Final

Site Investigation Report
Ground Scar at South End of Confidence Course, Parcel 158(7)

Fort McClellan
Calhoun County, Alabama

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK08, IT Corporation (IT) completed a site investigation (SI) at the Ground Scar at South End of Confidence Course, Parcel 158(7), at Fort McClellan in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site and, if present, whether the concentrations present an unacceptable risk to human health or the environment. The SI at the Ground Scar at South End of Confidence Course, Parcel 158(7), consisted of the sampling and analysis of five surface soil samples and two subsurface soil samples. In addition, three permanent 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. However, groundwater was not present at the site and no groundwater samples were collected. As part of this SI, IT incorporated data previously collected by QST Environmental, Inc. at the Ground Scar at South End of Confidence Course, Parcel 158(7).

The analytical results indicate that metals, volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and pesticides 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 Fort McClellan.

The potential threat to human receptors is expected to be low. Although the site is projected for reuse as a mixed business area, the analytical data were screened against residential human health SSSLs to evaluate the site for unrestricted land reuse. With the exception of iron in one subsurface soil sample the metals concentrations that exceeded SSSLs were below their respective background concentrations or were within the range of background values. The polynuclear aromatic hydrocarbon (PAH) compound benzo(a)pyrene exceeded its SSSL in one surface soil sample. VOC and pesticide concentrations were below SSSLs.

Several metals were detected in surface soils at concentrations exceeding ESVs. However, with the exception of mercury at two locations, the metals concentrations that exceeded ESVs were below their respective background concentrations or were within the range of background values.

Two VOCs (tetrachloroethene and trichloroethene), two pesticides (4,4'-DDE and 4,4'-DDT), and three PAH compounds exceeded ESVs in surface soils. However, the levels of these chemical constituents were low (less than 0.5 mg/kg) and are not expected to pose a significant threat to ecological receptors.

Based on the results of the SI, past operations at the Ground Scar at South End of Confidence Course, Parcel 158(7), do not appear to have adversely impacted the environment. The metals and chemical 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 at South End of Confidence Course, Parcel 158(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 provide environmental services for completion of the site investigation (SI) at the Ground Scar at South End of Confidence Course, Parcel 158(7), under Contract Number DACA21-96-D-0018, Task Order CK08.

The U.S. Army Environmental Center (AEC) originally contracted QST Environmental, Inc. (QST) to perform the SI at the Ground Scar at South End of Confidence Course, Parcel 158(7). QST prepared an SI work plan (QST, 1998) and conducted field activities in May 1998. QST collected soil samples and attempted to install three temporary groundwater monitoring wells using direct-push technology (DPT). However, the DPT borings (ranging from 10 to 32 feet below ground surface [bgs]) were dry and groundwater samples were not collected. Therefore, the USACE contracted IT to install three permanent groundwater monitoring wells using hollow-stem auger drilling and to collect three groundwater samples. IT installed each of the three wells to auger refusal at depths ranging from 32 to 46 feet bgs. IT was unable to collect groundwater samples because groundwater was not encountered in the monitoring wells.

This SI report summarizes field activities, including field sampling and analysis and monitoring well installation activities, and data compiled by IT and QST for the SI conducted at the Ground Scar at South End of Confidence Course, Parcel 158(7).

1.1 Project Description

The Ground Scar at South End of Confidence Course, Parcel 158(7), was identified as an area to be investigated prior to property transfer. The site was classified as a Category 7 site in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

Field work performed by IT during the SI was conducted in accordance with the installation-wide work plan (IT, 1998) 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. Sample locations and analytical parameters were specified in the QST work plan (QST, 1998).

The SI included field work by QST to collect five surface soil samples and two subsurface soil samples to determine if potential site-specific chemicals are present at the Ground Scar at South End of Confidence Course, Parcel 158(7). Both IT and QST attempted to collect groundwater samples at the site; however, groundwater was not encountered in any of the soil borings or wells installed at the site.

