Final

Site Investigation Report
Trenches Near Range 20 Firing Line,
Parcels 239(7) and 240(7)

Fort McClellan
Calhoun County, Alabama

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Task Order CK05
Contract No. DACA21-96-D-0018
IT Project No. 774645

November 2000

Revision 0

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See Attachment 1 – List of Abbreviations and Acronyms

Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK05, IT Corporation completed a site investigation (SI) at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), at Fort McClellan in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site and, if present, whether the concentrations would present an unacceptable risk to human health or the environment. The SI at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), consisted of a geophysical survey and the sampling and analyses of six surface soil samples, two depositional soil samples, six subsurface soil samples, and two groundwater samples. In addition, two temporary groundwater monitoring wells were installed in the residuum groundwater zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information.

The geophysical survey results indicate that most of the anomalies at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), are caused by surface metal and cultural features. The geophysical data do not indicate the presence of trenches; however, one geophysical anomaly identified in the Parcel 239(7) data is interpreted to be a pit containing a low concentration of buried metal.

Chemical analyses of samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), indicate that metals, volatile organic compounds, semivolatile organic compounds, and pesticides were detected in the various site media. Herbicides, polychlorinated biphenyls, and nitroaromatic explosives were not detected in any of the samples collected. 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.

The potential threat to human receptors is expected to be low. Although the site is projected for passive recreational use, the analytical data were screened against residential human health SSSLs to evaluate the site for possible unrestricted future land use. In soils, the concentrations of manganese (two surface soil samples) and iron (one surface soil sample) exceeded SSSLs and the respective background concentration. However, the concentrations of these metals were within the range of background values. The pesticide 4,4’-dichlorodiphenyltrichloroethane (DDT) was detected in one surface soil sample at a concentration (3.6 milligrams per kilogram) exceeding

the SSSL. Given the low concentration and limited distribution, the 4,4'-DDT is not expected to pose a significant threat to human health.

In groundwater, several metals were detected at concentrations exceeding SSSLs and background concentrations. However, the elevated metals results are likely the result of high turbidity at the time of sample collection and are not believed to be related to site activities. The concentration of the semivolatile organic compound bis(2-ethylhexyl)phthalate exceeded the SSSL in one groundwater sample. Bis(2-ethylhexyl)phthalate is a common contaminant in water samples and is probably not related to site activities.

The concentrations of three metals (barium, beryllium, and selenium) exceeded ESVs and the range of background values in two surface/depositional soil samples each. Additionally, the concentrations of three pesticides (4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyl-dichloroethene, and/or 4,4'-DDT) exceeded ESVs at four surface/depositional soil sample locations. The cumulative concentration of these pesticides in the eight surface and depositional soil samples collected was 5.33 milligrams per kilogram. The parcels are located within a heavily wooded area, away from the developed portion of the Main Post and are expected to support viable ecological habitat. However, the low levels of metals and pesticides detected are not expected to pose a substantial threat to ecological receptors.

Based on the results of the SI, past operations at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), do not appear to have adversely impacted the environment. The metals and chemical constituents detected in site media do not pose an unacceptable risk to human health and the environment. Therefore, IT Corporation recommends "No Further Action" and unrestricted reuse with regard to hazardous, toxic, and radioactive waste at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7).

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 with IT Corporation (IT) to perform the site investigation (SI) at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), under Contract Number DACA21-96-D-0018, Task Order CK05.

This SI report presents specific information and results compiled from the SI, including geophysical survey, field sampling and analysis, and monitoring well installation activities, conducted at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7).

1.1 Project Description

The Trenches near Range 20 Firing Line were identified as an area to be investigated prior to property transfer. The parcels were classified as Category 7 sites in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

A site-specific field sampling plan (SFSP) attachment (IT, 1998a) and a site-specific safety and health plan (SSHP) attachment were finalized in December 1998. The SFSP and SSHP were prepared to provide technical guidance for sample collection and analysis at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). The SFSP was used in conjunction with the SSHP as attachments to the installation-wide work plan (IT, 1998b) and the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan and quality assurance plan.

The SI included fieldwork to collect six surface soil samples, two depositional soil samples, six subsurface soil samples, and two groundwater samples to determine whether potential site-specific chemicals are present at the site and to provide data useful for supporting any future corrective measures and closure activities.

1.2 Purpose and Objectives

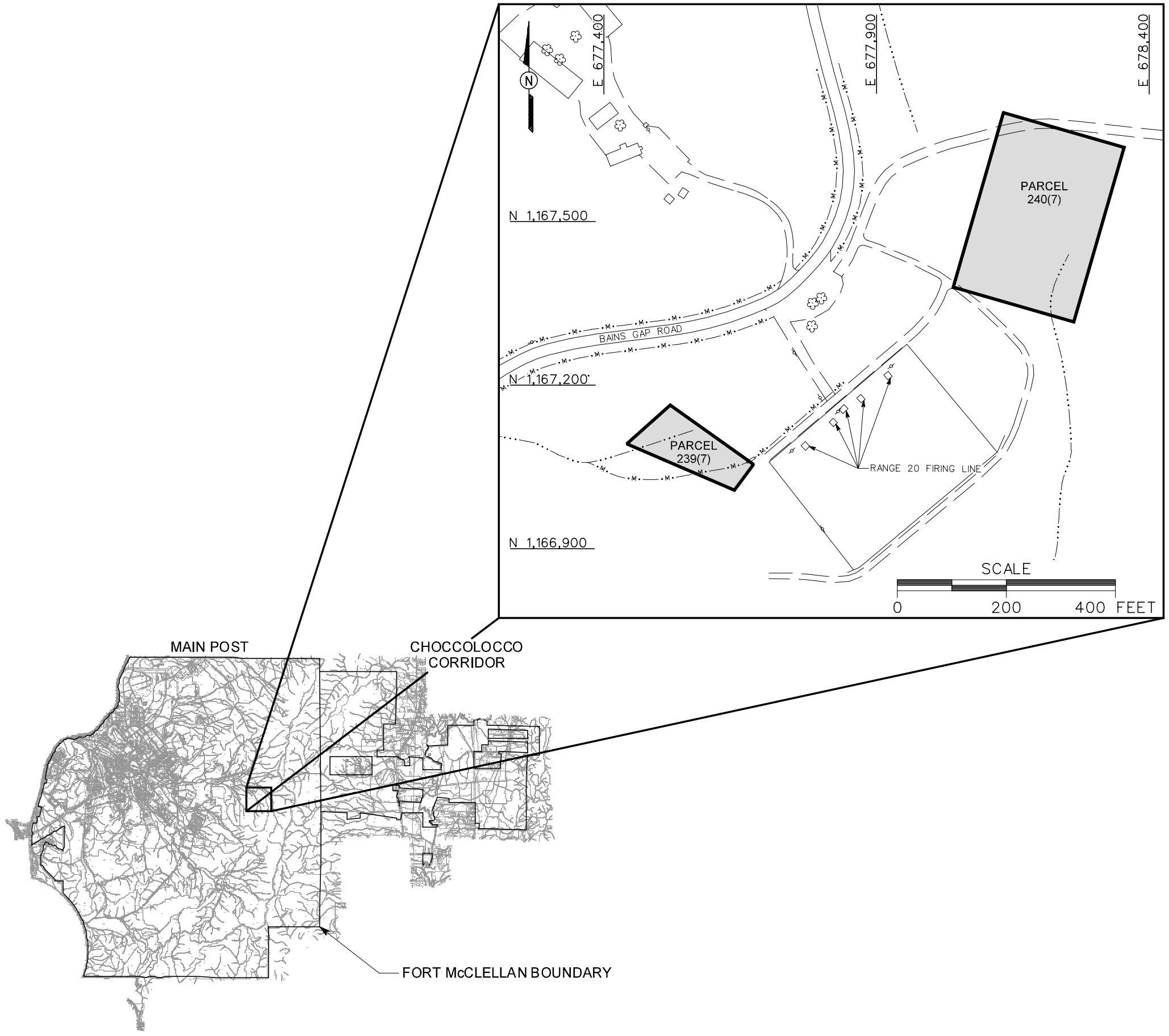
The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), at concentrations that would present an unacceptable risk to human health or the environment. 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 by IT as part of the human health and ecological risk evaluations associated with SIs being 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 [SAIC], 1998).

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

1.3 Site Description and History

The Trenches near Range 20 Firing Line (Parcels 239[7] and 240[7]) are located near Bains Gap Road in the central part of the Main Post of FTMC (Figures 1-1 and 1-2). Aerial photographs were reviewed to locate the approximate site boundary of each parcel. Parcel 239(7) is located south of Bains Gap Road, approximately 80 feet west of the Range 20 Firing Line. Parcel 240(7) is located approximately 200 feet northeast of the Range 20 Firing Line, adjacent to a dirt access road (Figure 1-2). Each parcel covers approximately 1 acre.

The original shape and orientation of each parcel are slightly different from those identified in the EBS (ESE, 1998). The actual shape and orientation of both parcels were identified during a site visit conducted by IT personnel in July 1998. At the time of SI activities, both parcels appeared to have been altered from the original habitat. The altered terrestrial habitat area was occupied by immature young pine trees approximately 8 feet tall or smaller. The young pine trees were surrounded by an unaltered mature forest with trees approximately 30 feet tall or larger.



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- MANMADE SURFACE DRAINAGE FEATURE
- UTILITY POLE

FIGURE 1-1
SITE LOCATION MAP
TRENCHES NEAR RANGE 20
FIRING LINE
PARCELS 239(7) AND 240(7)

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

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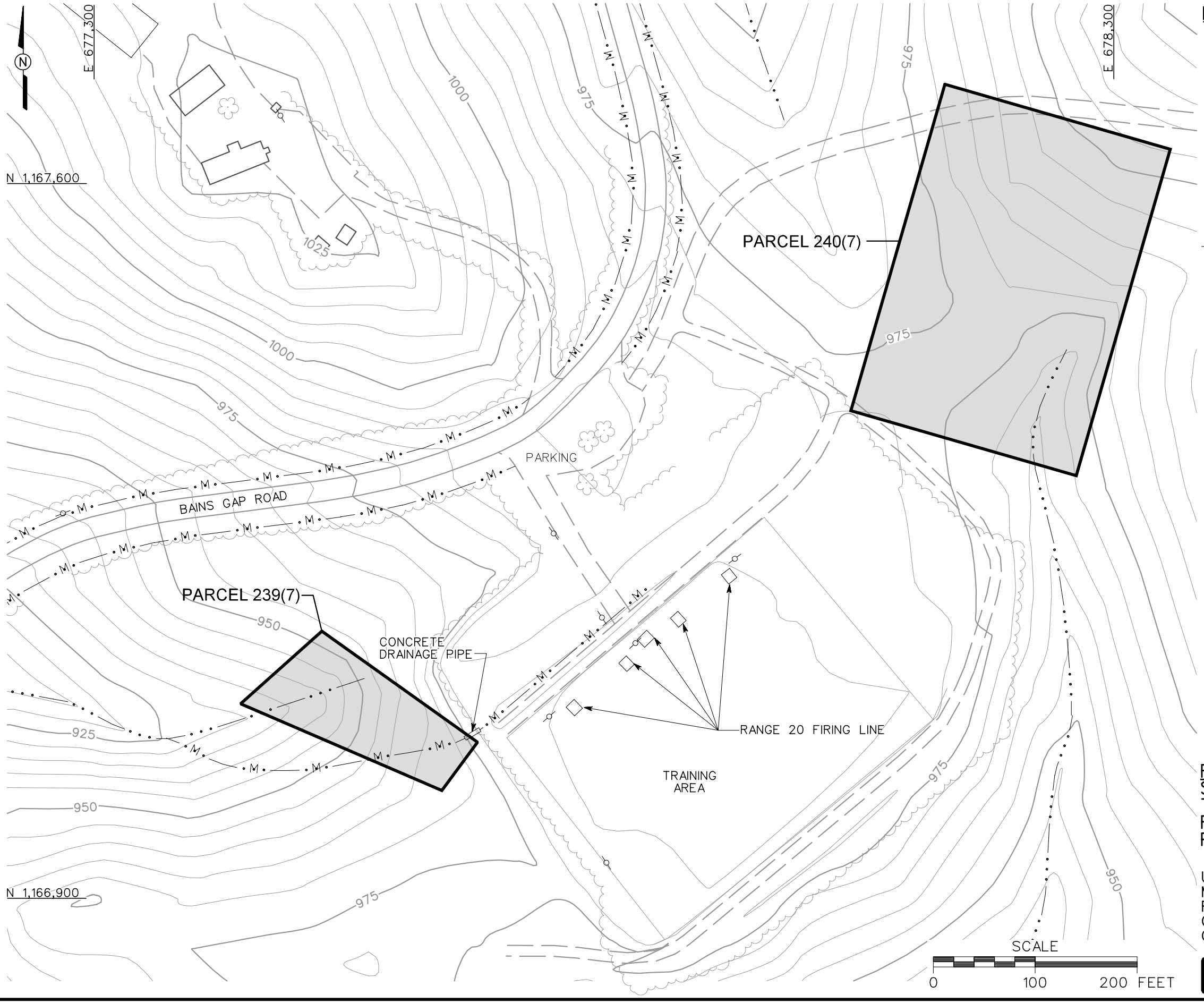

