Final

Site Investigation Report
Ground Scar with Trenches at Driving Course
Parcel 200(7)

Fort McClellan
Calhoun County, Alabama

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK05, IT Corporation completed a site investigation (SI) at the Ground Scar with Trenches at Driving Course, Parcel 200(7), at Fort McClellan (FTMC) in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the Ground Scar with Trenches at Driving Course, Parcel 200(7) and, if present, whether the concentrations present an unacceptable risk to human health or the environment. The SI at the Ground Scar with Trenches at Driving Course, Parcel 200(7), consisted of a geophysical survey and the sampling and analysis of four surface soil samples, six subsurface soil samples, four groundwater samples, three depositional soil samples, two surface water samples, and two sediment samples. In addition, four 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 indicated that anomalies at the Ground Scar with Trenches at Driving Course, Parcel 200(7) were caused by surface metal and cultural features. The geophysical data did not indicate the presence of trenches.

The analytical results indicated that metals, volatile organic compounds, semivolatile organic compounds, chlorinated pesticides, polychlorinated biphenyls, and chlorinated herbicides were detected in the environmental media sampled. To evaluate whether the detected constituents present an unacceptable risk to human health or the environment, the analytical results were compared to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC.

The potential impact to human receptors is expected to be minimal. Although the site is projected for active recreation, the analytical data were screened against residential human health SSSLs to evaluate the site for possible unrestricted land reuse. The metals that exceeded residential human health SSSLs, with a few exceptions, were within background concentrations or the range of background values, and thus do not pose an unacceptable risk to future human receptors. Volatile organic compounds and semivolatile organic compounds were not detected in any of the samples at concentrations exceeding residential human health SSSLs.

Several metals were detected in site media at concentrations exceeding ESVs and background concentrations. In addition, the concentration of one polychlorinated biphenyl (Aroclor 1260) marginally exceeded the ESV at one sampling location (0.04 milligram per kilogram and 0.02 milligram per kilogram, respectively). However, the potential impact to ecological receptors is expected to be minimal. The site is in a well-developed area consisting of buildings and paved roads. Consequently, the threat to potential ecological receptors is expected to be low.

Based on the results of the SI, past operations at the Ground Scar with Trenches at Driving Course, Parcel 200(7), do not appear to have adversely impacted the environment. The metals and organic compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, IT Corporation recommends "No Further Action" and unrestricted land reuse at the Ground Scar with Trenches at Driving Course, Parcel 200(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 IT Corporation (IT) to perform the site investigation (SI) of the Ground Scar with Trenches at Driving Course, Parcel 200(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 Ground Scar with Trenches at Driving Course, Parcel 200(7).

1.1 Project Description

The Ground Scar with Trenches at Driving Course, Parcel 200(7), was identified as an area to be investigated prior to property transfer. The Ground Scar with Trenches at Driving Course, Parcel 200(7), was classified as a Category 7 site in the environmental baseline study (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 areas are sites that are not evaluated and/or that require further evaluation.

A site-specific field sampling plan (SFSP) attachment and a site-specific safety and health plan (SSHP) attachment were finalized in December 1998 (IT, 1998a). The SFSP and SSHP provide technical guidance for sample collection and analysis at the Ground Scar with Trenches at Driving Course, Parcel 200(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 a geophysical survey and field work to collect four surface soil samples, six subsurface soil samples, two surface water, two sediment samples, four groundwater samples, and three depositional soil samples to determine if potential site-specific chemicals are present at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

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 Ground Scar with Trenches at Driving Course, Parcel 200(7), at concentrations that would present an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 of this report 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, ESVs, and polynuclear aromatic hydrocarbon (PAH) background screening values are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). The PAH background screening values were developed by IT at the direction of the BRAC Cleanup Team (BCT) to address the occurrence of PAH compounds in surface soils as a result of anthropogenic activities at FTMC. Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

Based on these conclusions, the BCT will make a decision to either propose "No Further Action" at the site or to conduct additional work at the site.

1.3 Site Description and History

The Ground Scar with Trenches at Driving Course, Parcel 200(7), is a 1.5-acre rectangular parcel located on the Main Post of FTMC (Figure 1-1). The parcel is situated in the southwest corner of the intersection of 22nd Street and Rocky Hollow Road (Figure 1-2). Review of aerial photographs taken by the U.S. Army Toxic and Hazardous Material Agency identified the ground scar on photographs taken in 1941, 1949, 1954, 1961, 1969, and 1972. On the aerial photograph taken in 1954, the ground scar appeared to contain five trenches oriented northeast-southwest (Photograph No. GR-10M, Frame No. 58) (ESE, 1998). However, the ground scar and associated trenches are no longer visible on recent aerial photographs taken after 1982. It is not known

if these trenches were used in training activities or used for disposal activities. Interviews conducted during the EBS suggest that the trenches identified in the aerial photographs may have been used to dispose of excess supertropical bleach (STB). STB was sometimes discarded into trenches after decontamination exercises (ESE, 1998). STB is a white powder containing 30 percent chlorine and is often referred to as bleach, supertropical bleach, and clorinated lime (U.S. Department of the Army and Air Force, 1963).

The ground scar was not observed during the EBS visual site inspection (ESE, 1998), or by IT personnel during a site visit in June 1998. Currently, the area the ground scar occupies is covered with thick vegetation (mostly kudzu) and pine trees. Construction debris, boulder-size rocks, and a corroded 5-gallon container were found in the approximate former location of the ground scar with trenches. The remainder of the area near the site was occupied by a vehicle driving course.

The driving course, located south/southwest of the ground scar, contains raised asphalt areas sloped to direct the flow of rainwater to grassy areas. The grassy areas are connected by a system of concrete culverts that concentrate the flow of runoff to the west side of the driving course, where five outlets are located. On the driving course there are four drainage ditches that flow to the west and two drainage ditches that flow to the south. Trenches running along the northern tree line and the southern boundary flow to the west, while a trench running parallel to Rocky Hollow Road and the trench running between the canopy and bleachers flow to the south.

Ingram Creek is located approximately 500 feet southwest of the parcel. A small tributary flows into Ingram Creek from the east. The site slopes from the northeast to the southwest. Site elevation ranges from approximately 810 to 830 feet above mean sea level. A site map with the surface features shown as described above is provided on Figure 1-2.

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 of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas)

2. Areas where only release or disposal of petroleum products has occurred

3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response

4. Areas of release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken

5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken

6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented

7. Areas that are not evaluated or require additional evaluation.

The EBS was conducted in accordance with the 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, Alabama Department of Environmental Management (ADEM), 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 historical maps and aerial photographs were reviewed to document historical land uses. Personal and telephone interviews of past and present FTMC employees and

military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels. The Ground Scar with Trenches at Driving Course, Parcel 200(7), was identified as a Category 7 CERFA parcel: areas that are not evaluated or require further evaluation. Previous studies to document site environmental conditions have not been conducted.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT at the Ground Scar with Trenches at Driving Course, Parcel 200(7), including a geophysical survey, environmental sampling and analysis, and monitoring well installation activities.

3.1 Geophysical Survey Activities

A geophysical survey was conducted at the Ground Scar with Trenches, Parcel 200(7), to identify anomalies representing trenches and to select sample locations in the area of concern. The area surveyed was approximately 224,000 square feet (5.1 acres), as shown on the geophysical survey site map (Figure 3-1). 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 survey was conducted using magnetic and electromagnetic techniques. A survey grid was established at the site to encompass suspect trench locations. Survey control was accomplished using a survey-grade total station global positioning system and a laser theodolite instrument. The global positioning system survey data were referenced to the U.S. State Plane Coordinate System (Alabama East Zone, North American Datum 1983).

A detailed site map was sketched in the field. The map included any surface cultural features within the survey area, or near its perimeter, that could potentially affect the geophysical data (e.g., vehicles, overhead utilities, and/or culverts).

Preliminary color contour maps of the data were analyzed and compared with the 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 map. The results of the geophysical survey are summarized in Section 4.1.

3.2 Environmental Sampling

The environmental sampling performed during the SI at the Ground Scar with Trenches at Driving Course, Parcel 200(7), included the collection of surface soil samples, subsurface soil samples, surface water samples, sediment samples, groundwater samples, and depositional soil samples for chemical analysis. The sample locations were determined by observing site physical characteristics during a site visit, geophysical survey activities, and by reviewing historical

documents pertaining to activities conducted at the site. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figure 3-2. Samples were submitted for laboratory analyses of site-related parameters listed in Section 3.4.

3.2.1 Surface and Depositional Soil Sampling

Surface soil samples were collected from four locations, and depositional soil samples were collected from three locations at the Ground Scar with Trenches at Driving Course, Parcel 200(7). Soil sampling locations and rationale are presented in Table 3-1. Sampling locations are shown on Figure 3-2. 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 the geophysical survey and sampling rationale, presence of surface structures, site topography, and proximity to utilities.