1.2 Purpose and Objectives

The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at the Ground Scar at South End of Confidence Course, Parcel 158(7), at concentrations that present an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC. The SSSLs and ESVs were developed by IT as part of the human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs and ESVs are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

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

1.3 Site Description and History

The Ground Scar at South End of Confidence Course, Parcel 158(7), is located in the central portion of the FTMC Main Post, near the intersection of Blacman Road (formerly Macarthur Avenue) and Baldwin Drive (formerly 25th Street) (Figures 1-1 and 1-2). The ground scar was identified on aerial photographs taken in 1964 and 1973 as a roughly rectangular area at the south

end of the Confidence Course (QST, 1998). The ground scar measured approximately 180 feet (north-south) by 120 feet (east-west). Additional information regarding the ground scar was not available (ESE, 1998). Evidence of disposal activities was not observed by QST personnel during a site inspection (QST, 1998).

Parcel 158(7) is a rectangular area covering approximately 0.5 acres (Figure 1-2). The site is located on the crest of a hill. The ground surface is relatively flat in the immediate vicinity of the ground scar with a prominent downward slope in the area just north of the site. The site is covered by small pine trees and is surrounded by larger trees (QST, 1998).

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

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

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

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

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, the Alabama Department of Environmental Management (ADEM), the U.S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available 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.

Previous investigations to document site environmental conditions have not been conducted at the Ground Scar at South End of Confidence Course, Parcel 158(7). Therefore, the site was classified as a Category 7 CERFA site: areas that have not been evaluated or that require further evaluation.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT and QST at the Ground Scar at South End of Confidence Course, Parcel 158(7), including environmental sampling and analysis, and groundwater monitoring well installation activities.

3.1 Environmental Sampling

The environmental sampling performed during the SI at the Ground Scar at South End of Confidence Course, Parcel 158(7), included the collection of surface and subsurface soil samples for chemical analysis. Groundwater samples were not collected at the site because groundwater was not encountered in any of the wells or soil borings installed at the site. The soil sample locations were determined by observing site physical characteristics during a site walkover and by reviewing historical aerial photographs. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figure 3-1. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.3.

3.1.1 Surface Soil Sampling

QST collected five surface soil samples during the SI at the Ground Scar at South End of Confidence Course, Parcel 158(7). Soil sampling locations and rationale are presented in Table 3-1. Sampling locations are shown on Figure 3-1 and sample designations are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on the sampling rationale, presence of surface structures, and site topography.

Sample Collection. Surface soil samples were collected from 0 to 1 foot below bgs using a direct-push sampling system in accordance with the QST work plan (QST, 1998). The samples were analyzed for parameters listed in Table 3-2 using methods outlined in Section 3.3. Sample collection logs are included in Appendix A.

3.1.2 Subsurface Soil Sampling

QST collected two subsurface soil samples from two soil borings at the Ground Scar at South End of Confidence Course, Parcel 158(7), as shown on Figure 3-1. Subsurface soil sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations and depths are listed in Table 3-2. Soil boring sampling locations were determined in the field by the on-site geologist based on sampling rationale, presence of surface structures, and site topography.

Sample Collection. QST contracted Graves Service Company, Inc. to complete the soil borings using DPT in accordance with procedures outlined in the QST work plan (QST, 1998). Subsurface soil samples were collected at a depth of 3 to 4 feet bgs. The samples were analyzed for parameters listed in Table 3-2 using methods outlined in Section 3.3. Sample collection logs are included in Appendix A.

3.1.3 Well Installation

IT installed three permanent groundwater monitoring wells at the Ground Scar at South End of Confidence Course, Parcel 158(7). The well locations are shown on Figure 3-1. Table 3-3 summarizes construction details of the wells installed at the site. The well construction logs are included in Appendix B.