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- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
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- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- MANMADE SURFACE DRAINAGE FEATURE
- UTILITY POLE

FIGURE 1-2
SITE MAP
TRENCHES NEAR RANGE 20
FIRING LINE
PARCELS 239(7) AND 240(7)

U. S. ARMY CORPS OF ENGINEERS
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Parcel 239(7) is approximately 200 feet in length (northwest to southeast) by 100 feet wide (northeast to southwest). The parcel consists of a valley that slopes to the northwest. A corrugated steel drainage pipe originating on the range side of the parcel receives rainwater via a ditch that runs along its northern edge of the walkway. The outflow from the pipe runs into a drainage ditch, which follows the slope of the valley to the northwest. The ditch measures up to 8 feet wide and 6 feet deep in some areas. The ditch channels rainwater to a point approximately 575 feet from the gravel road where another drainage ditch, which runs along Bains Gap Road, receives the runoff. The drainage ditch along Bains Gap Road runs the length of the road in a southwesterly direction where it terminates into a creek. Two unimproved access roads adjoin Bains Gap Road and have drainage pipes installed beneath the roads to allow uninterrupted flow of runoff to the drainage ditch along Bains Gap Road. A manmade drainage ditch also runs along the north side of Bains Gap Road. A drainage ditch parallels the site along its southern boundary. The site slopes from the northeast to the southwest and lies at an elevation of approximately 950 feet above mean sea level (msl) (Figure 1-2). A small tributary is located approximately 1,400 feet south of Parcel 239(7) and flows westward into Ingram Creek to the northwest.

Parcel 240(7) is approximately 300 feet in length (northeast to southwest) by 200 feet wide (northwest to southeast). The site slopes from the northeast to the southwest and lies at an elevation of approximately 1,000 feet above msl (Figure 1-2). A large drainage ditch runs southwest through the parcel. The ditch measures up to 15 feet wide and 10 feet deep. Loose rock fragments and cobble-size rocks were observed on the ground surface over approximately three-fourths of the site.

2.0 Previous Investigations

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). 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 (including migration) has occurred
2. Areas where only release or disposal of petroleum products has occurred
3. Areas of contamination below action levels
4. Areas where all necessary remedial actions have been taken
5. Areas of known contamination with removal and/or remedial action underway
6. Areas of known contamination where required response actions have not been taken
7. Areas that are not evaluated or require further evaluation.

The EBS was conducted in accordance with Community Environmental Response Facilitation Act (CERFA) (CERFA-Public Law 102-426) protocols 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, the U.S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historic maps and aerial photographs were reviewed to document historic 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. The Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), were identified as Category 7 CERFA sites: areas that are not evaluated or require further evaluation.

The precise location of each parcel near Range 20 is not clearly identified on any one map, and it is not certain that these parcels were ever used as disposal areas, excavation areas, or for training

activities. Other information regarding these parcels, dates of use, or operations was not available.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), including unexploded ordnance (UXO) avoidance, geophysical survey, environmental sampling and analysis, and groundwater monitoring well installation activities.

3.1 UXO Avoidance

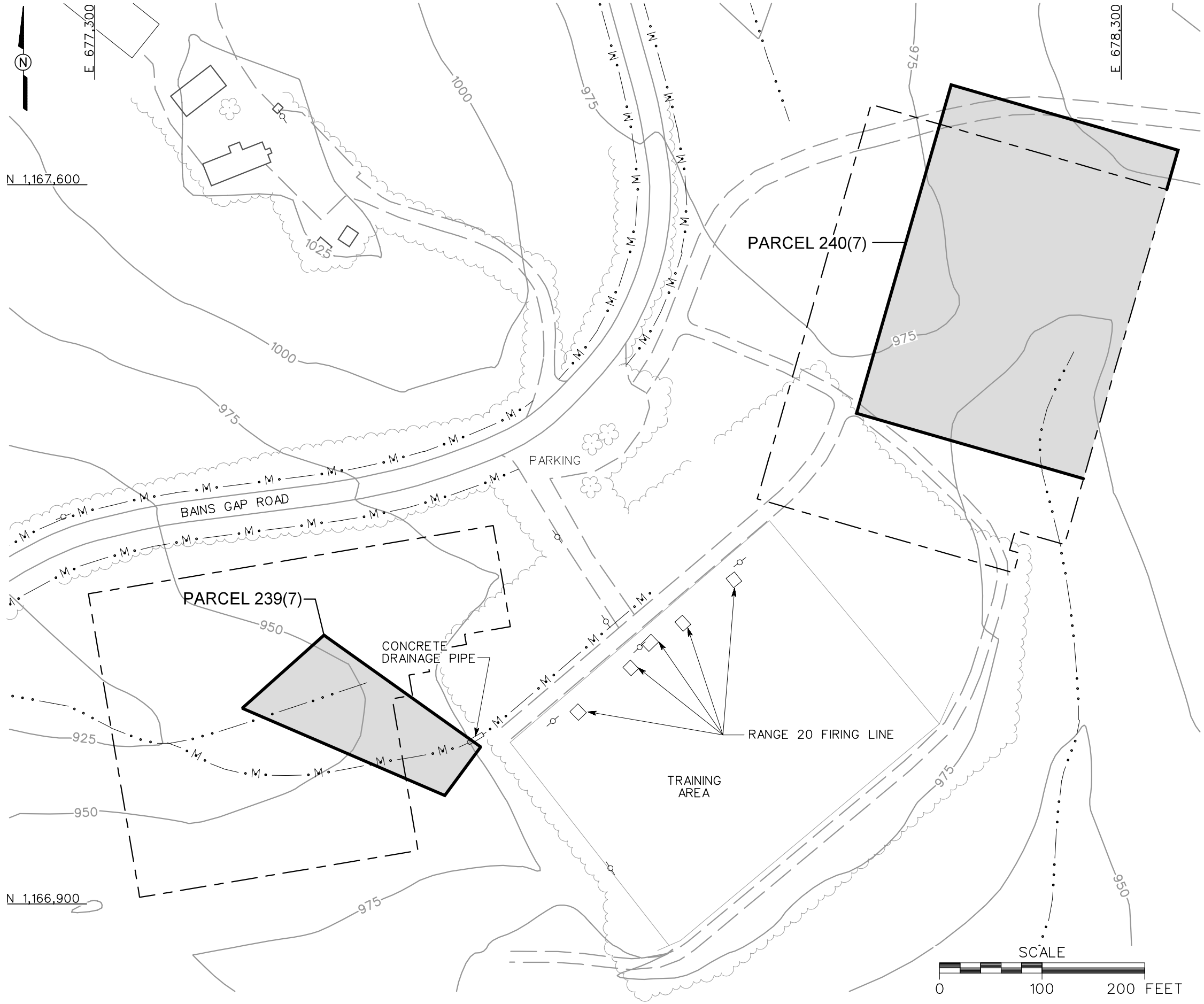
Because Range 20 is located within the World War I artillery impact area (USACE, 1998), IT performed UXO avoidance at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), following methodology outlined in Section 4.1.7 of the SAP (IT, 2000a). IT UXO personnel used a Schonstedt Heliflux Magnetic Locator to perform a surface sweep of the parcels prior to site access. After the parcels were cleared for access, sample locations were cleared using a Foerster Ferex Electromagnetic Detector following procedures outlined in Section 4.1.7.3 of the SAP (IT, 2000a).

3.2 Geophysical Surveys

Geophysical surveys were conducted at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), to identify anomalies representing trenches and to select sample locations in the area of concern. As shown on the site location map (Figure 3-1), the Parcel 239(7) survey area and Parcel 240(7) survey area encompassed approximately 105,000 square feet (2.4 acres) and 120,000 square feet (2.8 acres), respectively. A detailed discussion of the geophysical investigation, including theory of operation of the instruments, field procedures, data processing, and interpreted results of the investigation, is presented as Appendix A.

The surveys were conducted using magnetic and electromagnetic techniques. Survey grids were established at each site to encompass suspected trench locations. Survey control was accomplished using a survey-grade total station global positioning system and a laser theodolite instrument. The civil survey data were referenced to the U.S. State Plane Coordinate System (Alabama East Zone, North American Datum of 1983).

Detailed, hand-sketched maps of each site were drawn in the field. The maps included any surface cultural features within the survey areas, or near their perimeters, that could potentially affect the geophysical data (e.g., fences, culverts).



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- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 25 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- GEOPHYSICAL SURVEY AREA
- SURFACE DRAINAGE / CREEK
- MANMADE SURFACE DRAINAGE FEATURE
- UTILITY POLE

FIGURE 3-1
SITE MAP
EXTENT OF GEOPHYSICAL SURVEYS
TRENCHES NEAR RANGE 20
FIRING LINE
PARCELS 239(7) AND 240(7)

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Preliminary color contour maps of the data were analyzed and compared with each site sketch to differentiate between anomalies caused by surface and subsurface source materials. Suspected underground utilities were verified with an electromagnetic utility locator and their locations were placed on the site maps. The results of the geophysical surveys are summarized in Section 4.1.

3.3 Environmental Sampling

The environmental sampling performed during the SI at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), included the collection of surface and depositional soil samples, subsurface soil samples, and groundwater samples for chemical analyses. The sample locations were determined by observing site physical characteristics noted during a site walkover, by reviewing historical documents pertaining to activities conducted at the site, and based on UXO avoidance and geophysical survey activities. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figure 3-2. Samples were submitted for laboratory analyses of site-related parameters listed in Section 3.5.

3.3.1 Surface and Depositional Soil Sampling

Six surface soil samples and two depositional soil samples were collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), at the locations shown on Figure 3-2. Soil sampling locations and rationale are presented in Table 3-1. Sample designations and quality assurance/quality control (QA/QC) samples are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on UXO avoidance and geophysical survey activities, sampling rationale, presence of surface structures, site topography, and buried utilities.

Sample Collection. Surface and depositional soil samples were collected from the upper 1 foot of soil with a 3-inch diameter stainless-steel hand auger using the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000a). Surface and depositional soil samples were collected by first removing surface debris, such as rocks and vegetation, from the immediate sample area. The soil was then collected with the sampling device and screened with a photoionization detector (PID) in accordance with Section 4.7.1.1 of the SAP (IT, 2000a). Samples for volatile organic compound (VOC) analyses were collected directly from the sampler with three EnCore® samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.5. Sample collection logs are included in Appendix B.

Table 3-1

Sampling Locations and Rationale
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
PPMP-239-GP01	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil, and groundwater samples were collected in the northwestern section of the suspected trench (Parcel 239[7]). This is the furthest downgradient sampling point along the recovered terrestrial habitat area within the parcel.
PPMP-239-GP02	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected in the central section of the suspected trench (Parcel 239[7]) within the recovered terrestrial habitat area.
PPMP-239-GP03	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected in the southeastern portion of the suspected trench (Parcel 239[7]) area. This is the furthest upgradient sampling point along the recovered terrestial habitat area within the parcel.
PPMP-239-GP04	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil, and groundwater samples were collected near the southern section of the suspected trench (Parcel 240[7]). This is the furthest downgradient sampling point along the recovered terrestrial habitat area within the parcel.
PPMP-239-GP05	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected in the approximate center of the suspected trench (Parcel 240[7]) within the recovered terrestrial habitat area.
PPMP-239-GP06	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected from the northern portion of the suspected trench area (Parcel 240[7]). This is the furthest upgradient sampling point along the upper recovered terrestrial habitat area within the parcel.
PPMP-239-DEP01	Depositional Soil	A depositional soil sample was collected from a downgradient location at Parcel 239(7) where runoff exits the parcel
PPMP-239-DEP02	Depositional Soil	A depositional soil sample was collected approximately 5 feet downgradient of the drain pipe at Parcel 239(7) to determine if contamination migration from the site has occurred.