Sample Collection. Surface soil samples were collected from the upper 1 foot of soil by either direct-push technology or with a 3-inch diameter stainless-steel hand auger using the methodology specified in Section 4.9 of the SAP (IT, 2000a). The depositional soil samples were collected from the upper 0.5 foot of soil with a stainless steel trowel. 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 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) analysis 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 3.4. Sample collection logs are included in Appendix B.

3.2.2 Subsurface Soil Sampling

Subsurface soil samples were collected from six soil borings at the Ground Scar with Trenches at Driving Course, Parcel 200(7), as shown on Figure 3-2. Subsurface 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 the geophysical survey and sampling rationale, presence of surface structures, site topography, and proximity to utilities. IT contracted TEG, Inc., a direct-push technology subcontractor, to assist in subsurface soil sample collection.

Table 3-1

Sampling Locations and Rationale
Ground Scar with Trenches at Driving Course, Parcel 200(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sampling Location Rationale
PPMP-200-GP01	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil and groundwater samples were collected downgradient and southwest of the approximate location of the potential former trenches.
PPMP-200-GP02	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil and groundwater samples were collected south and downgradient of the approximate location of the potential former trenches. Potential contaminants would most likely migrate towards this sample location from the suspected source area (trenches).
PPMP-200-GP03	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil and groundwater samples were collected from the eastern end of the northernmost potential former trench.
PPMP-200-GP04	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil and groundwater samples were collected upgradient and northeast of the approximate location of the potential former trenches. Upgradient sample location to determine if potential contaminants are from the site or upgradient of the site.
PPMP-200-GP05	Subsurface Soil	A subsurface soil sample was collected northwest of the potential trench area and south of 22nd Street.
PPMP-200-GP06	Subsurface Soil	A subsurface soil sample was collected downgradient and to the southeast of the potential former trenches. Sample location represents a lower elevation area where surface water runoff could collect and percolate into the substratum.
PPMP-200-SW/SD01	Surface Water Sediment	Surface water and sediment samples were collected from a tributary to Ingram Creek downstream of Parcel 200(7).
PPMP-200-SW/SD02	Surface Water Sediment	Surface water and sediment samples were collected from a tributary to Ingram Creek downstream of Parcel 200(7).
PPMP-200-DEP01	Depositional Soil	A depositional soil sample was collected on the north side of Ingram Creek between the creek and the southern parcel boundary. This sample location represents a lower elevation where surface water runoff could collect and percolate into the substratum, or deposit dissolved material after evaporation.
PPMP-200-DEP02	Depositional Soil	A depositional soil sample was collected from an area of lower elevation southwest of the parcel. This sample location represents a lower elevation where surface water runoff could collect and percolate into the substratum, or deposit dissolved material after evaporation.
PPMP-200-DEP03	Depositional Soil	A depositional soil sample was collected from from an area of lower elevation west of the parcel. This sample location represents a lower elevation where surface water runoff could collect and percolate into the substratum, or deposit dissolved material after evaporation.

Table 3-2

Surface, Subsurface, and Depositional Soil Sample Designations and QA/QC Samples
Ground Scar with Trenches at Driving Course, Parcel 200(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-200-GP01	PPMP-200-GP01-SS-KX0001-REG PPMP-200-GP01-DS-KX0002-REG	0 - 10 10 -12			PPMP-200-GP01-SS-KX0001-MS PPMP-200-GP01-SS-KX0001-MSD	TCL VOCs, SVOCs, Cl Pesticides, Cl Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives
PPMP-200-GP02	PPMP-200-GP02-SS-KX0003-REG PPMP-200-GP02-DS-KX0006-REG	0 - 1 10 - 12				TCL VOCs, SVOCs, Cl Pesticides, Cl Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives
PPMP-200-GP03	PPMP-200-GP03-SS-KX0007-REG PPMP-200-GP03-DS-KX0008-REG	0 - 1 8 - 10	PPMP-200-GP03-SS-KX0004-FD	PPMP-200-GP03-SS-KX0005-FS		TCL VOCs, SVOCs, Cl Pesticides, Cl Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives
PPMP-200-GP04	PPMP-200-GP04-SS-KX0009-REG PPMP-200-GP04-DS-KX0010-REG	0 - 1 10 - 12				TCL VOCs, SVOCs, Cl Pesticides, Cl Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives
PPMP-200-GP05	PPMP-200-GP05-DS-KX0011-REG	9 - 12				TCL VOCs, SVOCs, Cl Pesticides, Cl Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives
PPMP-200-GP06	PPMP-200-GP06-DS-KX0014-REG	2 - 5	PPMP-200-GP06-DS-KX0012-FD	PPMP-200-GP06-DS-KX0013-FS		TCL VOCs, SVOCs, Cl Pesticides, Cl Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives
PPMP-200-DEP01	PPMP-200-DEP01-DEP-KX0016-REG	0 - 0.5				TCL VOCs, SVOCs, Cl Pesticides, Cl Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives
PPMP-200-DEP02	PPMP-200-DEP02-DEP-KX0017-REG	0 - 0.5				TCL VOCs, SVOCs, Cl Pesticides, Cl Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives
PPMP-200-DEP03	PPMP-200-DEP03-DEP-KX0018-REG	0 - 0.5				TCL VOCs, SVOCs, Cl Pesticides, Cl Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives

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

Sample Collection. Subsurface soil samples were collected from soil borings at a depth 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 3.4.

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 showing 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 groundwater was submitted for analysis. 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 analysis are summarized in Table 3-2. The on-site geologist constructed a detailed lithologic log. The lithological log for each borehole is included in Appendix C.

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

3.2.3 Well Installation

Four temporary wells were installed in the residuum groundwater zone at the Ground Scar with Trenches at Driving Course, Parcel 200(7), to collect groundwater samples for laboratory analysis. The well/groundwater sample locations are shown on Figure 3-2. Table 3-3 summarizes the construction details of the wells installed at the Ground Scar with Trenches at Driving Course, Parcel 200(7). The well construction logs are included in Appendix C.

IT contracted Miller Drilling, Inc., to install the temporary wells with a hollow-stem auger rig at the well/groundwater sample 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 borehole was augered to the depth of direct-push sampler refusal, and samples were collected at the depth of

Table 3-3

Temporary Well Construction Summary
Ground Scar with Trenches at Driving Course, Parcel 200(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)	Well Material
PPMP-200-GP01	1168480.78	674109.68	812.26	815.26	19.75	15	4.50 - 19.50	2" ID Sch. 40 PVC
PPMP-200-GP02	1168441.34	674164.34	814.71	817.11	25.00	15	9.75 - 24.75	2" ID Sch. 40 PVC
PPMP-200-GP03	1168507.42	674251.89	821.27	824.12	17.00	10	6.75 - 16.75	2" ID Sch. 40 PVC
PPMP-200-GP04	1168478.93	674380.08	831.11	832.98	38.25	15	23.00 - 38.00	2" ID Sch. 40 PVC

All temporary wells installed using hollow-stem auger.
Horizontal coordinates referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum 1983.
Elevations referenced to the North American Vertical Datum of 1988.
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.

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 split-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 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 10- to 15-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. Number 1 filter sand (environmentally safe, clean fine sand, sieve size 20 to 40) 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 using a solid PVC surge block 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 chips, was placed immediately on top of the filter sand and hydrated with potable water. If the bentonite seal was installed below the water table surface, the bentonite chips were allowed to hydrate in the groundwater. The bentonite seal placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). A locking well cap was placed on the PVC 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 well.

The temporary wells were developed by surging and pumping with a 2-inch-diameter submersible pump in accordance with methodology outlined in Section 4.8 and Appendix C of the SAP (IT, 2000a). The submersible pump being used for well development was moved in an up-and-down fashion to encourage any residual well installation materials to enter the well. These materials were then pumped out of the well in order to reestablish the natural hydraulic flow conditions. Development was performed until the water turbidity was less than or equal to 20 nephelometric turbidity units (NTU) or for a maximum of four hours. The well development logs are included in Appendix D.

3.2.4 Water Level Measurements

The depth to groundwater was measured in all temporary, permanent, and existing wells installed at FTMC in March 2000 following procedures outlined in Section 4.18 of the SAP (IT, 2000a). Depth to groundwater was measured with electronic water level meters. Each meter probe and cable were cleaned before use at each well following decontamination methodology presented in Section 4.10 of the SAP (IT, 2000a). Measurements were referenced to the top of each well casing. A summary of groundwater level measurements for the Ground Scar with Trenches at Driving Course, Parcel 200(7), is presented in Table 3-4.

3.2.5 Groundwater Sampling

Groundwater was sampled from the four temporary wells at the Ground Scar with Trenches at Driving Course, Parcel 200(7). 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 completed at the temporary well locations following procedures outlined in Section 4.9.1.4 of the SAP (IT, 2000a). Groundwater was sampled after purging a minimum of three well volumes and after field parameters, including temperature, pH, specific conductivity, oxidation-reduction potential, and turbidity, stabilized. Purging and sampling were performed with a submersible or peristaltic pump equipped with Teflon™ tubing. Field parameters were measured using a calibrated water-quality meter. 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 3.4.