IT contracted Miller Drilling, Inc., to install the wells with a hollow-stem auger rig. The wells were installed following procedures outlined in Section 4.7 and Appendix C of the SAP (IT, 2000a). The borehole at each location was advanced with a 4.25-inch inside diameter (ID) hollow-stem auger from ground surface to the first water-bearing zone in residuum (or to auger refusal). 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 refusal. The on-site geologist constructed a lithological log for each 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 provided site-specific geological and hydrogeological information. Because groundwater was not encountered prior to auger refusal, the well screen interval was placed at the bottom of the borehole. The lithological logs are included in Appendix B.

At each well location, the borehole was advanced to the depth of auger refusal. Upon reaching auger refusal, a 10-foot-length of 2-inch ID, 0.010-inch continuous slot Schedule 40 polyvinyl chloride (PVC) screen with a 3-inch PVC end cap was placed through the auger to the bottom of the borehole. The screen and end cap were attached to 2-inch ID, flush-threaded Schedule 40 PVC riser. A sand pack consisting of number 1 filter sand (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. A bentonite seal, consisting of approximately 2 feet of bentonite pellets, was placed immediately on top of the sand pack and hydrated with potable water. Bentonite seal placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). The wells were then grouted to ground surface using a bentonite-cement

grout. A locking well cap was placed on the PVC well casing. The well surface completion included placing a protective steel casing over the PVC riser and installing a concrete pad around the protective steel casing. Concrete-filled protective steel posts were placed around the well pad.

IT made several subsequent attempts to verify the presence of groundwater in the wells. However, the wells did not produce groundwater. Therefore, well development and groundwater sampling were not performed.

3.2 Surveying of Sample Locations

QST sample locations were surveyed using global positioning system survey techniques or traditional surveying techniques described in the QST work plan (QST, 1998). Map coordinates for each sample location were determined using a Transverse Mercator or State Planar grid to within $\pm$ 3 feet ($\pm$ 1 meter). Horizontal coordinates are included in Appendix C.

IT well 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 of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix C.

3.3 Analytical Program

Samples collected during the SI were analyzed for various chemical parameters based on the potential site-specific chemicals historically at the site and on EPA, ADEM, FTMC, and USACE requirements. The samples collected at the Ground Scar at South End of Confidence Course, Parcel 158(7), were analyzed for the following parameters:

- Volatile organic compounds (VOC) – EPA Method 8260B
- Semivolatile organic compounds (SVOC) – EPA Method 8270C
- Target analyte list metals – EPA Method 6010B/7000
- Pesticides/polychlorinated biphenyls (PCB) – EPA Method 8080
- Total organic carbon (TOC) – EPA Method 9060 (two surface soil samples and one subsurface soil sample only).

The samples were analyzed using EPA SW-846 methods, including Update III Methods where applicable.

3.4 Sample Preservation, Packaging, and Shipping

QST preserved, packaged, and shipped samples following guidelines specified in the QST work plan (QST, 1998).

3.5 Investigation-Derived Waste Management and Disposal

IT Investigation-Derived Waste. IT 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 at South End of Confidence Course, Parcel 158(7), was segregated as follows:

- Drill cuttings
- 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 (TCLP) analyses. Based on the results, drill cuttings and personal protective equipment generated during the SI were disposed as nonregulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

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

QST Investigation-Derived Waste. QST-generated IDW was managed and disposed as outlined in the QST work plan (QST, 1998).

3.6 Variances/Nonconformances

Neither IT nor QST documented any variances or nonconformances during completion of the SI at the Ground Scar at South End of Confidence Course, Parcel 158(7). IT made several attempts to collect groundwater samples from the wells installed at the site. However, groundwater was not encountered in any of the wells. In addition, the analytical data indicated that soils at the site were not contaminated. Therefore, the BCT concluded that impacts to groundwater were unlikely and that no groundwater samples would be collected at the site.