Table 3-2

Surface, Subsurface, and Depositional Soil Sample Designations and QA/QC Samples
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

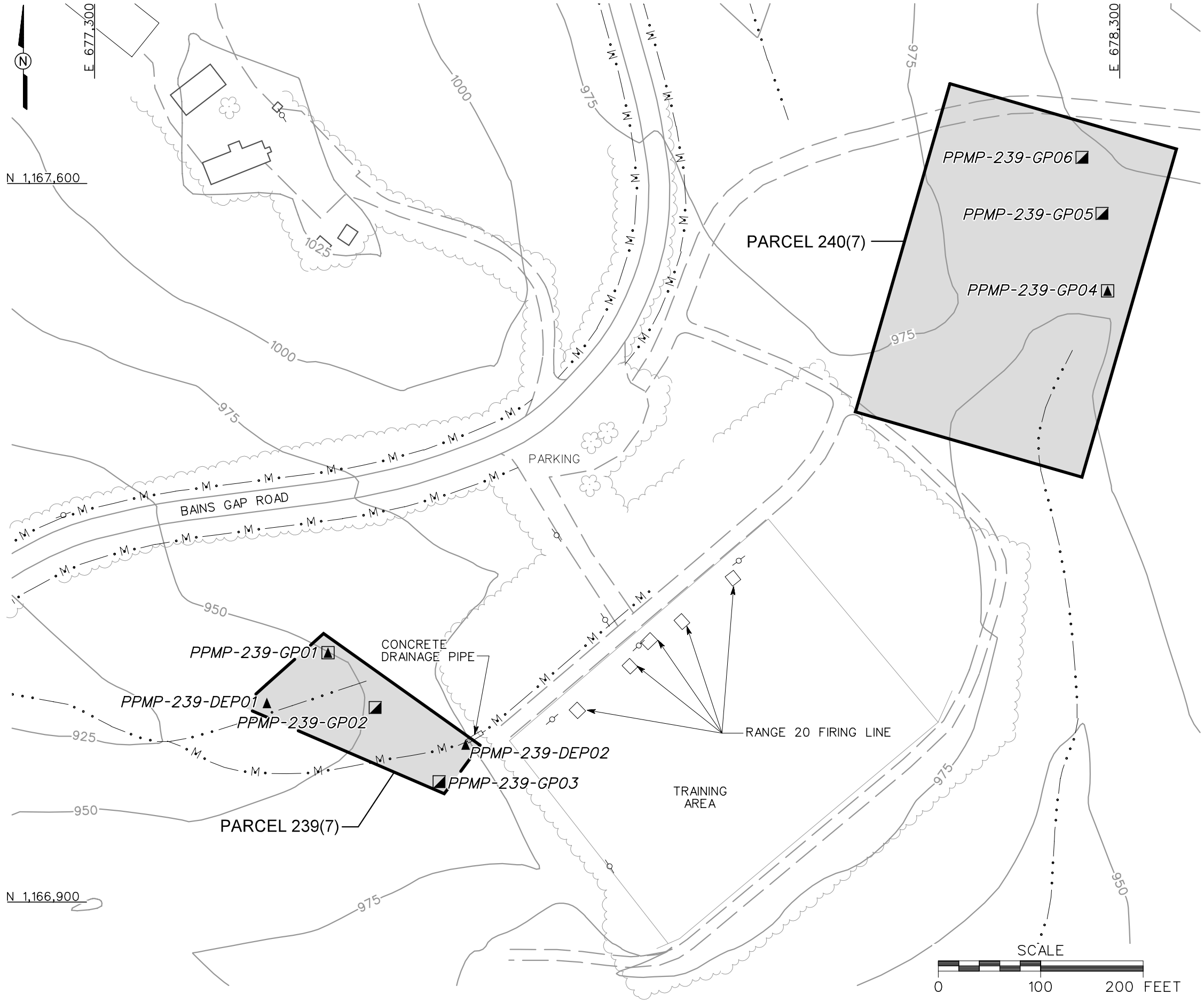
Sample Location	Sample Designation	Sample Depth (ft. bgs)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
PPMP-239-GP01	PPMP-239-GP01-SS-KV0001-REG PPMP-239-GP01-DS-KV0002-REG	0-0.5 6-9			PPMP-239-GP01-SS-KV0001-MS PPMP-239-GP01-SS-KV0001-MSD	TCL VOCs/SVOCs, TAL Metals, Cl Pesticides/Herbicides, PCBs, OP Pesticides, Nitroexplosives
PPMP-239-GP02	PPMP-239-GP02-SS-KV0003-REG PPMP-239-GP02-DS-KV0006-REG	0-0.5 6-9	PPMP-239-GP02-SS-KV0004-FD	PPMP-239-GP02-SS-KV0005-FS		TCL VOCs/SVOCs, TAL Metals, Cl Pesticides/Herbicides, PCBs, OP Pesticides, Nitroexplosives
PPMP-239-GP03	PPMP-239-GP03-SS-KV0007-REG PPMP-239-GP03-DS-KV0008-REG	0-0.5 7-10				TCL VOCs/SVOCs, TAL Metals, Cl Pesticides/Herbicides, PCBs, OP Pesticides, Nitroexplosives
PPMP-239-GP04	PPMP-239-GP04-SS-KV0009-REG PPMP-239-GP04-DS-KV0010-REG	0-0.5 5-8				TCL VOCs/SVOCs, TAL Metals, Cl Pesticides/Herbicides, PCBs, OP Pesticides, Nitroexplosives
PPMP-239-GP05	PPMP-239-GP05-SS-KV0011-REG PPMP-239-GP05-DS-KV0012-REG[a] PPMP-239-GP05-DS-KV0012R-REG[b]	0-0.5 1-4 1-4				TCL VOCs/SVOCs, TAL Metals, Cl Pesticides/Herbicides, PCBs, OP Pesticides, Nitroexplosives
PPMP-239-GP06	PPMP-239-GP06-SS-KV0013-REG PPMP-239-GP06-DS-KV0014-REG	0-1 6-9				TCL VOCs/SVOCs, TAL Metals, Cl Pesticides/Herbicides, PCBs, OP Pesticides, Nitroexplosives
PPMP-239-DEP01	PPMP-239-DEP01-DEP-KV0015-REG	0-1				TCL VOCs/SVOCs, TAL Metals, Cl Pesticides/Herbicides, PCBs, OP Pesticides, Nitroexplosives
PPMP-239-DEP02	PPMP-239-DEP02-DEP-KV0016-REG	0-1				TCL VOCs/SVOCs, TAL Metals, Cl Pesticides/Herbicides, PCBs, OP Pesticides, Nitroexplosives

[a] Sample analyzed for all parameters except VOCs because of laboratory error.
[b] Sample analyzed for VOCs only.

Cl - Chlorinated.
FD - Field duplicate.
FS - Field split.
ft.bgs - feet below ground surface.
MS/MSD - Matrix spike/matrix spike duplicate.
OP - Organophosphorus.
PCB - Polychlorinated biphenyl.
QA/QC - Quality assurance/quality control.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 3-2

Surface, Subsurface, and Depositional Soil Sample Designations and QA/QC Samples
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 25 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- MANMADE SURFACE DRAINAGE FEATURE
- UTILITY POLE
- GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- DEPOSITIONAL SOIL SAMPLE LOCATION

FIGURE 3-2
SAMPLE LOCATION MAP
TRENCHES NEAR RANGE 20
FIRING LINE
PARCELS 239(7) AND 240(7)

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

IT CORPORATION
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DWG. NO.: ...\774645es.594
PROJ. NO.: 774645
INITIATOR: T. WINTON
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DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. JENKINS
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 11/07/00
DRAWN BY: D. BILLINGSLEY
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3.3.2 Subsurface Soil Sampling

Subsurface soil samples were collected from six soil borings at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). Subsurface soil sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations, depths, and QA/QC samples are listed in Table 3-2. Soil boring sampling locations were determined in the field by the on-site geologist based on UXO avoidance and geophysical survey activities, sampling rationale, presence of surface structures, site topography, and buried and overhead utilities. IT contracted TEG, Inc., a direct-push technology subcontractor, to assist in subsurface soil sample collection.

Sample Collection. Subsurface soil samples were collected from soil borings at depths greater than 1 foot below ground surface (bgs) in the unsaturated zone. The soil borings were advanced and soil samples collected using the direct-push sampling procedures specified in Section 4.9.1.1 of the SAP (IT, 2000a). Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.5. Because of a laboratory error, the subsurface soil sample collected at PPMP-239-GP05 (sample number KV0012) was not analyzed for VOCs as requested. Therefore, the sample was recollected on October 4, 2000 (sample number KV0012R) and submitted for VOC analysis only.

Subsurface soil samples were collected continuously to 12 feet bgs or until direct-push sampler refusal was encountered. Samples were field screened using a PID in accordance with Section 4.7.1.1 of the SAP (IT, 2000a) to measure for 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 not greater than background, the deepest sample interval above the saturated zone was submitted for analyses. Samples to be analyzed for VOCs were collected directly from the sampler with three EnCore® samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. Samples submitted for laboratory analyses are summarized in Table 3-2. The on-site geologist constructed a detailed boring log for each soil boring. The lithological log for each borehole is included in Appendix C.

At the completion of soil sampling, boreholes were abandoned with hydrated bentonite chips following borehole abandonment procedures outlined in Appendix B of the SAP (IT, 2000a).

3.3.3 Well Installation

Two temporary wells were installed in the residuum groundwater zone at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), to collect groundwater samples for laboratory analyses. The well/groundwater sample locations are shown on Figure 3-2. Table 3-3 summarizes construction details of the temporary wells installed at the site. The well construction logs are included in Appendix C.

IT contracted Miller Drilling, Inc. to install the temporary wells with a hollow-stem auger at the locations shown on Figure 3-2. The wells were installed following procedures outlined in Section 4.7 and Appendix C of the SAP (IT, 2000a). The boreholes at these locations were advanced with a 4.25-inch inside diameter (ID) hollow-stem auger from ground surface to the first water-bearing zone in residuum at the well location. The boreholes were augered to the depth of direct-push sampler refusal and samples were collected from the depth of direct-push refusal to the bottom of the borehole. A 2-foot long, 2-inch ID carbon steel split-spoon sampler was driven at 5-foot intervals to collect residuum for observing and describing lithology. Where spoon refusal was encountered, the auger was advanced until the first water-bearing zone was encountered. The on-site geologist logging the auger boreholes continued the lithological log for each borehole from the depth of split-spoon sampler refusal to the bottom of the auger borehole by logging the auger drill cuttings. The drill cuttings were logged to determine lithologic changes and the approximate depth of groundwater encountered during drilling. This information was used to determine the optimal placement of the monitoring well screen interval and to provide site-specific geologic and hydrogeologic information. The lithological log for each borehole is included in Appendix C.

Upon reaching the target depth, a 15- or 20-foot length of 2-inch ID, 0.010-inch factory slotted, Schedule 40 polyvinyl chloride (PVC) screen with a 3-inch PVC end cap was placed through the auger to the bottom of the borehole. The screen and end cap were attached to 2-inch ID, flush-threaded Schedule 40 PVC riser. A sand pack consisting of number 1 filter sand was tremied around the well screen to approximately 2 feet above the top of the well screen as the augers were removed. The wells were surged approximately 10 minutes, or until no more settling of the filter sand occurred inside the borehole. A bentonite seal, consisting of approximately 2 feet of bentonite pellets, was placed immediately on top of the sand pack and hydrated with potable water. If the bentonite seal was installed below the water table surface, the bentonite pellets were allowed to hydrate in the groundwater. Bentonite seal placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). A locking well cap was placed on the PVC

Table 3-3

Temporary Well Construction Summary
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Temporary Well	Northing	Easting	Ground Elevation (ft msl)	TOC Elevation (ft msl)	Well Depth (ft bgs)	Screen Length (ft)	Screen Interval (ft bgs)	Sump Interval (ft bgs)	Well Material
PPMP-239-GP01	1167141.65	677529.20	948.83	950.07	55	20	34 - 54	54 - 54.25	2" ID Sch. 40 PVC
PPMP-239-GP04	1167494.56	678289.79	984.76	985.59	54	15	25 - 40	40 - 40.25	2" ID Sch. 40 PVC

Temporary wells installed with an auger drill rig using a 4.25-inch inside diameter hollow-stem auger.
Horizontal coordinates referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983 (NAD83).
Elevations referenced to the North American Vertical Datum of 1988 (NAVD88).
2" ID Sch. 40 PVC - 2-inch inside diameter, Schedule 40, polyvinyl chloride.
bgs - Below ground surface.
ft - Feet.
msl - Mean sea level.
TOC - Top of casing.

well casing. The temporary well surface completion included attaching plastic sheeting around the PVC riser using duct tape. Additionally, sand bags were used to secure the sheeting to the ground surface around the temporary well.