3.2.6 Surface Water Sampling

Two surface water samples were collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7), at the locations shown on Figure 3-2. The surface water sampling locations and rationale are listed in Table 3-1. The surface water sample designations and QA/QC samples are listed in Table 3-7. The sampling locations were determined in the field, based on drainage pathways and actual field observations.

Sample Collection. The surface water samples were collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP (IT, 2000a). The surface water samples were collected by dipping a stainless-steel pitcher in the water and pouring the water into the appropriate sample containers. The samples were collected after the field parameters described

Table 3-4

Groundwater Elevations
Ground Scar with Trenches at Driving Course, Parcel 200(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-200-GP01	13-Mar-00	20.70	812.26	815.26	794.56
PPMP-200-GP02	13-Mar-00	21.05	814.71	817.11	796.06
PPMP-200-GP03	13-Mar-00	6.67	821.27	824.12	817.45
PPMP-200-GP04	13-Mar-00	19.13	831.11	832.98	813.85

Elevations referenced to the North American Vertical Datum of 1988.

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

Table 3-5

Groundwater Sample Designations and QA/QC Samples
Ground Scar with Trenches at Driving Course, Parcel 200(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	QA/QC Samples			Analytical Suite
		Field Duplicates	Field Splits	MS/MSD	
PPMP-200-GP01	PPMP-200-GP01-GW-KX3001-REG			PPMP-200-GP01-GW-KX3001-MS PPMP-200-GP01-GW-KX3001-MSD	TCL VOCs, SVOCs, CI Pesticides, CI Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives
PPMP-200-GP02	PPMP-200-GP02-GW-KX3002-REG	PPMP-200-GP02-GW-KX3003-FD	PPMP-200-GP02-GW-KX3004-FS		TCL VOCs, SVOCs, CI Pesticides, CI Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives
PPMP-200-GP03	PPMP-200-GP03-GW-KX3005-REG				TCL VOCs, SVOCs, CI Pesticides, CI Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives
PPMP-200-GP04	PPMP-200-GP04-GW-KX3006-REG				TCL VOCs, SVOCs, CI Pesticides, CI Herbicides, OP Pesticides, PCBs, TAL Metals, Nitroexplosives

Groundwater samples were collected from the approximate midpoint of the saturated screened interval of the monitoring well.

CI - Chlorinated.
FD - Field duplicate.
FS - Field split.
MS/MSD - Matrix spike/matrix spike duplicate.
NA - Not applicable.
REG - Field sample.
OP - Organophosphorus.
PCB - Polychlorinated biphenyls.
QA/QC - Quality assurance/quality control.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 3-6

Groundwater and Surface Water Field Parameters
Ground Scar with Trenches at Driving Course, Parcel 200(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Date	Media	Specific Conductivity[a] (mS/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (^{o}C)	Turbidity (NTU)	pH (SU)
PPMP-200-GP01	5-Apr-99	GW	0.403	3.59	229	19.42	1.6	7.00
PPMP-200-GP02	6-Apr-99	GW	0.124	1.66	264	17.79	3.7	5.98
PPMP-200-GP03	5-Apr-99	GW	0.258	5.12	120	23.14	500.4	6.48
PPMP-200-GP04	6-Apr-99	GW	0.169	1.25	91	16.91	7.2	6.57
PPMP-200-SW/SD01	26-Jan-99	SW	NR	NR	NR	NR	NR	NR
PPMP-200-SW/SD02	25-Jan-99	SW	0.251	5.90	NR	13.98	29.1	7.10

[a]Specific conductivity values standardized to millisiemens per centimeter.

^{o}C - Degrees Celsius.
GW - Groundwater.
mS/cm - Millisiemens per centimeter.
mS/L - Millisiemens per liter.
mV - Millivolts.
NR - Not recorded.
NTU - Nephelometric turbidity units.
ORP - Oxidation-reduction potential.
ppm - Parts per million.
SU - Standard unit.
SW - Surface water.

Table 3-7

Surface Water and Sediment Sample Designations and QA/QC Samples
Ground Scar with Trenches at Driving Course, Parcel 200(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-200-SW/SD01	PPMP-200-SW/SD01-SW-KX2001-REG	NA				TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Cl. Pesticides/herbicides, OP Pesticides, Nitroexplosives
	PPMP-200-SW/SD01-SD-KX1001-REG	0-0.5				TOC and Grain size (sediment only)
PPMP-200-SW/SD02	PPMP-200-SW/SD02-SW-KX2002-REG	NA				TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Cl. Pesticides/herbicides, OP Pesticides, Nitroexplosives
	PPMP-200-SW/SD02-SD-KX1002-REG	0-0.5				TOC and Grain size (sediment only)

Cl. - Chlorinated.
ft bgs - Feet below ground surface.
NA - Not applicable.
OP - Organophosphorus.
PCB - Polychlorinated biphenyls.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
TOC - Total organic carbon.
VOC - Volatile organic compound.

in Section 3.2.5 had been measured using a calibrated water quality meter. Surface water field parameters are listed in Table 3-6. Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.4.

3.2.7 Sediment Sampling

Two sediment samples were collected at the same locations as the surface water samples, as shown on Figure 3-2. The sediment sampling locations and rationale are presented in Table 3-1. The sediment sample designations and QA/QC samples are listed in Table 3-7. The sediment sampling locations were determined in the field, based on drainage pathways and actual field observations.

Sample Collection. Sediment samples were collected in accordance with the procedures outlined in Section 4.9.1.2 of the SAP (IT, 2000a). The sediment samples were collected with a stainless-steel spoon and placed in a stainless-steel bowl. Samples for VOC analysis were then immediately collected from the stainless-steel bowl with three EnCore samplers. The remaining portion of the sample was homogenized and placed in the appropriate sample containers. Sample collection logs are included in Appendix B. The sediment samples were analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.4.

3.3 Surveying of Sample Locations

Sample locations were surveyed using global positioning system 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, 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix E.

3.4 Analytical Program

Samples collected during the SI were analyzed for various physical and chemical properties. The specific suite of analyses performed is based on the potential site-specific chemicals historically at the site and EPA, ADEM, FTMC, and USACE requirements. Samples collected from the Ground Scar with Trenches at Driving Course, Parcel 200(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
- Nitroexplosives - EPA Method 8330
- Total Organic Carbon - EPA Method 9060 (sediment only)
- Grain size - American Society for Testing and Materials D421/D422 (sediment only).

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 data is included in Appendix F. The Data Validation Summary Report is included as Appendix G.

3.5 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 for the analyses required in this SI are listed in Section 5.0, Table 5-1, of Appendix B of the SAP (IT, 2000a). Sample documentation and chain-of-custody records 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 USACE South Atlantic Division Laboratory in Marietta, Georgia.

3.6 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 Ground Scar with Trenches at Driving Course, Parcel 200(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 roll-off bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analysis. Based on the results, drill cuttings and personal protective equipment generated during the SI at the Ground Scar with Trenches at Driving Course, Parcel 200(7), 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 wash rack. 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.

3.7 Variances/Nonconformances

There were not any variances or nonconformances to the SFSP recorded during the completion of the SI at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

3.8 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 installation-wide 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 3.7, there were not any variances or nonconformances to the SFSP recorded.

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 discusses 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 comparisons to the SSSLs and ESVs developed by IT. Rejected data (assigned an "R" qualifier) were not used in the comparisons to SSSLs and ESVs. The data presented in this report, except where qualified, meet the principle data quality objective for this SI.

4.0 Site Characterization

IT utilized the results of the geophysical survey to aid in the placement of subsurface soil and groundwater sampling locations. Subsurface investigations performed at the Ground Scar with Trenches at Driving Course, Parcel 200(7), provided soil, geologic, and groundwater data. These data were used to characterize the geology and hydrogeology of the site.

4.1 Results of Geophysical Survey

The geophysical survey results indicated that anomalies at the Ground Scar with Trenches site (Parcel 200[7]) were caused by surface metal and cultural features. The geophysical data did not indicate the presence of trenches. The geophysical interpretation map of the site (Figure 4-1) contains detailed information on permanent site reference features as well as civil survey coordinates to aid in relocating the survey area.

A more 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 imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock

units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992), and vary in age from Lower Cambrian to Pennsylvanian.

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

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

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

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

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped 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 that makes up the Eden thrust sheet is exposed at FTMC through an eroded "window," or "fenster," in the overlying thrust sheet. Rocks within the window display complex folding, with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation, north by the Conasauga Formation, northeast, east, and southwest by the Shady Dolomite, and southeast and southwest by the Chilhowee Group (Osborne et al., 1997).