3.7 Data Quality

QST data were submitted to the Installation Restoration Data Management Information System (IRDMIS) database at the conclusion of ST field activities. Hard-copy data packages were sent to the AEC in Edgewood, Maryland for storage. IT retrieved the electronic data via IRDMIS and the original data packages from the AEC for evaluation. From the IRDMIS data, IT was able to identify the key fields of information and translate the data into the IT Environmental Management System ™ (ITEMS) database.

The field sample analytical data are presented in tabular form in Appendix D. QST hard-copy analytical data packages were validated during a complete (100 percent) Level III data validation effort. Appendix E includes a data validation summary report that discusses the results of the QST data validation. Selected results were rejected or qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the data validation report. In addition, during the validation the electronic results were compared to the hard-copy results. Concentrations in the database were corrected where necessary and validation qualifiers added to the QST data using ITEMS to reflect the findings summarized in the QST data validation report. The validated data were used in the comparison to the SSSLs and ESVs developed by IT. The QST data presented in this report, except where qualified, meet the principle data quality objective for this SI.

4.0 Site Characterization

Subsurface investigations performed at the Ground Scar at South End of Confidence Course, Parcel 158(7), provided soil and geologic data used to characterize the geology of the site.

4.1 Regional and Site Geology

4.1.1 Regional Geology

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

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

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

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group is comprised of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated, greenish-gray and black mudstone makes up the Nichols Formation with thin interbeds of

siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

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

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

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

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded

to laminated, siliceous dolomite and dolomitic limestone that weathers to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

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

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

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

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark- to light-gray limestone with abundant chert nodules and greenish-gray to grayish-red phosphatic shale with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale on the basis of fossil data.

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

4.1.2 Site Geology

The soils mapped at the Ground Scar at South End of Confidence Course, Parcel 158(7) consist of Anniston and Allen gravelly loam (AcD2), 10 to 15 percent slopes, eroded. The Anniston and Allen series of soils (which are mapped together as undifferentiated) consist of deep, well-formed, strongly acidic, friable soils that formed in old local alluvium that washed from adjacent, higher lying Linker, Muskingum, Enders, and Montevallo soils. In turn, these soils developed from weathered sandstone, shale, and quartzite. The texture of the subsoil ranges from light clay loam to clay or silty clay loam. Sandstone and quartzite gravel and cobbles are found throughout the soil (U.S. Department of Agriculture, 1961).

Figure 4-1 indicates a northeast-southwest thrust fault mapped to the southeast of the parcel. Bedrock northwest of the fault is mapped as the Missippian Floyd and Athens Shale undifferentiated (Osborne et al., 1997). The Floyd and Athens Shale consist of brown, dark-gray to black shale with localized interbedded limestone and sandstone (Osborne et al., 1997). Bedrock southeast of the thrust fault is mapped as the Ordovician Little Oak and Newala Limestones, undifferentiated. The Little Oak Newala Limestones are characterized as dark gray, medium- to thick-bedded limestone and minor dolomite.

Six soil borings were installed at the site using DPT or hollow-stem augers to depths ranging from 10 feet to 46 feet bgs. Figure 4-2 is a geologic cross-section constructed from the hollow-stem auger boring data. As shown on Figure 4-2, soils beneath the Ground Scar at South End of Confidence Course, Parcel 158(7), are primarily sandy clays and sandy silts overlying weathered

olive-green mudstone and siltstone. Competent bedrock was not encountered during drilling. The presence of mudstone and siltstone is inconsistent with the geology mapped by Osborne, et al. (1997). Based on the presence of these units, the weathered mudstone and siltstone likely represent residuum associated with the Little Oak and Newala Limestones. If so, the thrust fault shown on Figure 4-1 may actually be located to the west of Parcel 158(7).

4.2 Site Hydrology

4.2.1 Surface Hydrology

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

The site is located on the crest of a hill and lies at an elevation of approximately 870 feet above mean sea level. Surface water runoff follows site topography and flows radially from the site into drainage pathways along the surrounding roads. There are no natural surface water features in the immediate vicinity of the site. Runoff flows to the north toward Ingram Creek located approximately 1,500 feet to the north. Ingram Creek empties into Cane Creek, which flows to the northwest.