The temporary wells were developed by surging and pumping with a submersible pump in accordance with methodology outlined in Section 4.8 and Appendix C of the SAP (IT, 2000a). Development continued until the water turbidity was equal to or less than 20 nephelometric turbidity units (NTU) or for a maximum of 4 hours. The well development logs are included in Appendix D.

3.3.4 Water Level Measurements

The depth to groundwater was measured in the temporary wells installed at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), in March 2000 following procedures outlined in Section 4.18 of the SAP (IT, 2000a). Depth to groundwater was measured with an electronic water level meter. The meter probe and cable were cleaned between use at each well following decontamination methodology presented in Section 4.10 of the SAP (IT, 2000a). Measurements were referenced to the top of the PVC casing. A summary of groundwater level measurements is presented in Table 3-4.

3.3.5 Groundwater Sampling

Groundwater samples were collected from the two temporary wells installed at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). The well/groundwater sampling locations are shown on Figure 3-2. The groundwater sampling locations and rationale are listed in Table 3-1. The groundwater sample designations and QA/QC samples are listed in Table 3-5.

Sample Collection. Groundwater sampling was performed following procedures outlined in Section 4.9.1.4 of the SAP (IT, 2000a). Groundwater was sampled after purging a minimum three well volumes and after field parameters (temperature, pH, specific conductivity, dissolved oxygen, oxidation-reduction potential, and turbidity) stabilized. Purging and sampling were performed with either a submersible pump equipped with Teflon™ tubing or with a Teflon™ bailer. Groundwater field parameters were measured after the completion of purging and prior to sample collection using a Hydrolab® water quality unit. Field parameter readings are summarized in Table 3-6. Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.5.

Table 3-4

Groundwater Elevations
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Well Location	Date	Depth to Water (ft BTOC)	Ground Elevation (ft msl)	Top of Casing Elevation (ft msl)	Groundwater Elevation (ft msl)
PPMP-239-GP01	13-Mar-00	49.78	948.83	950.07	900.29
PPMP-239-GP04	13-Mar-00	17.90	984.76	985.59	967.69

Elevations referenced to the North American Vertical Datum of 1988 (NAVD88).

BTOC - Below top of casing.
ft - Feet.
msl - Mean sea level.

Table 3-5

Groundwater Sample Designations and QA/QC Samples
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft. bgs)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
PPMP-239-GP01	PPMP-239-GP01-GW-KV3001-REG	53.4-54			PPMP-239-GP01-GW-KV3001-MS PPMP-239-GP01-GW-KV3001-MSD	TCL VOCs/SVOCs, TAL Metals, Cl. Pesticides/Herbicides, OP Pesticides, PCBs, Nitroexplosives
PPMP-239-GP04	PPMP-239-GP04-GW-KV3002-REG	38.1-40	PPMP-239-GP04-GW-KV3003-FD	PPMP-239-GP04-GW-KV3004-FS		TCL VOCs/SVOCs, TAL Metals, Cl. Pesticides/Herbicides, OP Pesticides, PCBs, Nitroexplosives

Cl - Chlorinated.
FD - Field duplicate.
FS - Field split.
ft. bgs - feet below ground surface.
MS/MSD - Matrix spike/matrix spike duplicate.
OP - Organophosphorus.
PCB - Polychlorinated biphenyl.
QA/QC - Quality assurance/quality control.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

3.4 Surveying of Sample Locations

Sample locations were surveyed using GPS survey techniques described in Section 4.3 of the SAP (IT, 2000a), and conventional civil survey techniques described in Section 4.19 of the SAP (IT, 2000a). 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 E.

3.5 Analytical Program

The samples collected during the SI were analyzed for various chemical parameters. The specific suite of analyses performed was based on the potential site-specific chemicals historically at the site and EPA, Alabama Department of Environmental Management, FTMC, and USACE requirements. Samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), were analyzed for the following parameters:

- Target compound list VOCs – EPA Method 5035/8260B
- Target compound list semivolatile organic compounds (SVOC) – EPA Method 8270C
- Target analyte list metals – EPA Method 6010B/7000
- Polychlorinated biphenyls (PCB) – EPA Method 8082
- Chlorinated herbicides – EPA Method 8151A
- Chlorinated pesticides – EPA Method 8081A
- Organophosphorus pesticides – EPA Method 8141A
- Nitroaromatic explosives – EPA Method 8330.

The samples were analyzed using EPA SW-846 methods, including Update III methods where applicable, as presented in Table 6-1 in Appendix B of the SAP (IT, 2000a). Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of Appendix B of the SAP [IT, 2000a]). Chemical data were reported via hard copy data packages by the laboratory using Contract Laboratory Program-like forms. These packages were validated in accordance with EPA National Functional Guidelines by Level III criteria. A summary of validated analytical data is included in Appendix F. The Data Validation Summary Report is included as Appendix G.

3.6 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping followed requirements specified in Section 4.13.2 of the SAP (IT, 2000a). Sample containers, sample volumes, preservatives, and holding times

Table 3-6

Groundwater Field Parameters
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Date	Media	Specific Conductivity (µmhos/cm)	Dissolved Oxygen (ppm)	Redox Potential (mV)	Temperature (^{o}C)	Turbidity (NTUs)	pH (Std units)
PPMP-239-GP01	14-Apr-99	GW	33.4	663	324	17.34	>1000*	5.19
PPMP-239-GP04	15-Apr-99	GW	190.3	4.86	234	18.65	>1000	5.98

* Based on visual observation.

^{o}C - Degrees Celsius.
GW - Groundwater.
µmhos/cm - Micromhos per centimeter.
mV - Millivolts.
NTUs - Nephelometric turbidity units.
ppm - Parts per million.
Std units - Standard units.

for the analyses required in this SI are listed in Chapter 5.0, Table 5-1, of Appendix B of the SAP (IT, 2000a). Sample documentation and chain of custody were recorded as specified in Section 4.13 of the SAP (IT, 2000a).

Completed analysis request and chain of custody records (Appendix B) were secured and included with each shipment of sample coolers to Quanterra Environmental Services in Knoxville, Tennessee. Split samples were shipped to the USACE South Atlantic Division Laboratory in Marietta, Georgia.

3.7 Investigation-Derived Waste Management and Disposal

Investigation-derived waste (IDW) was managed and disposed as outlined in Appendix D of the SAP (IT, 2000a). The IDW generated during the SI at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), was segregated as follows:

- Drill cuttings
- Purge water from well development and sampling activities, and decontamination fluids
- Personal protective equipment.

Solid IDW was stored inside the fenced area surrounding Buildings 335 and 336 in lined rolloff bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analyses. Based on the results, drill cuttings and personal protective equipment generated during the SI were disposed as nonregulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

Liquid IDW was contained in the existing 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 nonregulated waste to the FTMC wastewater treatment plant on the Main Post.

3.8 Variances/Nonconformances

Two variances to the SFSP were recorded during completion of the SI at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). The variances did not alter the intent of the investigation or the sampling rationale presented in Table 4-2 of the SFSP (IT, 1998a). The

variances to the SFSP are summarized in Table 3-7 and included in Appendix H. There were not any nonconformances to the SFSP recorded during completion of the SI.

3.9 Data Quality

The field sample analytical data are presented in tabular form in Appendix F. 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. Sample collection logs pertaining to the collection of these samples were reviewed and organized for this report and are included in Appendix B. As discussed in Section 3.8, two variances to the SFSP were recorded during completion of the SI. However, the variances did not impact the usability of the data.

Data Validation. A complete (100 percent) Level III data validation effort was performed on the reported analytical data. Appendix G consists of a data validation summary report that was prepared to discuss the results of the validation. Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System™ database for tracking and reporting. The qualified data were used in the comparison to the SSSLs and ESVs. Rejected data (assigned an "R" qualifier) were not used in the comparison to the SSSLs and ESVs.

The data presented in this report, except where qualified, meet the principle data quality objective for this SI.

Table 3-7

Variances to the Site-Specific Field Sampling Plan
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Variance to the SFSP	Justification for Variance	Impact to Site Investigation
Sample location PPMP-239-DEP01 was moved approximately 160 feet south of its proposed sample location to a lower elevation.	Sample PPMP-239-DEP01 was inadvertently proposed at a high elevation within the parcel.	Relocation to a lower elevation allowed sampling where runoff would most likely exit the parcel and accumulate.
Sample location PPMP-239-DEP02 was not proposed in the Final Site-Specific Field Sampling Plan.	Sample PPMP-239-DEP02 was collected adjacent to a concrete drainpipe emanating from the site. This depositional soil sample was collected at the request of the regulatory agencies.	Sample PPMP-239-DEP02 allowed more accurate determination of contamination exiting the parcel.

4.0 Site Characterization

IT utilized the results of the geophysical survey to aid in the placement of soil and groundwater sampling locations. Subsurface investigations performed at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), provided soil, bedrock, and groundwater data used to characterize the geology and hydrogeology of the site.

4.1 Results of Geophysical Survey

The geophysical survey results indicate that most of the anomalies at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), are caused by surface metal and cultural features. The geophysical data do not indicate the presence of trenches; however, one geophysical anomaly identified in the Parcel 239(7) data is interpreted to be a pit containing a low concentration of buried metal. Geophysical interpretation maps of each site (Figures 4-1 and 4-2) contain detailed information on permanent site reference features as well as civil survey coordinates to aid in relocating the survey areas.

A detailed discussion of the data interpretation is included in the interpretation chapter of the geophysics report (Chapter A.4.0, Appendix A).

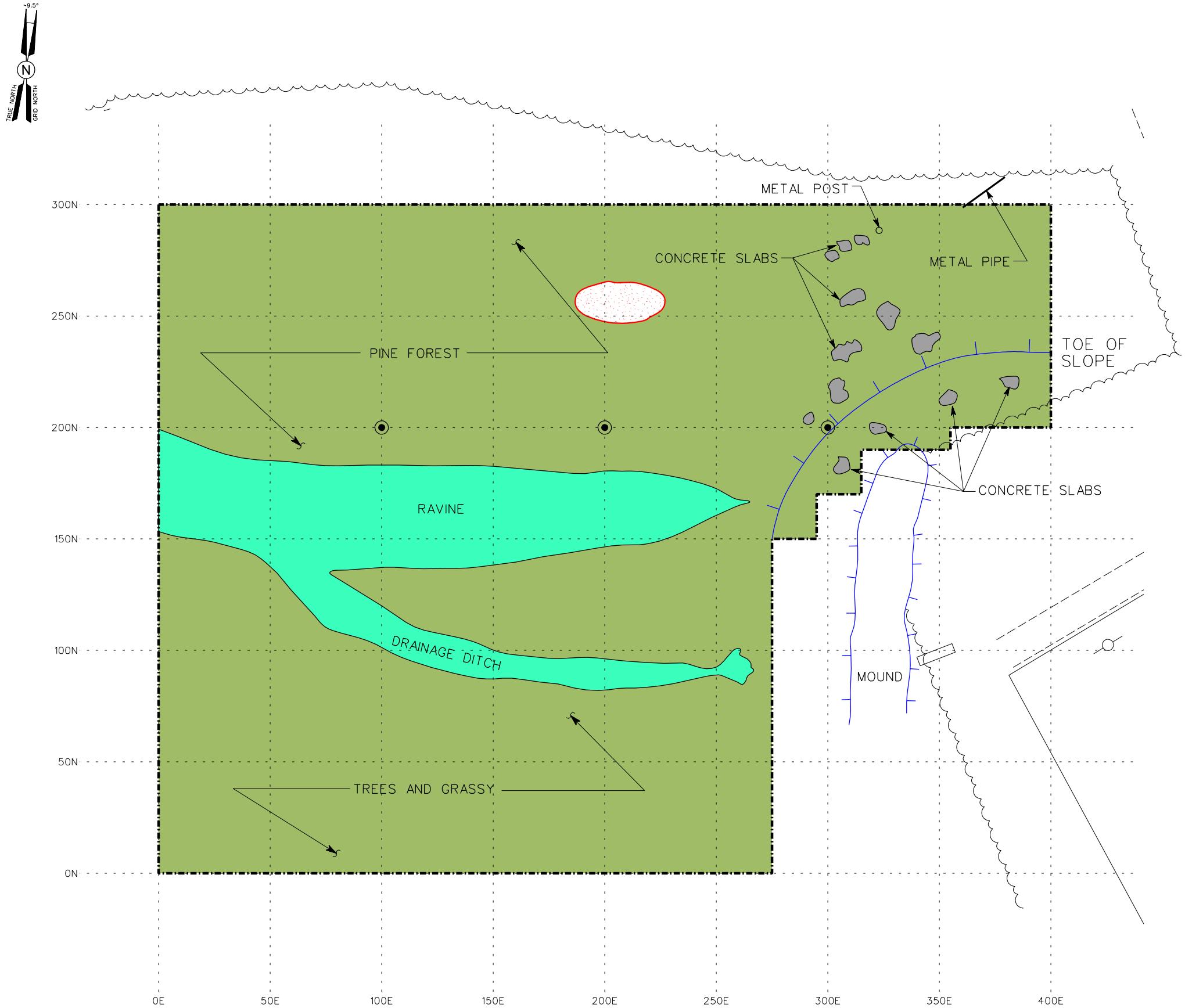
4.2 Regional and Site Geology

4.2.1 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



LEGEND

- UNIMPROVED ROADS AND PARKING
- LOW CONCENTRATION OF BURIED METAL
- GEOPHYSICAL SURVEY BOUNDARY
- CIVIL SURVEY STAKE LOCATION
- MOUND
- TREES / TREELINE