4.2.2 Site Geology

Soil type at the Ground Scar with Trenches at Driving Course, Parcel 200(7), is classified as Anniston and Allen Gravelly Loam (AcC2 and AcD2). These soils consist of well-drained stony loam or stony clay loam over stratified local alluvium with limestone or shale bedrock. The soils are deep, friable, well drained, medium to strongly acidic soils that have developed in old

alluvium on foot slopes and fans along the bases of mountains. The alluvium typically ranges in thickness from 2 feet to 8 feet. The color of the surface soil ranges from very dark brown to reddish-brown and dark reddish-brown. These soils are suitable for cultivation, but erosion is a risk because of the slopes. Severely eroded benches and shallow gullies are common in most areas. The soils are moderately permeable to roots and water. Infiltration is slow to moderate; capacity to hold moisture is moderate to low.

The Ground Scar with Trenches at Driving Course, Parcel 200(7), is situated in the southeastern portion of the Ordovician window in the uppermost thrust sheet. Bedrock beneath the site is mapped as Mississippian/Ordovician Floyd and Athens Shale, undifferentiated.

Based on direct-push and hollow-stem auger boring data collected during the SI, residuum beneath the Ground Scar with Trenches at Driving Course, Parcel 200(7), consists of predominantly silts and clays overlying weathered shale. The weathered shale is encountered at depths ranging from 15 to 35 feet bgs at the Ground Scar with Trenches at Driving Course, Parcel 200(7). The contact between the residuum and the weathered shale is generally gradual. Hard, competent shale was not encountered in the borings installed at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

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. 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.

Southwest of the parcel, Ingram Creek (a major tributary of Cane Creek) flows to the west-northwest. A small tributary flows along the south side of the driving course to the west, where it joins Ingram Creek. The land surface of the site slopes to the west toward Ingram Creek. Surface water runoff in the vicinity of the site is directed to Ingram Creek by topography and storm drains. A man-made drainage ditch runs from the northwest to the southeast and drains surface water runoff from the site.

4.3.2 Hydrogeology

During boring and well installation activities, groundwater was generally encountered in the residuum directly above the weathered shale or in fracture zones within the weathered shale at depths ranging from 15 to 36 feet bgs. Static groundwater levels were measured in the temporary wells on March 13, 2000, as summarized on Table 3-4. Groundwater elevations were calculated by measuring the depth to groundwater relative to the surveyed top-of-casing elevations. A groundwater elevation map constructed from March 2000 data is shown on Figure 4-2. This figure shows the potentiometric surface generally mimicking the land surface. Groundwater flow at the site is to the west-southwest with a hydraulic gradient of approximately 0.17 feet/foot and to the southeast with a hydraulic gradient of approximately 0.03 feet/foot.

Static groundwater levels summarized in Table 3-4 range from 3 feet below to 17 feet above the depth to water data from the boring logs (Appendix C). This indicates that the groundwater has an upward vertical hydraulic head and is under semiconfined conditions.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7), indicate that metals, VOCs, SVOCs, PCBs, chlorinated pesticides, and chlorinated herbicides have been detected in the various site media. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed 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 background metals 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 H. Additionally, SVOC concentrations in surface soils that exceeded the SSSLs and ESVs were compared to PAH background screening values, where available. The PAH background screening values were derived from PAH analytical data from 18 parcels at FTMC that were determined to represent anthropogenic activity (IT, 2000b). PAH background screening values were developed for two categories of surface soils: beneath asphalt and adjacent to asphalt. The PAH background screening values for soils adjacent to asphalt are the more conservative (i.e., lower) of the PAH background values and are the values used herein for comparison.

Six compounds were quantified by both SW-846 Method 8260B (as VOC) and Method 8270C (as SVOC), namely, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobutadiene, and naphthalene. Method 8260B yields a reporting limit of 0.005 milligrams per kilogram (mg/kg), while Method 8270C has a reporting limit of 0.330 mg/kg, which is typical for a soil matrix sample. Because of the direct nature of the Method 8260B analysis and its resulting lower reporting limit, 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 5-5 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix E.

5.1 Surface and Depositional Soil Analytical Results

Four surface soil samples and three depositional soil samples were collected for chemical analysis at the Ground Scar with Trenches at Driving Course, Parcel 200(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 background screening values, as presented in Table 5-1.

Metals. Twenty metals were detected in surface and depositional soil samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7). With the exception of one thallium result (sample location PPMP-200-GP01), all of the detected metals were present in each of the samples. Seven of the sodium results and the one thallium result were flagged with a "B" data qualifier, signifying that these metals were also detected in an associated laboratory or field blank sample.

The concentrations of aluminum (samples PPMP-200-GP01, PPMP-200-GP02, and PPMP-200-GP03), arsenic (at seven locations), iron (at seven locations), and manganese (samples PPMP-200-DEP01 and PPMP-200-DEP02) exceeded residential human health SSSLs. However, all of the detected metals concentrations were within background concentrations determined by SAIC (1998) (Appendix H).

Aluminum (at seven locations), arsenic (sample PPMP-200-GP03), beryllium (sample PPMP-200-GP03), chromium (at seven locations), cobalt (sample PPMP-200-DEP01), copper (at three locations), iron (at seven locations), lead (sample PPMP-200-DEP01), manganese (at three locations), mercury (sample PPMP-200-DEP01), selenium (at five locations), vanadium (at seven locations), and zinc (at three locations) concentrations exceeded ESVs. With the exceptions of beryllium (at one location), copper (at three locations), selenium (at four locations), and zinc (at

Table 5-1

Surface and Depositional Soil Analytical Results
Ground Scar with Trenches at Driving Course, Parcel 200(7)
Fort McClellan, Calhoun County, Alabama

					Parcel:		PPMP-200			PPMP-200					PPMP-200				
					Sample Location:		PPMP-200-DEP01			PPMP-200-DEP02					PPMP-200-DEP03				
					Sample Number:		KX0016			KX0017					KX0018				
					Sample Date:		9-Mar-99			9-Mar-99					9-Mar-99				
					Sample Depth (Feet):		0- 1			0- 1					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**
PESTICIDES																			
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	ND					ND					ND				
Endosulfan II	mg/kg	NA	4.66E+01	1.19E-01	ND					3.50E-03	J				ND				
Endosulfan sulfate	mg/kg	NA	4.66E+01	3.58E-02	ND					1.90E-03	J				ND				
METALS																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	5.26E+03				YES	4.14E+03				YES	3.36E+03				YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	8.70E+00			YES		5.60E+00			YES		4.60E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	1.31E+02		YES			5.44E+01					3.31E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	8.20E-01		YES			4.80E-01	J				5.90E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	2.90E+03		YES			1.72E+03					2.43E+03		YES		
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.64E+01				YES	1.29E+01				YES	1.18E+01				YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	2.77E+01		YES		YES	5.20E+00	J				3.00E+00	J			
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	5.56E+01		YES		YES	2.00E+01		YES			8.70E+00				
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	2.80E+04			YES	YES	1.66E+04			YES	YES	1.41E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	2.00E+02		YES		YES	3.73E+01					1.79E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	6.30E+02	J				4.12E+02	J				1.88E+02	J			
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	1.55E+03			YES	YES	4.34E+02			YES	YES	7.90E+01				
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	1.10E-01		YES		YES	9.40E-02		YES			5.20E-02	B			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	1.22E+01		YES			4.70E+00	J				4.40E+00	J			
Potassium	mg/kg	8.00E+02	NA	NA	3.86E+02	J				2.75E+02	J				1.36E+02	J			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	1.60E+00		YES		YES	1.10E+00		YES		YES	7.30E-01		YES		
Sodium	mg/kg	6.34E+02	NA	NA	1.17E+02	B				8.68E+01	B				8.11E+01	B			
Thallium	mg/kg	3.43E+00	5.08E-01	1.00E+00	ND					ND					ND				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	2.79E+01				YES	2.17E+01				YES	1.85E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	2.50E+02		YES		YES	5.70E+01		YES		YES	2.52E+01				
POLYCHLORINATED BIPHENYLS																			
Aroclor 1260	mg/kg	NA	2.93E-01	2.00E-02	ND					ND					ND				
SEMIVOLATILE ORGANIC COMPOUNDS																			
2-Methylnaphthalene	mg/kg	NA	1.55E+02	NA	1.30E-01	J				ND					ND				
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	ND					ND					ND				
Di-n-octyl phthalate	mg/kg	NA	1.56E+02	7.09E+02	ND					ND					1.30E-01	J			
Phenanthrene	mg/kg	1.08E+00	2.32E+03	1.00E-01	8.70E-02	J				ND					ND				
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	9.30E-01	ND					ND					ND				
VOLATILE ORGANIC COMPOUNDS																			
Acetone	mg/kg	NA	7.76E+02	2.50E+00	1.30E-02	B				1.60E-02	J				9.80E-03	B			
Methylene chloride	mg/kg	NA	8.41E+01	2.00E+00	6.70E-03	B				5.10E-03	B				6.80E-03	B			