4.2.2 Hydrogeology

Groundwater was not encountered at depths less than 46 feet bgs during the SI at Parcel 158(7). However, based on regional hydrogeology data collected by IT, groundwater present at the site at greater depths would likely flow to the northwest.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at the Ground Scar at South End of Confidence Course, Parcel 158(7), indicate that metals, VOCs, SVOCs, and pesticides were detected in site media. PCBs were not detected in any of the samples collected. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, 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.

Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to metals background screening values (background concentrations) 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 F.

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

The following sections and Tables 5-1 and 5-2 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix D.

5.1 Surface Soil Analytical Results

Five surface soil samples were collected for chemical analysis at the Ground Scar at South End of Confidence Course, Parcel 158(7). Surface soil samples were collected from the upper 1 foot of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-1.

Metals. Twenty metals were detected in surface soil samples collected at the Ground Scar at South End of Confidence Course, Parcel 158(7). The concentrations of six metals (aluminum, arsenic, chromium, iron, manganese, and vanadium) exceeded SSSLs. However, with the exception of aluminum and iron in one sample (SI16-SS02), the concentrations of these metals were below their respective background concentrations. The aluminum and iron results were within the range of background values established by SAIC (1998) (Appendix F).

The concentrations of six metals (aluminum, chromium, iron, manganese, mercury, and vanadium) exceeded ESVs. However, with the exception of aluminum (one location), iron (one location), and mercury (two locations), the concentrations of these metals were below their respective background concentrations. The aluminum and iron concentrations were within the range of background values. The mercury results (0.69 and 0.39 mg/kg) exceeded the range of background mercury values (0.031 to 0.32 mg/kg).

Volatile Organic Compounds. Twelve VOCs (1,1,1-trichloroethane, 1,2-dichloroethene, 2-butanone, acetone, benzene, carbon disulfide, ethylbenzene, methylene chloride, tetrachloroethene, toluene, trichloroethene, and xylenes) were detected in surface soil samples collected at the site. Sample SI16-SS03 contained 11 of the 12 detected VOCs. VOC concentrations in the surface soil samples ranged from 0.00042 to 0.44 mg/kg.

VOC concentrations in surface soils were below SSSLs. The concentrations of tetrachloroethene (in three samples) and trichloroethene (five samples) exceeded ESVs in surface soil samples.

Semivolatile Organic Compounds. A total of ten SVOCs, all of which were polynuclear aromatic hydrocarbon (PAH) compounds, were detected in two of the surface soil samples (SI16-SS03 and SI16-SS04) collected at the site. SVOCs were not detected at the remaining surface soil sample locations. Sample SI16-SS04 contained each of the detected SVOCs. SVOC concentrations in the surface soil samples ranged from 0.07 to 0.35 mg/kg.

The benzo(a)pyrene concentration (0.34 mg/kg) exceeded its SSSL (0.085 mg/kg) and ESV (0.1 mg/kg) in the sample collected at SI16-SS04. The concentrations of two additional PAHs (fluoranthene and pyrene) exceeded ESVs in sample SI16-SS04.

Pesticides. Two pesticides (4,4'-DDE and 4,4'-DDT) were detected in two of the surface soil samples (SI16-SS03 and SI16-SS04) collected at the site. Pesticides were not detected at the remaining surface soil sample locations. The concentrations of these pesticides were below SSSLs. The 4,4'-DDE concentrations (0.00427 mg/kg and 0.043 mg/kg) and the 4,4'-DDT concentrations (0.0039 mg/kg and 0.00717 mg/kg) exceeded ESVs (0.0025 mg/kg for both compounds) in both samples.

Total Organic Carbon. Two of the surface soil samples (SI16-SS02A and SI16-SS04) were analyzed for TOC content. TOC concentrations were 1,880 mg/kg and 9,090 mg/kg, respectively, as summarized in Appendix D.