NAD 83 SPHEROID, ALABAMA EAST STATE PLANE DATUM		
LOCAL GRID COORDINATES	STATE PLANE COORDINATES	
200N,100E	1167118.734N	677410.536E
200N,200E	1167134.872N	677508.607E
200N,300E	1167152.043N	677608.119E

SCALE

0 50 100 FEET

FIGURE 4-1
SITE MAP WITH GEOPHYSICAL INTERPRETATION, PARCEL 239(7)
TRENCHES NEAR RANGE 20
FIRING LINE
PARCELS 239(7) AND 240(7)

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FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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DATE LAST REV.:
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STARTING DATE: 11/07/00
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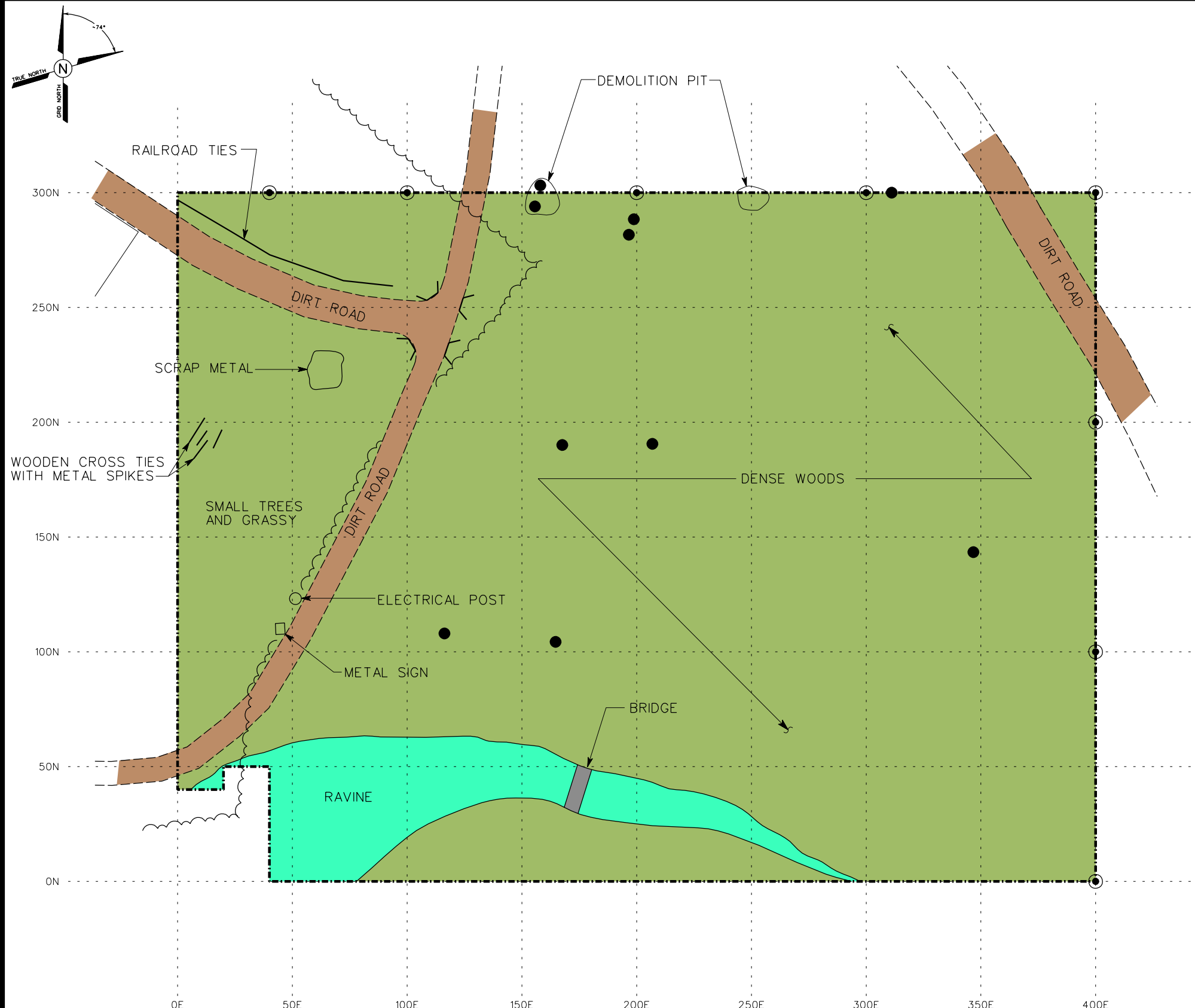

LEGEND

- GEOPHYSICAL SURVEY BOUNDARY
- CIVIL SURVEY STAKE LOCATION
- SURFACE METAL OBJECT
- TREES / TREELINE

NAD 83 SPHEROID, ALABAMA EAST STATE PLANE DATUM		
LOCAL GRID COORDINATES	STATE PLANE COORDINATES	
0N,400E	1167595.170N	678345.981E
100N,400E	1167622.222N	678249.926E
200N,400E	1167649.591N	678154.913E
300N,400E	1167677.597N	678060.314E
300N,300E	1167581.494N	678031.977E
300N,200E	1167485.546N	678003.829E
300N,100E	1167389.663N	677959.096E
300N,40E	1167332.161N	677959.096E

SCALE

0 50 100 FEET

FIGURE 4-2
SITE MAP WITH GEOPHYSICAL INTERPRETATION, PARCEL 240(7) TRENCHES NEAR RANGE 20 FIRING LINE PARCELS 239(7) AND 240(7)

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

IT CORPORATION
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DWG. NO.: ...\774645es.664
PROJ. NO.: 774645
INITIATOR: T. WINTON
PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. JENKINS
DATE LAST REV.:
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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 is comprised of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County 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 (Szabo 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 appear to dominate the unit and consist primarily of coarse-grained, vitreous quartzite, and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consist 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. 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 weathers 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 together as undifferentiated at FTMC and 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 (Szabo 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 toward 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 on the basis of fossil data.

The Jacksonville Thrust Fault is the most significant structural geologic feature in the vicinity 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 comprising 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).

4.2.2 Site Geology

The soil at Parcels 239(7) and 240(7) is mapped as Stony Rough Land. Stony Rough Land is a designation for areas of rugged relief with significant bedrock outcrop covered by a patchy veneer of soil materials. The soil materials in these areas generally consist of clay in areas underlain by limestone or dolomite and stoney sands in areas underlain by sandstone. These soil materials are also generally shallow with slow infiltration and a low capacity for available moisture (U. S. Department of Agriculture, 1961).

Based on direct-push and hollow-stem auger boring data collected during the SI, the soil at Parcel 239(7) consists of a 0.5- to 3-feet-thick dark brown to reddish brown, silty sand underlain by a 4.5- to 7-foot-thick reddish brown, light gray to purplish, silty clay. The soil at Parcel 240(7) consists of a 0.5- to 1.5-feet-thick dark brown silty sand that is underlain by 3- to 6.5-feet-thick reddish brown, light gray to purplish, sandy, silty clay.

The bedrock at the site is mapped as the Shady Dolomite (Osborne et al., 1997). The Shady Dolomite consists of interlayered bluish-gray or pale yellowish-gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline porous chert (Osborne et al., 1989). Weathered Shady Dolomite is characterized by compact grayish-orange to moderate yellowish-brown clay. Furthermore, the lower 150 feet of the Shady Dolomite in the Anniston area is described as moderate-red, yellow, and grayish-red-purple silty clay and clayey siltstone (Raymond et al., 1988). During monitoring well installation activities, silty, red brown to purple shale with chert nodules was encountered in PPMP-239-GP01 from 9 feet bgs to the end of the boring and in PPMP-239-GP04 from 8 feet bgs to the end of the boring. Drilling logs for the monitoring wells and the direct-push samples are located in Appendix C.

4.3 Site Hydrology

4.3.1 Surface Hydrology

Precipitation in the form of rainfall averages about 54 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1998). The major surface water features at the Main Post of FTMC include Remount Creek, Cane Creek, and Cave Creek. These waterways flow in a general northwest to westerly direction towards the Coosa River on the western boundary of Calhoun County.

Parcel 239(7) is located on a steep westerly-facing slope. Runoff from the site follows topography and flows west into a tributary to Ingram Creek. Parcel 240(7) is located on an east-west trending divide in which the northern portion on the parcel slopes to the north and the southern half of the parcel slopes to the south. Runoff in the northern half of the parcel flows north into a tributary of Cane Creek and runoff from the southern half of the parcel flows south into a tributary of Ingram Creek. Ingram Creek is a tributary to Cane Creek.

4.3.2 Hydrogeology

Static groundwater levels were measured in monitoring wells at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), on March 13, 2000 (Table 3-4). Groundwater elevations were calculated by measuring the depth to groundwater relative to the surveyed top-of-casing elevations. Shallow groundwater flow at Parcels 239(7) and 240(7) is most likely controlled by topography. Shallow groundwater at Parcel 239(7) most likely flows west eventually discharging into Ingram Creek. Shallow groundwater flow at Parcel 240(7) most likely follows topography with groundwater in the northern half of the parcel flowing north eventually discharging into Cane Creek and shallow groundwater in the southern half of the parcel flowing south eventually discharging into Ingram Creek.

5.0 Summary of Analytical Results

The results of the chemical analyses of samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), indicate that metals, VOCs, SVOCs, and pesticides have been detected in the various site media. Herbicides, PCBs, and nitroaromatic explosives were not detected in any of the samples collected. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, detected constituent concentrations were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metal concentrations exceeding the SSSLs and ESVs were subsequently compared to metals background screening values (background concentrations) (SAIC, 1998) to determine if the metals concentrations are within natural background concentrations. Summary statistics for background metals samples collected at FTMC (SAIC, 1998) are included in Appendix I.

Six compounds were quantified by both SW-846 Method 8260B (as VOC) and Method 8270C (as SVOC), including 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobutadiene, and naphthalene. Method 8260B yields a reporting limit (RL) of 0.005 milligrams per kilogram (mg/kg), while Method 8270C has a RL of 0.330 mg/kg, which is typical for a soil matrix sample. Due to the direct nature of the Method 8260B analysis and its resulting lower RL, this method should be considered superior to Method 8270C when quantifying low levels (0.005 to 0.330 mg/kg) of these compounds. Method 8270C and its associated methylene chloride extraction step is superior, however, when dealing with samples that contain higher concentrations (greater than 0.330 mg/kg) of these compounds. Therefore, all data were considered and none were categorically excluded. Data validation qualifiers were helpful in evaluating the usability of data, especially if calibration, blank contamination, precision, or accuracy indicator anomalies were encountered. The validation qualifiers and concentrations reported (e.g., whether concentrations were less than or greater than 0.330 mg/kg) were used to determine which analytical method was likely to return the more accurate result.