Table 5-1

Surface and Depositional Soil Analytical Results
Ground Scar with Trenches at Driving Course, Parcel 200(7)
Fort McClellan, Calhoun County, Alabama

					Parcel:	PPMP-200				PPMP-200					PPMP-200					PPMP-200			
					Sample Location:	PPMP-200-GP01				PPMP-200-GP02					PPMP-200-GP03					PPMP-200-GP04			
					Sample Number:	KX0001				KX0003					KX0007					KX0009			
					Sample Date:	29-Jan-99				29-Jan-99					2-Feb-99					28-Jan-99			
					Sample Depth (Feet):	0- 2				0- 2					0- 2					0- 2			
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**
PESTICIDES																							
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	ND					5.30E-04	J				ND					6.50E-04	J		
Endosulfan II	mg/kg	NA	4.66E+01	1.19E-01	ND					ND					ND					ND			
Endosulfan sulfate	mg/kg	NA	4.66E+01	3.58E-02	ND					ND					ND					ND			
METALS																							
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	8.84E+03			YES	YES	8.03E+03			YES	YES	1.03E+04			YES	YES	3.87E+03			
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	9.10E+00			YES		7.00E+00			YES		1.16E+01			YES	YES	3.40E+00			YES
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	3.42E+01					2.47E+01					3.33E+01					2.14E+01	J		
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	4.50E-01	J				6.70E-01					1.30E+00		YES		YES	2.00E-01	B		
Calcium	mg/kg	1.72E+03	NA	NA	1.99E+02	J				1.32E+03	J				6.51E+01	J				1.87E+02	J		
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.77E+01				YES	1.22E+01				YES	1.36E+01				YES	1.11E+01			
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	4.30E+00	J				2.20E+00	J				1.60E+00	J				1.60E+00	J		
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	1.88E+01		YES			4.40E+01		YES		YES	5.83E+01		YES		YES	3.80E+00			
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	3.14E+04			YES	YES	2.44E+04			YES	YES	3.31E+04			YES	YES	1.23E+04			YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.71E+01					1.77E+01					2.52E+01					5.20E+00			
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	1.71E+02	J				1.36E+02	J				1.40E+02	J				8.87E+01	J		
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	2.82E+02				YES	5.51E+01					7.70E+00					6.20E+01			
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	5.20E-02					9.00E-02		YES			9.50E-02		YES			3.80E-02	J		
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	1.38E+01		YES			4.50E+00	J				5.80E+00					1.40E+00	J		
Potassium	mg/kg	8.00E+02	NA	NA	2.72E+02	J				4.73E+02	J				8.52E+02		YES			1.16E+02	J		
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	1.80E+00		YES		YES	2.00E+00		YES		YES	3.20E+00		YES		YES	7.10E-01		YES	
Sodium	mg/kg	6.34E+02	NA	NA	8.28E+01	B				2.62E+02	B				6.99E+01	B				6.26E+01	B		
Thallium	mg/kg	3.43E+00	5.08E-01	1.00E+00	4.30E-01	B				ND					ND					ND			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	3.11E+01				YES	2.85E+01				YES	3.16E+01				YES	1.98E+01			
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	3.96E+01	J				5.04E+01	J	YES		YES	4.14E+01	J	YES			5.20E+00	J		
POLYCHLORINATED BIPHENYLS																							
Aroclor 1260	mg/kg	NA	2.93E-01	2.00E-02	ND					4.00E-02	J			YES	ND					ND			
SEMIVOLATILE ORGANIC COMPOUNDS																							
2-Methylnaphthalene	mg/kg	NA	1.55E+02	NA	ND					ND					ND					ND			
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	3.60E-02	J				ND					ND					4.30E-02	B		
Di-n-octyl phthalate	mg/kg	NA	1.56E+02	7.09E+02	ND					ND					ND					ND			
Phenanthrene	mg/kg	1.08E+00	2.32E+03	1.00E-01	ND					ND					ND					ND			
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	9.30E-01	ND					ND					6.50E-02	B				ND			
VOLATILE ORGANIC COMPOUNDS																							
Acetone	mg/kg	NA	7.76E+02	2.50E+00	ND					ND					1.10E-02	B				6.20E-02	J		
Methylene chloride	mg/kg	NA	8.41E+01	2.00E+00	5.00E-03	B				4.50E-03	B				3.40E-03	B				3.50E-03	B		

Table 5-1

Surface and Depositional Soil Analytical Results
Ground Scar with Trenches at Driving Course, Parcel 200(7)
Fort McClellan, Calhoun County, Alabama

				Parcel:	
				Sample Location:	
				Sample Number:	
				Sample Date:	
				Sample Depth (Feet):	
Parameter	**Units**	**BKG[a]**	**SSSL[b]**	**ESV[b]**	**>ESV**
PESTICIDES					
4,4'-DDT	mg/kg	NA	1.79E+00	2.50E-03	
Endosulfan II	mg/kg	NA	4.66E+01	1.19E-01	
Endosulfan sulfate	mg/kg	NA	4.66E+01	3.58E-02	
METALS					
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	
Calcium	mg/kg	1.72E+03	NA	NA	
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	
Potassium	mg/kg	8.00E+02	NA	NA	
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	
Sodium	mg/kg	6.34E+02	NA	NA	
Thallium	mg/kg	3.43E+00	5.08E-01	1.00E+00	
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	
POLYCHLORINATED BIPHENYLS					
Aroclor 1260	mg/kg	NA	2.93E-01	2.00E-02	
SEMIVOLATILE ORGANIC COMPOUNDS					
2-Methylnaphthalene	mg/kg	NA	1.55E+02	NA	
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	
Di-n-octyl phthalate	mg/kg	NA	1.56E+02	7.09E+02	
Phenanthrene	mg/kg	1.08E+00	2.32E+03	1.00E-01	
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	9.30E-01	
VOLATILE ORGANIC COMPOUNDS					
Acetone	mg/kg	NA	7.76E+02	2.50E+00	
Methylene chloride	mg/kg	NA	8.41E+01	2.00E+00	

Table 5-1

Surface and Depositional Soil Analytical Results
Ground Scar with Trenches at Driving Course, Parcel 200(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 back metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama,* July. For SVOCs, value listed is the background screening criterion for soils adjacent to asphalt 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] 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 method detection limit but less than or equal to reporting limit.
mg/kg - Milligrams per kilogram.
NA - Not available.
ND - Not detected.
Qual - Data validation qualifier.

Table 5-2

Subsurface Soil Analytical Results
Ground Scar with Trenches at Driving Course, Parcel 200(7)
Fort McClellan, Calhoun County, Alabama

				Parcel:	PPMP-200			PPMP-200				PPMP-200			
				Sample Location:	PPMP-200-GP01			PPMP-200-GP02				PPMP-200-GP03			
				Sample Number:	KX0002			KX0006				KX0008			
				Sample Date:	29-Jan-99			29-Jan-99				2-Feb-99			
				Sample Depth (Feet):	10-12			10-12				10-12			
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	9.11E+03			YES	9.46E+03			YES	1.06E+04			YES
Arsenic	mg/kg	1.83E+01	4.26E-01	1.42E+01			YES	8.60E+00			YES	9.20E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	5.11E+01				4.50E+01				5.86E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	1.50E+00		YES		1.50E+00		YES		1.60E+00		YES	
Calcium	mg/kg	6.37E+02	NA	1.79E+02	J			3.37E+02	J			6.34E+01	J		
Chromium	mg/kg	3.83E+01	2.32E+01	1.40E+01				1.31E+01				1.34E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	2.05E+01		YES		4.60E+00	J			1.37E+01			
Copper	mg/kg	1.94E+01	3.13E+02	2.21E+01		YES		6.38E+01		YES		7.44E+01		YES	
Iron	mg/kg	4.48E+04	2.34E+03	4.31E+04			YES	3.02E+04			YES	2.64E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	2.42E+01				2.46E+01				1.94E+01			
Magnesium	mg/kg	7.66E+02	NA	1.76E+02	J			2.47E+02	J			2.50E+03		YES	
Manganese	mg/kg	1.36E+03	3.63E+02	9.76E+02			YES	3.18E+01				9.51E+01			
Mercury	mg/kg	7.00E-02	2.33E+00	7.00E-02		YES		8.90E-02		YES		1.10E-01		YES	
Nickel	mg/kg	1.29E+01	1.54E+02	3.60E+01		YES		1.03E+01				1.21E+01			
Potassium	mg/kg	7.11E+02	NA	2.39E+02	J			4.15E+02	J			5.94E+02			
Selenium	mg/kg	4.70E-01	3.91E+01	1.70E+00		YES		2.10E+00		YES		2.20E+00		YES	
Sodium	mg/kg	7.02E+02	NA	8.10E+01	B			3.57E+02	J			7.18E+01	B		
Thallium	mg/kg	1.40E+00	5.08E-01	ND				4.40E-01	B			6.40E-01	J		YES
Vanadium	mg/kg	6.49E+01	5.31E+01	2.29E+01				3.43E+01				3.10E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	7.33E+01	J	YES		3.93E+01	J	YES		7.76E+01	J	YES	
SEMIVOLATILE ORGANIC COMPOUNDS															
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	ND				ND				ND			
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	ND				ND				8.00E-02	B		
VOLATILE ORGANIC COMPOUNDS															
Acetone	mg/kg	NA	7.76E+02	ND				1.00E-02	J			1.30E-02	B		
Methylene chloride	mg/kg	NA	8.41E+01	5.30E-03	B			4.20E-03	B			4.10E-03	B		

