petroleum hydrocarbons	WSA	Watershed Screening Assessment
SSC	site-specific chemical	TR	target cancer risk	WWI	World War I
SSHO	site safety and health officer	TRADOC	U.S. Army Training and Doctrine Command	WWII	World War II
SSHP	site-specific safety and health plan	TRPH	total recoverable petroleum hydrocarbons	XRF	x-ray fluorescence
SSL	soil screening level	TRV	toxicity reference value	yd <sup>3</sup>	cubic yards
SSSL	site-specific screening level	TSCA	Toxic Substances Control Act	ZVI	zero-valent iron
SSSSL	site-specific soil screening level	TSDF	treatment, storage, and disposal facility		