The following sections and Tables 5-1 through 5-3 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix F.

Table 5-1

Surface and Depositional Soil Analytical Results
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Sample Location Sample Number Sample Date Sample Depth (Feet)					PPMP-239-DEP01 KV0015 10-Mar-99 0- 1					PPMP-239-DEP02 KV0016 10-Mar-99 0- 1					PPMP-239-GP01 KV0001 16-Feb-99 0-0.5					PPMP-239-GP02 KV0003 16-Feb-99 0- 0.5				
Parameter	**Units**	**BKG[a]**	**SSSL[b]**	**ESV[b]**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**
METALS																								
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	8.49E+03			YES	YES	1.40E+03				YES	4.60E+03				YES	6.58E+03				YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	4.20E+00			YES		4.00E+00			YES		9.30E+00			YES		6.00E+00	J		YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	1.25E+02		YES			2.68E+01					1.59E+02	J	YES			3.32E+02	J	YES		YES
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	1.10E+00		YES		YES	3.40E-01	J				8.70E-01		YES			7.10E-01				
Calcium	mg/kg	1.72E+03	NA	NA	3.95E+02	J				1.59E+04		YES			1.81E+02	J				9.72E+01	J			
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	9.70E+00				YES	2.43E+01			YES	YES	1.13E+01				YES	1.11E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	2.98E+01		YES		YES	2.70E+00	J				2.67E+01	J	YES		YES	1.42E+01	J			
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	9.50E+00					5.80E+00					3.05E+01	J	YES			2.51E+01	J	YES		
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.57E+04			YES	YES	1.12E+04			YES	YES	3.61E+04		YES	YES	YES	3.16E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	2.46E+01					4.30E+00					5.52E+01	J	YES		YES	4.15E+01	J	YES		
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	4.41E+02	J				2.20E+03		YES			3.63E+02	J				7.79E+02				
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	2.60E+03		YES	YES	YES	1.90E+02				YES	7.97E+02			YES	YES	1.23E+03	J		YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	7.00E-02					ND					3.30E-02	B				1.90E-02	B			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	9.50E+00					4.80E+00					2.91E+01	J	YES			2.16E+01	J	YES		
Potassium	mg/kg	8.00E+02	NA	NA	6.98E+02					2.05E+02	J				6.47E+02					1.27E+03		YES		
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	1.40E+00		YES		YES	ND					1.70E+00		YES		YES	1.30E+00		YES		YES
Sodium	mg/kg	6.34E+02	NA	NA	1.52E+02	B				7.71E+01	B				4.53E+01	B				4.10E+01	B			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.65E+01				YES	9.30E+00				YES	3.03E+01				YES	2.45E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	2.07E+01					1.95E+01					6.76E+01	J	YES		YES	4.91E+01	J	YES		
VOLATILE ORGANIC COMPOUNDS																								
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	6.70E-03	J				ND					5.50E-03	J				3.60E-03	J			
Acetone	mg/kg	NA	7.76E+02	2.50E+00	4.00E-01	J				ND					1.90E-01	J				2.30E-01	J			
Methylene chloride	mg/kg	NA	8.41E+01	2.00E+00	5.00E-03	B				5.40E-03	B				4.10E-03	B				4.60E-03	B			
Toluene	mg/kg	NA	1.55E+03	5.00E-02	ND					ND					ND					ND				
Trichlorofluoromethane	mg/kg	NA	2.33E+03	1.00E-01	4.40E-03	J				ND					3.80E-03	B				ND				
p-Cymene	mg/kg	NA	1.55E+03	NA	ND					ND					4.40E-03	J				ND				
SEMIVOLATILE ORGANIC COMPOUNDS																								
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	9.30E-01	ND					ND					7.10E-02	J				ND				
PESTICIDES																								
4,4'-DDD	mg/kg	NA	2.54E+00	2.50E-03	ND					ND					3.00E-02	J			YES	2.00E-02	J			YES
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	1.30E-02				YES	ND					1.60E-01	J			YES	5.10E-02	J			YES
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	1.80E-02				YES	2.20E-03	J				4.80E-01	J			YES	3.20E-01	J			YES
Endosulfan I	mg/kg	NA	4.66E+01	1.19E-01	ND					ND					ND					ND				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	ND					ND					ND					ND				

Table 5-1

Surface and Depositional Soil Analytical Results
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Sample Location Sample Number Sample Date Sample Depth (Feet)					PPMP-239-GP03 KV0007 15-Feb-99 0- .5					PPMP-239-GP04 KV0009 16-Feb-99 0- 0.5					PPMP-239-GP05 KV0011 16-Feb-99 0- 0.5					PPMP-239-GP06 KV0013 16-Feb-99 0- 1				
Parameter	**Units**	**BKG[a]**	**SSSL[b]**	**ESV[b]**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**
METALS																								
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	6.83E+03				YES	6.39E+03				YES	6.34E+03				YES	5.45E+03				YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	5.00E+00			YES		3.00E+00			YES		2.60E+00			YES		2.00E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	1.89E+02	J	YES		YES	3.20E+02	J	YES		YES	1.68E+02	J	YES		YES	7.40E+01	J			
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	8.00E-01		YES			1.10E+00		YES		YES	8.00E-01		YES			5.20E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	7.96E+02					2.59E+03		YES			8.45E+02					1.77E+02	J			
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.03E+01				YES	8.10E+00				YES	7.50E+00				YES	1.49E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	1.65E+01	J	YES			1.33E+01	J				1.26E+01	J				5.30E+00	J			
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	1.62E+01	J	YES			1.37E+01	J	YES			2.77E+01	J	YES			1.21E+01	J			
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	2.01E+04			YES	YES	9.11E+03			YES	YES	1.39E+04			YES	YES	9.40E+03			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	3.32E+01	J				4.90E+01	J	YES			1.37E+01	J				1.92E+01	J			
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	6.37E+02					6.46E+02					6.38E+02					3.37E+02	J			
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.04E+03			YES	YES	1.75E+03		YES	YES	YES	1.06E+03			YES	YES	4.88E+02			YES	YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	5.50E-02					9.10E-02		YES			5.00E-02					4.10E-02	B			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	1.08E+01	J	YES			7.10E+00	J				5.70E+00	J				3.40E+00	J			
Potassium	mg/kg	8.00E+02	NA	NA	7.27E+02					7.71E+02					7.35E+02					4.37E+02	J			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	9.40E-01		YES		YES	8.10E-01		YES		YES	1.00E+00		YES		YES	5.50E-01	J	YES		
Sodium	mg/kg	6.34E+02	NA	NA	4.11E+01	B				4.60E+01	B				4.38E+01	B				5.50E+01	B			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.71E+01				YES	1.14E+01				YES	1.35E+01				YES	1.22E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	4.65E+01	J	YES			3.24E+01	J				2.67E+01	J				1.82E+01	J			
VOLATILE ORGANIC COMPOUNDS																								
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	ND					4.00E-03	J				4.10E-03	J				ND				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	7.70E-02	J				1.20E-01	J				1.10E-01	J				6.80E-02	J			
Methylene chloride	mg/kg	NA	8.41E+01	2.00E+00	4.90E-03	B				4.80E-03	B				4.00E-03	B				3.20E-03	B			
Toluene	mg/kg	NA	1.55E+03	5.00E-02	2.80E-03	J				2.30E-03	J				ND					ND				
Trichlorofluoromethane	mg/kg	NA	2.33E+03	1.00E-01	4.50E-03	J				5.40E-03	B				3.90E-03	B				ND				
p-Cymene	mg/kg	NA	1.55E+03	NA	2.70E-02	J				ND					ND					ND				
SEMIVOLATILE ORGANIC COMPOUNDS																								
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	9.30E-01	ND					ND					ND					ND				
PESTICIDES																								
4,4'-DDD	mg/kg	NA	2.54E+00	2.50E-03	3.50E-01	J			YES	1.40E-03	J				1.80E-03	J				1.50E-03	J			
4,4'-DDE	mg/kg	NA	1.79E+00	2.50E-03	2.80E-01	J			YES	2.20E-03	J				ND					ND				
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	3.60E+00	J		YES	YES	ND					ND					1.10E-03	J			
Endosulfan I	mg/kg	NA	4.66E+01	1.19E-01	ND					1.50E-03	J				ND					ND				
delta-BHC	mg/kg	NA	2.33E+00	9.94E+00	ND					ND					1.60E-03	J				ND				

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

[a] Bkg - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama,* July.

[b] Residential human health 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 (and greater than zero).

J - Result is greater than the method detection limit but less than or equal to the reporting limit.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-2

Subsurface Soil Analytical Results
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Parcel				PPMP-239				PPMP-239				PPMP-239				PPMP-239			
Sample Location				PPMP-239-GP01				PPMP-239-GP02				PPMP-239-GP03				PPMP-239-GP04			
Sample Number				KV0002				KV0006				KV0008				KV0010			
Sample Date				16-Feb-99				16-Feb-99				15-Feb-99				16-Feb-99			
Sample Depth (Feet)				6-9				6-9				7-10				5-8			
Parameter	**Units**	**BKG[a]**	**SSSL[b]**	**Result**	**Qual**	**>BKG**	**>SSSL**	**Result**	**Qual**	**>BKG**	**>SSSL**	**Result**	**Qual**	**>BKG**	**>SSSL**	**Result**	**Qual**	**>BKG**	**>SSSL**
METALS																			
Aluminum	mg/kg	1.36E+04	7.80E+03	1.02E+04			YES	1.01E+04			YES	6.32E+03				8.94E+03			YES
Arsenic	mg/kg	1.83E+01	4.26E-01	1.30E+00			YES	4.40E+00			YES	1.30E+00			YES	1.70E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	4.95E+01	J			9.70E+01	J			1.03E+01	J			1.15E+02	J		
Beryllium	mg/kg	8.60E-01	9.60E+00	7.60E-01				5.00E-01	J			5.40E-01	J			6.30E-01			
Calcium	mg/kg	6.37E+02	NA	ND				1.23E+02	J			ND				ND			
Chromium	mg/kg	3.83E+01	2.32E+01	1.58E+01				1.01E+01				9.90E+00				1.89E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	3.50E+00	J			1.00E+01	J			1.10E+00	J			8.80E+00	J		
Copper	mg/kg	1.94E+01	3.13E+02	4.20E+00	J			8.40E+00	J			1.80E+00	J			1.66E+01	J		
Iron	mg/kg	4.48E+04	2.34E+03	2.80E+04			YES	1.68E+04			YES	8.35E+03			YES	1.96E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	7.80E+00	J			2.40E+01	J			4.90E+00	J			5.30E+00	J		
Magnesium	mg/kg	7.66E+02	NA	1.17E+03		YES		4.74E+02	J			1.44E+02	J			7.63E+03		YES	
Manganese	mg/kg	1.36E+03	3.63E+02	9.33E+01				3.76E+02			YES	1.78E+01				1.53E+02			
Mercury	mg/kg	7.00E-02	2.33E+00	1.80E-02	B			6.60E-02				1.80E-02	B			ND			
Nickel	mg/kg	1.29E+01	1.54E+02	9.20E+00	J			6.30E+00	J			5.30E+00	J			2.11E+01	J	YES	
Potassium	mg/kg	7.11E+02	NA	1.84E+03		YES		6.50E+02				8.83E+02		YES		6.72E+03		YES	
Selenium	mg/kg	4.70E-01	3.91E+01	9.90E-01		YES		8.00E-01		YES		ND				6.10E-01		YES	
Sodium	mg/kg	7.02E+02	NA	6.58E+01	B			4.02E+01	B			5.05E+01	B			6.54E+01	B		
Vanadium	mg/kg	6.49E+01	5.31E+01	1.81E+01				1.92E+01				7.10E+00				2.13E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	2.40E+01	J			2.00E+01	J			1.37E+01	J			4.25E+01	J	YES	
VOLATILE ORGANIC COMPOUNDS																			
Acetone	mg/kg	NA	7.76E+02	7.30E-03	B			8.90E-02	J			4.10E-02	J			6.60E-02	J		
Methylene chloride	mg/kg	NA	8.41E+01	4.30E-03	B			4.00E-03	B			4.00E-03	B			3.70E-03	B		
Naphthalene	mg/kg	NA	1.55E+02	ND				ND				ND				ND			
Trichlorofluoromethane	mg/kg	NA	2.33E+03	ND				ND				ND				3.70E-03	B		
PESTICIDES																			
4,4'-DDD	mg/kg	NA	2.54E+00	ND				ND				1.30E-02	J			ND			
4,4'-DDE	mg/kg	NA	1.79E+00	ND				ND				4.90E-03	J			ND			
4,4'-DDT	mg/kg	NA	1.79E+00	ND				ND				2.40E-01	J			ND			
Endosulfan sulfate	mg/kg	NA	4.66E+01	ND				ND				6.70E-03	J			ND			