Table 5-2

Subsurface Soil Analytical Results
Ground Scar with Trenches at Driving Course, Parcel 200(7)
Fort McClellan, Calhoun County, Alabama

				Parcel:	PPMP-200			PPMP-200				PPMP-200			
				Sample Location:	PPMP-200-GP04			PPMP-200-GP05				PPMP-200-GP06			
				Sample Number:	KX0010			KX0011				KX0014			
				Sample Date:	28-Jan-99			3-Feb-99				3-Feb-99			
				Sample Depth (Feet):	10-12			9-12				2-5			
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	6.56E+03				1.14E+04			YES	7.29E+03			
Arsenic	mg/kg	1.83E+01	4.26E-01	8.00E+00			YES	1.84E+01		YES	YES	1.04E+01			YES
Barium	mg/kg	2.34E+02	5.47E+02	1.88E+01	J			2.17E+01	J			1.71E+01	J		
Beryllium	mg/kg	8.60E-01	9.60E+00	2.60E-01	B			7.40E-01				2.30E-01	B		
Calcium	mg/kg	6.37E+02	NA	4.94E+01	J			ND				3.00E+02	J		
Chromium	mg/kg	3.83E+01	2.32E+01	1.42E+01				1.66E+01				3.73E+01			YES
Cobalt	mg/kg	1.75E+01	4.68E+02	2.30E+00	J			3.30E+00	J			1.50E+00	J		
Copper	mg/kg	1.94E+01	3.13E+02	1.14E+01				2.64E+01		YES		1.36E+01			
Iron	mg/kg	4.48E+04	2.34E+03	2.54E+04			YES	6.42E+04		YES	YES	3.89E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.18E+01				2.49E+01				1.04E+01			
Magnesium	mg/kg	7.66E+02	NA	8.92E+01	J			1.58E+02	J			1.27E+02	J		
Manganese	mg/kg	1.36E+03	3.63E+02	4.63E+01				1.39E+02				5.66E+01	J		
Mercury	mg/kg	7.00E-02	2.33E+00	5.10E-02				6.20E-02				4.90E-02			
Nickel	mg/kg	1.29E+01	1.54E+02	5.00E+00	J			2.28E+01		YES		2.90E+00	J		
Potassium	mg/kg	7.11E+02	NA	2.59E+02	J			3.08E+02	J			2.64E+02	J		
Selenium	mg/kg	4.70E-01	3.91E+01	1.20E+00		YES		3.10E+00		YES		2.20E+00		YES	
Sodium	mg/kg	7.02E+02	NA	7.19E+01	B			7.50E+01	B			7.09E+01	B		
Thallium	mg/kg	1.40E+00	5.08E-01	4.90E-01	B			ND				5.10E-01	J		YES
Vanadium	mg/kg	6.49E+01	5.31E+01	3.44E+01				3.84E+01				5.55E+01			YES
Zinc	mg/kg	3.49E+01	2.34E+03	1.46E+01	J			6.36E+01	J	YES		8.70E+00	J		
SEMIVOLATILE ORGANIC COMPOUNDS															
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	ND				5.20E-02	B			1.50E-01	B		
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	ND				5.90E-02	B			1.20E-01	B		
VOLATILE ORGANIC COMPOUNDS															
Acetone	mg/kg	NA	7.76E+02	1.90E-02	J			9.20E-03	B			2.00E-02	B		
Methylene chloride	mg/kg	NA	8.41E+01	3.80E-03	B			3.80E-03	B			3.70E-03	B		

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 method detection limit but less than or equal to reporting limit.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-3

Groundwater Analytical Results
Ground Scar with Trenches at Driving Course, Parcel 200(7)
Fort McClellan, Calhoun County, Alabama

				Parcel:	PPMP-200				PPMP-200				PPMP-200				PPMP-200			
				Sample Location:	PPMP-200-GP01				PPMP-200-GP02				PPMP-200-GP03				PPMP-200-GP04			
				Sample Number:	KX3001				KX3002				KX3005				KX3006			
				Sample Date:	5-Apr-99				6-Apr-99				5-Apr-99				6-Apr-99			
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/L	2.34E+00	1.56E+00		3.55E-02	B			3.03E-01	B			2.04E+01		YES	YES	4.55E-02	B		
Arsenic	mg/L	1.78E-02	4.00E-05		ND				ND				6.40E-03	B		YES	ND			
Barium	mg/L	1.27E-01	1.10E-01		4.84E-02	J			7.18E-02	J			3.03E-01		YES	YES	2.26E-01		YES	YES
Beryllium	mg/L	1.24E-03	3.12E-03		ND				ND				2.00E-03	B	YES		ND			
Calcium	mg/L	5.65E+01	NA		6.80E+01		YES		1.61E+01				1.67E+01				2.23E+01			
Chromium	mg/L	NA	4.69E-03		ND				ND				3.50E-02			YES	ND			
Cobalt	mg/L	2.34E-02	9.39E-02		ND				ND				6.04E-02		YES		ND			
Copper	mg/L	2.55E-02	6.26E-02		ND				ND				5.40E-02		YES		ND			
Iron	mg/L	7.04E+00	4.69E-01		ND				2.72E-01	B			2.58E+01		YES	YES	1.20E-01	B		
Lead	mg/L	7.99E-03	1.50E-02		ND				ND				1.90E-02		YES	YES	ND			
Magnesium	mg/L	2.13E+01	NA		7.06E+00				5.51E+00				2.10E+01				9.00E+00			
Manganese	mg/L	5.81E-01	7.35E-02		2.60E-03	J			4.60E-03	J			1.38E+00		YES	YES	5.37E-01			YES
Mercury	mg/L	NA	4.60E-04		ND				5.50E-05	B			1.20E-04	B			4.60E-05	B		
Nickel	mg/L	NA	3.13E-02		ND				ND				7.30E-02			YES	ND			
Potassium	mg/L	7.20E+00	NA		7.94E-01	J			9.11E-01	J			6.44E+00				ND			
Sodium	mg/L	1.48E+01	NA		4.35E+00	B			1.84E+00	B			9.80E+00				2.74E+00	B		
Thallium	mg/L	1.45E-03	1.00E-04		5.30E-03	B	YES	YES	4.20E-03	B	YES	YES	5.40E-03	B	YES	YES	4.30E-03	B	YES	YES
Vanadium	mg/L	1.70E-02	1.10E-02		ND				ND				4.50E-02	J	YES	YES	ND			
Zinc	mg/L	2.20E-01	4.69E-01		ND				1.34E-02	J			1.29E-01				1.05E-02	J		
SEMIVOLATILE ORGANIC COMPOUNDS																				
bis(2-Ethylhexyl)phthalate	mg/L	NA	4.30E-03		ND				ND				2.50E-03	B			ND			
VOLATILE ORGANIC COMPOUNDS																				
1,2,4-Trimethylbenzene	mg/L	NA	6.00E-03		ND				9.80E-04	J			ND				1.10E-03	B		
1,3,5-Trimethylbenzene	mg/L	NA	6.00E-03		ND				3.20E-04	J			ND				3.10E-04	B		
Bromomethane	mg/L	NA	2.17E-03		1.00E-04	B			ND				ND				ND			
n-Propylbenzene	mg/L	NA	1.30E-02		ND				1.90E-04	J			ND				1.50E-04	B		
o-Chlorotoluene	mg/L	NA	2.82E-02		ND				1.20E-04	J			ND				ND			
p-Cymene	mg/L	NA	2.26E-01		ND				ND				ND				1.20E-04	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 method detection limit but less than or equal to reporting limit.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-4

Surface Water Analytical Results
Ground Scar with Trenches at Driving Course, Parcel 200(7)
Fort McClellan, Calhoun County, Alabama