5.2 Subsurface Soil Analytical Results

Two subsurface soil samples were collected for chemical analysis at the Ground Scar at South End of Confidence Course, Parcel 158(7). Subsurface soil samples were collected at depths of 3 to 4 feet bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-2.

Metals. Nineteen metals were detected in subsurface soil samples collected at the site. All nineteen metals were detected in both of the samples collected. The concentrations of five metals (aluminum, arsenic, chromium, iron, and vanadium) exceeded SSSLs. Of these metals, aluminum (both samples), iron (SI16-SS02), and vanadium (SI16-SS02) concentrations also exceeded their respective background concentrations. However, the aluminum, iron, and vanadium results were within the range of background values (Appendix F).

Volatile Organic Compounds. Eleven VOCs (1,1,1-trichloroethane, 1,1-dichloroethene, 1,2-dichloroethene, acetone, benzene, ethylbenzene, methylene chloride, tetrachloroethene, toluene, trichloroethene, and xylenes) were detected in subsurface soil samples collected at the Ground Scar at South End of Confidence Course, Parcel 158(7). Sample SI16-SS02B contained each of the detected VOCs. VOC concentrations in the subsurface soil samples ranged from 0.00067 to 0.065 mg/kg.

The VOC concentrations in subsurface soils were below SSSLs.

Semivolatile Organic Compounds. SVOCs were not detected in the subsurface soil samples collected at the Ground Scar at South End of Confidence Course, Parcel 158(7).

Pesticides. Pesticides were not detected in the subsurface soil samples collected at the Ground Scar at South End of Confidence Course, Parcel 158(7).

Total Organic Carbon. One of the subsurface soil samples (SI16-SS02B) was analyzed for TOC content. The TOC concentration in the sample was 1,260 mg/kg, as summarized in Appendix D.

6.0 Summary, Conclusions, and Recommendations

IT, under contract with the USACE, completed an SI at the Ground Scar at South End of Confidence Course, Parcel 158(7), at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site at concentrations that present an unacceptable risk to human health or the environment. The SI at the Ground Scar at South End of Confidence Course, Parcel 158(7), consisted of the sampling and analysis of five surface soil samples and two subsurface soil samples. In addition, three permanent 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. However, groundwater was not present at the site. As part of the SI, IT incorporated data previously collected by QST at the site.

Chemical analysis of samples collected at the Ground Scar at South End of Confidence Course, Parcel 158(7), indicate that metals, VOCs, SVOCs, and pesticides were detected in site media. 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. Additionally, metals concentrations exceeding SSSLs and ESVs were compared to media-specific background screening values (SAIC, 1998).

The potential threat to human receptors is expected to be low. Although the site is projected for reuse as a mixed business area, the analytical data were screened against residential human health SSSLs to evaluate the site for unrestricted land reuse. With the exception of iron in one subsurface soil sample, the metals concentrations that exceeded SSSLs were below their respective background concentrations or were within the range of background values. The PAH compound benzo(a)pyrene exceeded its SSSL in one surface soil sample. VOC and pesticide concentrations were below SSSLs.

Several metals were detected in surface soils at concentrations exceeding ESVs. However, with the exception of mercury in two samples, the metals concentrations that exceeded ESVs were below their respective background concentrations or were within the range of background values. Two VOCs (tetrachloroethene and trichloroethene), two pesticides (4,4'-DDE and 4,4'-DDT), and three PAH compounds exceeded ESVs in surface soils. However, the levels of these

chemical constituents were low (less than 0.5 mg/kg) and are not expected to pose a significant threat to ecological receptors.

Based on the results of the SI, past operations at the Ground Scar at South End of Confidence Course, Parcel 158(7), do not appear to have adversely impacted the environment. The metals and chemical 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 at South End of Confidence Course, Parcel 158(7).

7.0 References

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