Table 5-2

Subsurface Soil Analytical Results
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Parcel Sample Location Sample Number Sample Date Sample Depth (Feet)				PPMP-239 PPMP-239-GP05 KV0012 16-Feb-99 1-4				PPMP-239 PPMP-239-GP05 KV0012R 2-Oct-00 1-4				PPMP-239 PPMP-239-GP06 KV0014 16-Feb-99 6-9			
Parameter	**Units**	**BKG[a]**	**SSSL[b]**	**Result**	**Qual**	**>BKG**	**>SSSL**	**Result**	**Qual**	**>BKG**	**>SSSL**	**Result**	**Qual**	**>BKG**	**>SSSL**
METALS															
Aluminum	mg/kg	1.36E+04	7.80E+03	7.05E+03				NR				1.11E+04			YES
Arsenic	mg/kg	1.83E+01	4.26E-01	1.30E+00			YES	NR				1.10E+00	J		YES
Barium	mg/kg	2.34E+02	5.47E+02	1.61E+02	J			NR				2.74E+01	J		
Beryllium	mg/kg	8.60E-01	9.60E+00	4.30E-01	J			NR				4.00E-01	J		
Calcium	mg/kg	6.37E+02	NA	9.01E+01	J			NR				ND			
Chromium	mg/kg	3.83E+01	2.32E+01	1.02E+01				NR				1.43E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	5.30E+00	J			NR				5.60E+00	J		
Copper	mg/kg	1.94E+01	3.13E+02	9.60E+00	J			NR				8.10E+00	J		
Iron	mg/kg	4.48E+04	2.34E+03	1.47E+04			YES	NR				2.54E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	7.00E+00	J			NR				6.10E+00	J		
Magnesium	mg/kg	7.66E+02	NA	3.01E+03		YES		NR				3.30E+03		YES	
Manganese	mg/kg	1.36E+03	3.63E+02	1.36E+02				NR				5.40E+01			
Mercury	mg/kg	7.00E-02	2.33E+00	1.10E-02	B			NR				2.10E-02	B		
Nickel	mg/kg	1.29E+01	1.54E+02	1.17E+01	J			NR				1.32E+01	J	YES	
Potassium	mg/kg	7.11E+02	NA	3.13E+03		YES		NR				3.82E+03		YES	
Selenium	mg/kg	4.70E-01	3.91E+01	5.70E-01		YES		NR				1.00E+00		YES	
Sodium	mg/kg	7.02E+02	NA	3.50E+01	B			NR				4.43E+01	B		
Vanadium	mg/kg	6.49E+01	5.31E+01	1.24E+01				NR				2.08E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	2.34E+01	J			NR				2.44E+01	J		
VOLATILE ORGANIC COMPOUNDS															
Acetone	mg/kg	NA	7.76E+02	NP				ND				4.10E-02	B		
Methylene chloride	mg/kg	NA	8.41E+01	NP				2.50E-03	B			3.40E-03	B		
Naphthalene	mg/kg	NA	1.55E+02	NP				8.10E-04	B			ND			
Trichlorofluoromethane	mg/kg	NA	2.33E+03	NP				ND				3.10E-03	B		
PESTICIDES															
4,4'-DDD	mg/kg	NA	2.54E+00	ND				NR				ND			
4,4'-DDE	mg/kg	NA	1.79E+00	ND				NR				ND			
4,4'-DDT	mg/kg	NA	1.79E+00	ND				NR				ND			
Endosulfan sulfate	mg/kg	NA	4.66E+01	ND				NR				ND			

Table 5-2

Subsurface Soil Analytical Results
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

[a] Bkg - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama* , July.

[b] 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 (and greater than zero).
J - Result is greater than the method detection limit but less than or equal to the reporting limit.
mg/kg - Milligrams per kilogram.
NA - Not available.
ND - Not detected.
NP - Analysis not performed because of laboratory error.
NR - Analysis not requested.
Qual - Data validation qualifier.

Table 5-3

Groundwater Analytical Results
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Sample Location Sample Number Sample Date				PPMP-239-GP01 KV3001 14-Apr-99				PPMP-239-GP04 KV3002 15-Apr-99			
Parameter	**Units**	**BKG[a]**	**SSSL[b]**	**Result**	**Qual**	**>BKG**	**>SSSL**	**Result**	**Qual**	**>BKG**	**>SSSL**
METALS											
Aluminum	mg/L	2.34E+00	1.56E+00	1.69E+01		YES	YES	1.43E+02		YES	YES
Arsenic	mg/L	1.78E-02	4.00E-05	ND				1.46E-02	B		YES
Barium	mg/L	1.27E-01	1.10E-01	2.35E-01		YES	YES	2.67E+00		YES	YES
Beryllium	mg/L	1.24E-03	3.12E-03	1.90E-03	J	YES		1.31E-02		YES	YES
Calcium	mg/L	5.65E+01	NA	9.35E-01	B			2.51E+00	J		
Chromium	mg/L	NA	4.69E-03	2.44E-02			YES	2.57E-01			YES
Cobalt	mg/L	2.34E-02	9.39E-02	9.60E-03	J			7.90E-02		YES	
Copper	mg/L	2.55E-02	6.26E-02	5.70E-03	J			1.93E-01		YES	YES
Iron	mg/L	7.04E+00	4.69E-01	1.78E+01		YES	YES	1.60E+02		YES	YES
Lead	mg/L	7.99E-03	1.50E-02	3.50E-03				6.20E-02	J	YES	YES
Magnesium	mg/L	2.13E+01	NA	3.74E+00	J			8.04E+01		YES	
Manganese	mg/L	5.81E-01	7.35E-02	4.36E-01			YES	2.55E+00		YES	YES
Nickel	mg/L	NA	3.13E-02	2.37E-02	J			2.64E-01			YES
Potassium	mg/L	7.20E+00	NA	1.76E+01		YES		9.71E+01		YES	
Selenium	mg/L	NA	7.82E-03	ND				7.10E-03			
Sodium	mg/L	1.48E+01	NA	2.02E+00	B			1.67E+01		YES	
Thallium	mg/L	1.45E-03	1.00E-04	4.60E-03	B	YES	YES	ND			
Vanadium	mg/L	1.70E-02	1.10E-02	2.34E-02	J	YES	YES	2.66E-01		YES	YES
Zinc	mg/L	2.20E-01	4.69E-01	4.96E-02				5.05E-01		YES	YES
VOLATILE ORGANIC COMPOUNDS											
Acetone	mg/L	NA	1.56E-01	5.10E-02	B			4.70E-03	B		
Bromomethane	mg/L	NA	2.17E-03	1.50E-04	B			ND			
Chloroform	mg/L	NA	1.15E-03	ND				5.40E-04	J		
SEMIVOLATILE ORGANIC COMPOUNDS											
Diethyl phthalate	mg/L	NA	1.23E+00	1.80E-03	J			ND			
bis(2-Ethylhexyl)phthalate	mg/L	NA	4.30E-03	1.30E-02			YES	1.90E-03	J		

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

[a] Bkg - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama* , July.

[b] 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 (and greater than zero).

J - Result is greater than the method detection limit but less than or equal to the reporting limit.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

5.1 Surface and Depositional Soil Analytical Results

Six surface soil samples and two depositional soil samples were collected for chemical analyses at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). Surface and depositional soil samples were collected from the upper 1 foot of soil at the locations shown on Figure 3-2. Analytical results were compared to residential human health SSSLs, ESVs, and metals background concentrations, as presented in Table 5-1.

Metals. Nineteen metals were detected in surface and depositional soil samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). The concentrations of five metals (aluminum, arsenic, chromium, iron, and manganese) exceeded SSSLs. With the exception of manganese (two locations) and iron (one location), the concentrations of these metals were below the respective background concentration. The manganese and iron results were within the range of background values determined by SAIC (1998) (Appendix I).

The following metals were detected at concentrations exceeding ESVs and the respective background concentration: barium (four locations), beryllium (two locations), cobalt (two locations), lead (one location), manganese (two locations), selenium (six locations), and zinc (one location). With the exception of barium, beryllium, and selenium at two sample locations each, the concentrations of these metals were within the range of background values determined by SAIC (1998) (Appendix I).

Volatile Organic Compounds. Six VOCs, including 2-butanone, acetone, methylene chloride, toluene, trichlorofluoromethane, and p-cymene, were detected in surface and depositional soil samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). The methylene chloride results and three of the five trichlorofluoromethane results were flagged with a “B” data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank. The remaining VOC results were flagged with a “J” data qualifier indicating that the results were greater than the method detection limit (MDL) but less than the RL. Sample locations PPMP-239-GP03 and PPMP-239-GP04 each contained five of the six detected VOCs. VOC concentrations in the surface and depositional samples ranged from 0.0023 mg/kg to 0.4 mg/kg, and the cumulative concentration was 1.31 mg/kg.

The VOC concentrations in surface and depositional soils were below SSSLs and ESVs.

Semivolatile Organic Compounds. The SVOC bis(2-ethylhexyl)phthalate was detected in

one surface soil sample (PPMP-239-GP01) at a concentration below the SSSL and ESV.

Pesticides. Five pesticides, including 4,4'- dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, 4,4'-DDT, Endosulfan I, and delta-betahexachlorocyclohexane, were detected in surface and depositional soil samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). All but two of the pesticide results were flagged with a "J" data qualifier indicating that the results were greater than the MDL but less than the RL. Endosulfan I (PPMP-239-GP04) and delta-betahexachlorocyclohexane (PPMP-239-GP05) were each detected in only one of the samples. Pesticide concentrations in the surface and depositional soil samples ranged from 0.0011 mg/kg to 3.6 mg/kg, and the cumulative concentration was 5.34 mg/kg.

The concentration of 4,4'-DDT exceeded the SSSL at one sample location (PPMP-239-GP03). The concentrations of three pesticides (4,4'-dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and 4,4'-DDT) exceeded ESVs at three sample locations (PPMP-239-GP01, PPMP-239-GP02, and PPMP-239-GP03). 4,4'-dichlorodiphenyldichloroethene and 4,4'-DDT concentrations also exceeded ESVs at one additional location (PPMP-239-DEP01).

5.2 Subsurface Soil Analytical Results

Six subsurface soil samples were collected for chemical analyses at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figure 3-2. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-2.

Metals. Nineteen metals were detected in subsurface soil samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). Each of the detected metals was present in the samples collected at sample locations PPMP-239-GP02 and PPMP-239-GP05.

The concentrations of four metals (aluminum, arsenic, iron, and manganese) exceeded SSSLs but were below the respective background concentration.

Volatile Organic Compounds. Four VOCs, including acetone, methylene chloride, naphthalene, and trichlorofluoromethane, were detected in subsurface soil samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). The methylene chloride,

naphthalene, and trichlorofluoromethane results were flagged with a “B” data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank. VOC concentrations in the subsurface soil samples ranged from 0.00081 mg/kg to 0.089 mg/kg, and the cumulative concentration was 0.274 mg/kg.

The VOC concentrations in subsurface soils were below SSSLs.

Pesticides. Four pesticides, including 4,4’- dichlorodiphenyldichloroethane, 4,4’-dichlorodiphenyldichloroethene, 4,4’-DDT, and endosulfan sulfate, were detected in the subsurface soil sample collected at PPMP-239-GP03. The analytical results were flagged with a “J” data qualifier indicating that the results were greater than the MDL but less than the RL. Pesticides were not detected in any of the other subsurface soil samples. Pesticide concentrations in the subsurface soil samples ranged from 0.0049 mg/kg to 0.24 mg/kg, and the cumulative concentration was 0.265 mg/kg.

The pesticide concentrations in subsurface soils were below SSSLs.

5.3 Groundwater Analytical Results

Groundwater samples were collected from two temporary wells installed at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), at the locations shown on Figure 3-2. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-3.