					Parcel:		PPMP-200					PPMP-200			
					Sample Location:		PPMP-200-SW/SD01					PPMP-200-SW/SD02			
					Sample Number:		KX1001					KX1002			
					Sample Date:		26-Jan-99					25-Jan-99			
Parameter	**Units**	**BKG[a]**	**SSSL[b]**	**ESV[b]**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**
METALS														
Aluminum	mg/L	5.26E+00	1.53E+01	8.70E-02	1.11E+00				YES	1.04E+00	J			YES
Barium	mg/L	7.53E-02	1.10E+00	3.90E-03	4.97E-02	J			YES	5.90E-02	J			YES
Beryllium	mg/L	3.00E-04	1.75E-02	5.30E-04	1.20E-04	B				ND				
Calcium	mg/L	2.52E+01	NA	1.16E+02	3.53E+01		YES			3.52E+01	J	YES		
Chromium	mg/L	1.11E-02	4.08E-02	1.10E-02	1.30E-03	J				1.00E-03	J			
Iron	mg/L	1.96E+01	4.70E+00	1.00E+00	1.18E+00				YES	1.10E+00	J			YES
Lead	mg/L	8.60E-03	1.50E-02	1.32E-03	3.90E-03				YES	2.80E-03	J			YES
Magnesium	mg/L	1.10E+01	NA	8.20E+01	5.36E+00					7.11E+00	J			
Manganese	mg/L	5.65E-01	6.40E-01	8.00E-02	8.70E-03	J				7.90E-03	J			
Potassium	mg/L	2.56E+00	NA	5.30E+01	4.14E-01	B				6.12E-01	B			
Sodium	mg/L	3.44E+00	NA	6.80E+02	1.17E+00	J				1.28E+00	J			
Zinc	mg/L	4.03E-02	4.65E+00	5.89E-02	9.60E-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] Recreational site user site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

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

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

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-5

Sediment Analytical Results
Ground Scar with Trenches at Driving Course, Parcel 200(7)
Fort McClellan, Calhoun County, Alabama

					Parcel:		PPMP-200					PPMP-200		
					Sample Location:		PPMP-200-SW/SD01					PPMP-200-SW/SD02		
					Sample Number:		KX2001					KX2002		
					Sample Date:		26-Jan-99					25-Jan-99		
					Sample Depth (Feet):		0- .5					0- .5		
Parameter	**Units**	**BKG[a]**	**SSSL[b]**	**ESV[b]**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**
HERBICIDES														
2,2-Dichloropropanoic Acid	mg/kg	NA	2.99E+04	NA	ND					2.70E+00				
METALS														
Aluminum	mg/kg	8.59E+03	1.15E+06	NA	5.68E+03	J				7.55E+03	J			
Antimony	mg/kg	7.30E-01	4.22E+02	1.20E+01	4.50E-01	J				9.80E-01	J	YES		
Arsenic	mg/kg	1.13E+01	5.58E+01	7.24E+00	9.00E+00				YES	2.64E+01		YES		YES
Barium	mg/kg	9.89E+01	8.36E+04	NA	5.75E+01					1.08E+02		YES		
Beryllium	mg/kg	9.70E-01	1.50E+02	NA	7.70E-01					1.60E+00		YES		
Cadmium	mg/kg	4.30E-01	1.71E+02	1.00E+00	1.10E-01	J				4.00E-01	J			
Calcium	mg/kg	1.11E+03	NA	NA	7.63E+03		YES			2.30E+03		YES		
Chromium	mg/kg	3.12E+01	2.79E+03	5.23E+01	1.63E+01	J				4.40E+01	J	YES		
Cobalt	mg/kg	1.10E+01	6.72E+04	5.00E+01	7.90E+00					2.43E+01		YES		
Copper	mg/kg	1.71E+01	4.74E+04	1.87E+01	1.11E+01					1.45E+01				
Iron	mg/kg	3.53E+04	3.59E+05	NA	2.55E+04	J				6.78E+04	J	YES		
Lead	mg/kg	3.78E+01	4.00E+02	3.02E+01	2.75E+01	J				4.56E+01	J	YES		YES
Magnesium	mg/kg	9.06E+02	NA	NA	2.56E+03	J	YES			1.11E+03	J	YES		
Manganese	mg/kg	7.12E+02	4.38E+04	NA	3.31E+02	J				1.27E+03	J	YES		
Mercury	mg/kg	1.10E-01	2.99E+02	1.30E-01	5.00E-02	J				ND				
Nickel	mg/kg	1.30E+01	1.76E+04	1.59E+01	6.00E+00					1.48E+01		YES		
Potassium	mg/kg	1.01E+03	NA	NA	4.93E+02	J				2.79E+02	J			
Selenium	mg/kg	7.20E-01	5.96E+03	NA	7.80E-01		YES			1.30E+00		YES		
Sodium	mg/kg	6.92E+02	NA	NA	5.23E+01	B				2.70E+01	B			
Thallium	mg/kg	1.30E-01	7.78E+01	NA	ND					6.50E-01	B	YES		
Vanadium	mg/kg	4.09E+01	4.83E+03	NA	2.92E+01	J				7.52E+01	J	YES		
Zinc	mg/kg	5.27E+01	3.44E+05	1.24E+02	4.25E+01	J				8.14E+01	J	YES		
SEMIVOLATILE ORGANIC COMPOUNDS														
Benzo(a)anthracene	mg/kg	NA	8.93E+01	3.30E-01	6.30E-02	J				8.70E-02	J			
Benzo(a)pyrene	mg/kg	NA	8.93E+00	3.30E-01	8.00E-02	J				1.10E-01	J			
Benzo(b)fluoranthene	mg/kg	NA	8.93E+01	6.55E-01	1.10E-01	J				1.40E-01	J			
Benzo(ghi)perylene	mg/kg	NA	2.79E+04	6.55E-01	7.40E-02	J				1.10E-01	J			
Benzo(k)fluoranthene	mg/kg	NA	8.93E+02	6.55E-01	ND					5.60E-02	J			
Chrysene	mg/kg	NA	9.79E+03	3.30E-01	6.40E-02	J				9.00E-02	J			
Fluoranthene	mg/kg	NA	3.73E+04	3.30E-01	1.00E-01	J				1.40E-01	J			
Indeno(1,2,3-cd)pyrene	mg/kg	NA	8.93E+01	6.55E-01	ND					8.50E-02	J			
Phenanthrene	mg/kg	NA	2.79E+05	3.30E-01	ND					6.10E-02	J			
Pyrene	mg/kg	NA	3.06E+04	3.30E-01	7.60E-02	J				1.00E-01	J			
TOTAL ORGANIC CARBON														
Total Organic Carbon	mg/kg	NA	NA	NA	7.43E+03					4.80E+03				
VOLATILE ORGANIC COMPOUNDS														
Methylene chloride	mg/kg	NA	9.84E+03	1.26E+00	2.60E-03	B				7.70E-03	B			

Table 5-5

Sediment Analytical Results
Ground Scar with Trenches at Driving Course, Parcel 200(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] Recreational site user site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).
J - Result is greater than method detection limit but less than or equal to reporting limit.
mg/kg - Milligrams per kilogram.
NA - Not available.
ND - Not detected.
Qual - Data validation qualifier.

one location), the concentrations of these metals were within background concentrations or the range of background values.

Volatile Organic Compounds. Two VOCs were detected in surface and depositional soil samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7). The methylene chloride results and three of the acetone results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. None of the detected VOCs was present at a concentration exceeding residential human health SSSLs or ESVs.

Semivolatile Organic Compounds. Five SVOCs were detected in surface and depositional soil samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7). SVOCs were not detected in the soils collected from sample locations PPMP-200-DEP02 and PPMP-200-GP02. None of the detected SVOCs was present at a concentration exceeding residential human health SSSLs or ESVs.

Polychlorinated Biphenyls. Aroclor 1260 was detected in the sample from location PPMP-200-GP02 at a concentration of 0.04 mg/kg, exceeding the ESV (0.02 mg/kg) but below the residential human health SSSL.

Pesticides and Herbicides. Three chlorinated pesticides, 4,4'-DDT, Endosulfan II, and Endosulfan sulfate, were detected in two surface soil samples (PPMP-200-GP02, PPMP-200-GP04) and one depositional soil sample (PPMP-200-DEP02) collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7). However, none of these pesticides were detected at concentrations exceeding SSSLs or ESVs. Chlorinated herbicides and organophosphorus pesticides were not detected in the surface and depositional soil samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

Nitroexplosives. Nitroexplosives were not detected in surface and depositional soil samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

5.2 Subsurface Soil Analytical Results

Six subsurface soil samples were collected for chemical analysis at the Ground Scar with Trenches at Driving Course, Parcel 200(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 background screening values, as presented in Table 5-2.

Metals. Twenty metals were detected in subsurface soil samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7). The concentrations of seven metals (aluminum, arsenic, chromium, iron, manganese, thallium, and vanadium) exceeded residential human health SSSLs. However, with the exceptions of arsenic (sample PPMP-200-GP05) and iron (sample PPMP-200-GP05), the concentrations of these metals were less than their background screening values. The arsenic concentrations were within the range of background values (Appendix H).

Volatile Organic Compounds. The VOCs acetone and methylene chloride were detected in subsurface soil samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7). The methylene chloride analytical results and three of the acetone results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. None of the detected VOCs were present at a concentration exceeding residential human health SSSLs.