Metals. Nineteen metals were detected in groundwater samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). Thirteen metals, including aluminum, arsenic, barium, beryllium, chromium, copper, iron, lead, manganese, nickel, thallium, vanadium, and zinc, were detected at concentrations exceeding SSSLs. With the exception of arsenic, chromium, and nickel, the concentrations of these metals also exceeded the respective background concentration. Background concentrations were not available for chromium and nickel (SAIC, 1998).

It should be noted that both groundwater samples had high turbidity (>1,000 NTUs) at the time of sample collection. To evaluate the effects of turbidity on metals concentrations in groundwater at FTMC, IT resampled five wells that previously had high turbidity using a “low-flow” groundwater purging and sampling technique to reduce turbidity to below 10 NTUs. The

resampling effort demonstrated that the concentrations of most metals in the lower turbidity samples were significantly lower (1 to 2 orders of magnitude) than in the higher turbidity samples (IT, 2000c). Consequently, the elevated metals results in the groundwater samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), are likely the result of high turbidity.

Volatile Organic Compounds. Three VOCs, including acetone, bromomethane, and chloroform, were detected in groundwater samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). The acetone and bromomethane results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank. VOC concentrations in the groundwater samples ranged from 0.00015 milligrams per liter (mg/L) to 0.051 mg/L and the cumulative concentration was 0.056 mg/L.

The VOC concentrations in groundwater were below SSSLs.

Semivolatile Organic Compounds. Diethyl phthalate and bis(2-ethylhexyl)phthalate were detected in groundwater samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7). SVOC concentrations in the groundwater samples ranged from 0.0018 mg/L to 0.013 mg/L and the cumulative concentration was 0.017 mg/L.

The bis(2-ethylhexyl)phthalate concentration at sample location PPMP-239-GP01 exceeded the SSSL.

6.0 Summary and Conclusions and Recommendations

IT, under contract with USACE, completed a SI at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site at concentrations that would present an unacceptable risk to human health or the environment. The SI at Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), consisted of a geophysical survey and the sampling and analyses of six surface soil samples, two depositional soil samples, six subsurface soil samples, and two groundwater samples. In addition, two temporary monitoring wells were installed in the residuum groundwater zone to facilitate groundwater sample collection and provide site-specific geological and hydrogeological characterization information.

The geophysical survey results indicate that most of the anomalies at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), are caused by surface metal and cultural features. The geophysical data do not indicate the presence of trenches; however, one geophysical anomaly identified in the Parcel 239(7) data is interpreted to be a pit containing a low concentration of buried metal.

Chemical analyses of samples collected at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), indicate that metals, VOCs, SVOCs, and pesticides were detected in the various site media. Herbicides, PCBs, and nitroaromatic explosives were not detected in any of the samples collected. Analytical results were compared to the human health SSSLs and ESVs developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC. Additionally, metal concentrations exceeding SSSLs and ESVs were compared to media-specific background screening values (SAIC, 1998).

The potential threat to human receptors is expected to be low. Although the site is projected for passive recreational use, the analytical data were screened against residential human health SSSLs to evaluate the site for possible unrestricted future land use. In soils, the concentrations of manganese (two surface soil samples) and iron (one surface soil sample) exceeded SSSLs and the respective background concentration. However, the concentrations of these metals were within the range of background values determined by SAIC (1998). The pesticide 4,4’-DDT was detected in one surface soil sample at a concentration (3.6 mg/kg) exceeding the SSSL (1.79 mg/kg). Given the low concentration and limited distribution, the 4,4’-DDT is not expected to

pose a significant threat to human health.

In groundwater, several metals were detected at concentrations exceeding SSSLs and background concentrations. However, the elevated metals results are likely the result of high turbidity at the time of sample collection and are not believed to be related to site activities. The concentration of the SVOC bis(2-ethylhexyl)phthalate exceeded the SSSL in one groundwater sample. Bis(2-ethylhexyl)phthalate is a common contaminant in water samples and is probably not related to site activities.

The concentrations of three metals (barium, beryllium, and selenium) exceeded ESVs and the range of background values in two surface/depositional soil samples each. Additionally, the concentrations of three pesticides (4,4'- dichlorodiphenyldichloroethane, 4,4'-dichlorodiphenyldichloroethene, and/or 4,4'-DDT) exceeded ESVs at four surface/depositional soil sample locations. The cumulative concentration of these pesticides in the eight surface and depositional soil samples collected was 5.33 mg/kg. The parcels are located within a heavily wooded area, away from the developed portion of the Main Post and are expected to support viable ecological habitat. However, the low levels of metals and pesticides detected are not expected to pose a substantial threat to ecological receptors.

Based on the results of the SI, past operations at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7), do not appear to have adversely impacted the environment. The metals and chemical constituents detected in site media do not pose an unacceptable risk to human health and the environment. Therefore, IT recommends "No Further Action" and unrestricted reuse with regard to hazardous, toxic, and radioactive waste at the Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7).

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ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

Abs	skin absorption
AC	hydrogen cyanide
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
ADEM	Alabama Department of Environmental Management
AEL	airborne exposure limit
AL	Alabama
amb.	Amber
ANAD	Anniston Army Depot
APT	armor piercing tracer
ASP	Ammunition Supply Point
ASR	Archives Search Report, July 1999
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
B	analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCT	BRAC Cleanup Team
BFB	bromofluorobenzene
bgs	below ground surface
bkg	background
bls	below land surface
BOD	biological oxygen demand
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BTEX	benzene, toluene, ethylbenzene, and xylenes
BTOC	below top of casing
BZ	breathing zone
C	ceiling limit value
Ca	carcinogen
CCAL	continuing calibration
CCB	continuing calibration blank
CD	compact disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CFC	chlorofluorocarbon
CG	cyanogen chloride
ch	inorganic clays of high plasticity
CK	carbonyl chloride
cl	inorganic clays of low to medium plasticity
Cl.	chlorinated
CLP	Contract Laboratory Program
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
COC	chain of custody
COE	Corps of Engineers
Con	skin or eye contact
CRL	certified reporting limit
CRZ	contamination reduction zone
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
ctr.	container
CWA	chemical warfare agent
CWM	chemical warfare materials, clear wide mouth
CX	dichloroformoxime
D	duplicate
DANC	decontamination agent, non-corrosive
ºC	degrees Celsius
ºF	degrees Fahrenheit
DDT	dichlorodiphenyltrichloroethane
DEP	depositional soil
DI	deionized
DIMP	di-isopropylmethylphosphonate
DMMP	dimethylmethylphosphonate
DOD	U.S. Department of Defense
DP	direct-push
DPDO	Defense Property Disposal Office
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
E&E	Ecology and Environment, Inc.
EBS	environmental baseline survey
Elev.	elevation
EM	electromagnetic
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive and ordnance disposal
EODT	explosive and ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
ER	equipment rinsate
ESE	Environmental Science and Engineering, Inc.
ESV	ecological screening value
E-W	east to west
EZ	exclusion zone
FB	field blank
FD	field duplicate
FedEx	Federal Express, Inc.
FFE	field flame expedient
Fil	filtered
Flt	filtered
FMP 1300	Former Motor Pool 1300 Site
Frtn	fraction
FS	field split
ft	feet
ft/ft	feet per foot
FTA	fire training area
FTMC	Fort McClellan
g	gram
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
GFAA	graphite furnace atomic absorption
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
HA	hand auger
HCl	hydrochloric acid
HD	distilled mustard
HDPE	high-density polyethylene
Herb.	herbicides
HNO_3	nitric acid
hr	hour
H&S	health and safety
HSA	hollow stem auger
HTRW	hazardous, toxic, and radioactive waste
I	out of control, data rejected due to low recovery
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDW	investigation-derived waste
IMPA	isopropylmethyl phosphonic acid
in.	inch
Ing	ingestion

Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IRDMIS	Installation Restoration Data Management Information System
IT	IT Corporation
ITEMS	IT Environmental Management System ™
J	estimated concentration
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
K	conductivity
L	lewisite; liter
LC_{50}	lethal concentration for 50 percent of population tested
LD_{50}	lethal dose for 50 percent of population tested
l	liter
LCS	laboratory control sample
LEL	lower explosive limit
LT	less than the certified reporting limit
max	maximum
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimer
min	minimum
MINICAMS	miniature continuous air sampling system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MOGAS	motor vehicle gasoline
MPA	methyl phosphonic acid
MR	molasses residue
MS	matrix spike
mS/cm	milliSiemens per centimeter
MSD	matrix spike duplicate
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
N/A	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
ND	not detected
NE	no evidence
NFA	No Further Action
ng/L	nanograms per liter
NGVD	National Geodetic Vertical Datum
NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
No.	number
NOAA	National Oceanic and Atmospheric Administration
NR	not requested
ns	nanosecond
N-S	north to south
nT	nanotesla
NTU	nephelometric turbidity unit
O&G	oil and grease
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
OSHA	Occupational Safety and Health Administration
OWS	oil/water separator
oz	ounce
PAH	polynuclear aromatic hydrocarbon
Pb	lead
PCB	polychlorinated biphenyl
PCE	perchlorethene
PDS	Personnel Decontamination Station
PEL	permissible exposure limit
Pest.	pesticide
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
POL	petroleum, oils, and lubricants
PP	peristaltic pump
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental Inc.
qty	quantity
Qual	qualifier
R	rejected
RCRA	Resource Conservation and Recovery Act
ReB3	Rarden silty clay loams
REG	field sample
REL	recommended exposure limit
RFA	request for analysis
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
RTK	real-time kinematic
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
sc	clayey sands; sand-clay mixtures
Sch.	schedule
SD	sediment
SDG	sample delivery group
SDZ	safe distance zone
SEMS	Southern Environmental Management & Specialties
SFSP	site-specific field sampling plan
SGF	standard grade fuels
SHP	installation-wide safety and health plan
SI	site investigation
sm	silty sands; sand-silt mixtures
SOP	standard operating procedure
sp	poorly graded sands; gravelly sands
SP	sump pump
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSSL	site-specific screening level
STB	supertropical bleach
STEL	short-term exposure limit
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SZ	support zone
TAL	target analyte list

TAT	turn around time
TB	trip blank
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TERC	Total Environmental Restoration Contract
TIC	tentatively identified compounds
TLV	threshold limit value
TN	Tennessee
TOC	top of casing, total organic carbon
TPH	total petroleum hydrocarbons
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TWA	time weighted average
UCL	upper confidence limit
UCR	upper certified range
UJ	not detected above reporting limit; result should be estimated
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USAMCLS	U.S. Army Chemical School
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validated qualifier
VX	nerve agent (O-ethyl-S- [diisoproplaminoethyl]-methylphosphonothiolate)
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd^3	cubic yards

APPENDIX A

GEOPHYSICAL SURVEY REPORT

APPENDIX B

SAMPLE COLLECTION LOGS AND ANALYSIS REQUEST/CHAIN OF CUSTODY RECORDS

APPENDIX C

BORING LOGS AND WELL CONSTRUCTION LOGS

APPENDIX D

WELL DEVELOPMENT LOGS

APPENDIX E

SURVEY DATA

Appendix E

Survey Data
Trenches Near Range 20 Firing Line, Parcels 239(7) and 240(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Northing	Easting	Ground Elevation (ft msl)	Top of Casing Elevation (ft msl)
PPMP-239-DEP01	1167090.86	677469.72	935.35	NA
PPMP-239-DEP02	1167050.44	677663.50	973.79	NA
PPMP-239-GP01	1167141.65	677529.20	948.83	950.07
PPMP-239-GP02	1167087.80	677575.20	953.81	NA
PPMP-239-GP03	1167015.43	677637.53	965.82	NA
PPMP-239-GP04	1167494.56	678289.79	984.76	985.59
PPMP-239-GP05	1167569.69	678284.28	993.69	NA
PPMP-239-GP06	1167624.41	678264.75	999.38	NA

Horizontal coordinates referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983 (NAD83).

Elevations referenced to the North American Vertical Datum of 1988 (NAVD88).

ft msl - Feet mean sea level
NA - Not available, temporary well not installed.

APPENDIX F

SUMMARY OF VALIDATED ANALYTICAL DATA

APPENDIX G

DATA VALIDATION SUMMARY REPORT

APPENDIX H

VARIANCES/NONCONFORMANCES

APPENDIX I

SUMMARY STATISTICS FOR BACKGROUND MEDIA, FORT MCCLELLAN, ALABAMA