Semivolatile Organic Compounds. The SVOCs di-n-butyl phthalate and bis(2-ethylhexyl)phthalate were detected in subsurface soil samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7). SVOCs were not detected at three sample locations (PPMP-200-GP01, PPMP-200-GP02, and PPMP-200-GP04). The di-n-butyl phthalate and bis(2-ethylhexyl)phthalate analytical results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. None of the detected SVOCs was present at a concentration exceeding residential human health SSSLs.

Polychlorinated Biphenyls. PCBs were not detected in the subsurface soil samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

Pesticides and Herbicides. Chlorinated pesticides, chlorinated herbicides, and organophosphorus pesticides were not detected in the subsurface soil samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

Nitroexplosives. Nitroexplosives were not detected in the subsurface soil samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

5.3 Groundwater Analytical Results

Four temporary monitoring wells were sampled at the Ground Scar with Trenches at Driving Course, Parcel 200(7), at the sample locations shown on Figure 3-2. Analytical results were compared to residential human health SSSLs and background screening values, as presented in Table 5-3.

Metals. Nineteen metals (aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, sodium, thallium, vanadium, and zinc) were detected in groundwater samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7). Sample location PPMP-200-GP03 contained all of the detected metals, while PPMP-200-GP01, PPMP-200-GP02, and PPMP-200-GP04 each contained eight, eleven, and ten of the nineteen detected metals, respectively.

The concentrations of ten metals (aluminum, arsenic, barium, chromium, iron, lead, manganese, nickel, thallium, and vanadium) exceeded residential human health SSSLs in the groundwater samples. However, with the exceptions of aluminum, thallium, and vanadium (all in sample PPMP-200-GP03), the concentrations of these metals were below their background concentrations or within the range of background values (Appendix H). As shown on Table 3-6 and in the purge records in Appendix B, the sample collected from PPMP-200-GP03 had elevated high turbidity 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 purging and sampling technique to reduce turbidity to less than 10 NTUs. The resampling effort demonstrated that the concentrations of most metals in the lower turbidity samples were significantly lower than in the higher turbidity samples (IT, 2000c) (Appendix I). Consequently, the elevated metal results in PPMP-200-GP03 are likely the result of high turbidity.

Volatile Organic Compounds. Six VOCs (1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, bromomethane, n-propylbenzene, o-chlorotoluene, and p-cymene) were detected in groundwater samples. The bromomethane results and one each of the 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and n-propylbenzene results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. VOC concentrations were below residential human health SSSLs.

Semivolatile Organic Compounds. Bis(2-ethylhexyl)phthalate was detected in one of the

groundwater samples (PPMP-200-GP03). The bis(2-ethylhexyl)phthalate results were flagged with a "B" data qualifier, signifying that this compound was also detected in an associated laboratory or field blank sample. The bis(2-ethylhexyl)phthalate concentration was below the residential human health SSSL.

Polychlorinated Biphenyls. PCBs were not detected in groundwater samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

Pesticides and Herbicides. Chlorinated pesticides, chlorinated herbicides, and organophosphorus pesticides were not detected in groundwater samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

Nitroexplosives. Nitroexplosives were not detected in groundwater samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

5.4 Surface Water Analytical Results

Two surface water samples were collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7), at the sample locations shown on Figure 3-2. Analytical results were compared to recreational site-user human health SSSLs, ESVs, and background concentrations, as presented in Table 5-4.

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Metals. Twelve metals were detected in surface water samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

None of the detected metals concentrations exceeded residential human health SSSLs. Aluminum, barium, iron, and lead concentrations exceeded ESVs in each surface water sample, but were within background concentrations.

Volatile Organic Compounds. VOCs were not detected in the surface water samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

Semivolatile Organic Compounds. SVOCs were not detected in the surface water samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

Polychlorinated Biphenyls. PCBs were not detected in the surface water samples collected

at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

Pesticides and Herbicides. Chlorinated pesticides, chlorinated herbicides, and organophosphorus pesticides were not detected in the surface water samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

Nitroexplosives. Nitroexplosives were not detected in the surface water samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

5.5 Sediment Analytical Results

Two sediment samples were collected for chemical analysis at the Ground Scar with Trenches at Driving Course, Parcel 200(7), at the locations shown on Figure 3-2. Analytical results were compared to recreational site-user human health SSSLs, ESVs, and background concentrations, as presented in Table 5-5.

Metals. Twenty-two metals were detected in sediment samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7). The two samples collected each contained 21 of the detected metals. None of the metals was detected at a concentration exceeding recreational site-user human health SSSLs. Arsenic (both locations) and lead (sample PPMP-200-SW/SD02) concentrations exceeded ESVs. However, with the exception of arsenic (sample PPMP-200-SW/SD02), the concentrations of these metals were within background concentrations or the range of background values.

Volatile Organic Compounds. Methylene chloride was detected in sediment samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7). The methylene chloride analytical results were flagged with a "B" data qualifier, signifying that this compound was also detected in an associated laboratory or field blank sample. The methylene chloride concentrations were below SSSLs and ESVs.

Semivolatile Organic Compounds. Ten PAH compounds (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phananthrene, and pyrene) were detected in sediment samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7). Sample location PPMP-200-SW/SD02 contained all ten of the detected PAHs. Sample PPMP-200-SW/SD01 contained seven of the ten detected PAHs. None of the detected PAHs were present at

a concentration exceeding SSSLs or ESVs.

Polychlorinated Biphenyls. PCBs were not detected in the sediment samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

Pesticides and Herbicides. 2,2-Dichloropropanoic acid, a chlorinated herbicide, was detected at sample location PPMP-200-SW/SD02 at a concentration below the SSSL. Chlorinated pesticides and organophosphorus pesticides were not detected in the sediment samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

Nitroexplosives. Nitroexplosives were not detected in the sediment samples collected at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

TOC. The sediment samples were analyzed for TOC content. TOC concentrations ranged from 4,800 mg/kg to 7,430 mg/kg. The TOC results are summarized in Appendix F.

Grain Size. The results of grain size analysis for sediment sample are included in Appendix F.

6.0 Summary and Conclusions and Recommendations

IT, under contract with USACE, completed an SI at the Ground Scar with Trenches at Driving Course, Parcel 200(7), at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the Ground Scar with Trenches at Driving Course, Parcel 200(7) and, if present, whether the concentrations present an unacceptable risk to human health or the environment. The SI at the Ground Scar with Trenches at Driving Course, Parcel 200(7), consisted of a geophysical survey and the sampling and analysis of four surface soil samples, six subsurface soil samples, four groundwater samples, three depositional soil samples, two surface water samples, and two sediment samples. In addition, four temporary 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 indicated that anomalies at the Ground Scar with Trenches at Driving Course, Parcel 200(7), were caused by surface metal and cultural features. The geophysical data did not indicate the presence of trenches.

The analytical results indicated that metals, VOCs, SVOCs, PCBs, chlorinated pesticides, and chlorinated herbicides were detected in the environmental media sampled. To evaluate whether the detected constituents present are an unacceptable risk to human health or the environment, the analytical results were compared to human health SSSLs, ESVs, and background screening values. 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. Additionally, metals results exceeding the SSSLs and ESVs were compared to media-specific background concentrations (SAIC, 1998), and SVOC concentrations exceeding SSSLs and ESVs in surface and depositional soils were compared to PAH background screening values (IT, 2000b). The results are summarized below.

The potential impact to human receptors is expected to be minimal. The metals that exceeded residential human health SSSLs, with a few exceptions, were within background concentrations or the range of background values, and thus, do not pose an unacceptable risk to future human receptors. Although the site is projected for active recreational use, screening against the more conservative residential human health SSSLs indicates the potential threat to human health to be very low in the residential scenario.

Several metals were detected in site media at concentrations exceeding ESVs and background concentrations. In addition, the concentration of one PCB (Aroclor 1260) marginally exceeded the ESV at one sampling location (0.04 mg/kg and 0.02 mg/kg, respectively). However, the potential impact to ecological receptors is expected to be minimal. The site is in a well-developed area consisting of buildings and paved roads. Consequently, the threat to potential ecological receptors is expected to be low.

Based on the results of the SI, past operations at the Ground Scar with Trenches at Driving Course, Parcel 200(7), do not appear to have adversely impacted the environment. The metals and organic compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, IT recommends "No Further Action" and unrestricted land reuse at the Ground Scar with Trenches at Driving Course, Parcel 200(7).

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ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

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 F

SUMMARY OF VALIDATED ANALYTICAL DATA

APPENDIX G

DATA VALIDATION SUMMARY REPORT

APPENDIX H

SUMMARY STATISTICS FOR BACKGROUND MEDIA, FORT McCLELLAN, ALABAMA

APPENDIX I

GROUNDWATER RESAMPLING RESULTS, LETTER REPORT