# Final

# Site Investigation Report
# Range I, Parcel 201(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 (IT) completed a site investigation (SI) at Range I, Parcel 201(7), at Fort McClellan (FTMC) 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 Range I, Parcel 201(7), consisted of a geophysical survey and the sampling and analysis of 12 surface and depositional soil samples, 10 subsurface soil samples, 4 groundwater samples, and 1 surface water/sediment sample. In addition, 4 permanent monitoring wells were installed in the saturated zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information.

The geophysical survey results did not indicate the presence of buried metals drums or munitions at the site.

Chemical analysis of samples collected at the site indicates that metals, volatile organic compounds (VOC), and semivolatile organic compounds (SVOC) were detected in the environmental media sampled. Explosives and chemical warfare material breakdown products (including Lewisite breakdown products) were not detected in site media. To evaluate whether the detected constituents pose 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.

Arsenic was detected at concentrations exceeding its SSSL, ESV, and upper background range in three surface soil samples. In addition, three metals (chromium, iron, and vanadium) exceeded their respective SSSLs and upper background ranges in subsurface soils. The elevated chromium, iron, and vanadium concentrations are probably not related to historical activities conducted at the site and likely reflect variations in naturally occurring levels of these metals. Arsenic, however, is a suspected site-related contaminant present at concentrations that require additional study. Therefore, IT recommends further investigation to determine the extent of arsenic contamination in surface soil at Range I, Parcel 201(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) at Range I, Parcel 201(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 Range I, Parcel 201(7).

## 1.1 Project Description

Range I was identified as an area to be investigated prior to property transfer. The site was classified as a Category 7 parcel in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 parcels are areas that are unevaluated and/or that require further evaluation.

A site-specific field sampling plan (SFSP) attachment (IT, 2001) and a site-specific safety and health plan (SSHP) attachment were finalized in February 2001. The SFSP and SSHP were prepared to provide technical guidance for sample collection and analysis at Range I, Parcel 201(7). The SFSP was used in conjunction with the SSHP as attachments to 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.

The SI included fieldwork to collect 10 surface soil samples, 2 depositional soil samples, 10 subsurface soil samples, 4 groundwater samples, and 1 surface water/sediment sample. Data from the field investigation were used to determine whether potential site-specific chemicals are present at Range I, Parcel 201(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 Range I, Parcel 201(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 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

Range I, Parcel 201(7), is located within Training Area 10A in the western portion of Pelham Range (Figure 1-1). The site is fenced and posted, but the fence was in disrepair during an EBS site visit (ESE, 1998) (Figure 1-2). The fenced area, which covers approximately 0.5 acre, was the focus of the SI.

Range I was reportedly used for both agent shell tapping and area-denial/decontamination exercises from 1963 to 1964. However, there have been accounts that there are two Range I's and the reported agent shell-tapping activities likely occurred at the Anniston Army Depot Shell Tapping Area (U.S. Army Center for Health Promotion and Preventive Medicine [CHPPM], 1999).

Retired U.S. Army personnel report conducting area-denial/decontamination exercises at this general location. Forty chemical land mines, consisting of lewisite-filled 1-gallon metal cans, were detonated during one exercise. The area was decontaminated using M3A2 truck-mounted decontamination equipment to dispense lime slurry. A chain-link fence was erected around the area after decontamination training was completed. However, area decontamination exercises reportedly occupied a larger area than the existing fenced area (ESE, 1998).

A previous investigation by Roy F. Weston, Inc. (1990) reported that the top 2 feet of soil was removed to an unknown location. Additional information regarding the date of excavation or the volume of soil removed was not provided in the report. However, a draft report by CHPPM stated that there was visual evidence of earthwork in a 1977 photograph of Range I (CHPPM, 1999; U.S. Army Toxic and Hazardous Materials Agency, 1977). In addition, Range I was described as a location with "possible hot disposal pits"; however, no definition of hot disposal pits was provided (U.S. Army Toxic and Hazardous Materials Agency, 1977).

During site reconnaissance conducted by IT in 2000, several mounds and depressions were observed. The origin of the mounds and depressions is unknown but may be related to the earthwork activity conducted at the site.

## 2.0 Previous Investigations

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

1. Areas where no storage, release, or disposal 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 Community Environmental Response Facilitation Act (CERFA) protocols (CERFA-Public Law 102-426) and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, the Alabama Department of Environmental Management (ADEM), the U.S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of CERCLA-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historic maps and aerial photographs were reviewed to document historic land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels. Previous investigations have been conducted at Range I as discussed in the following paragraphs.

***U.S. Army (1979).*** The Army collected surface soil samples for distilled mustard (HD) analysis in 1979 (Roy F. Weston, Inc., 1990). The results did not indicate the presence of HD. The 1999 CHPPM draft report cites the *Reassessment of FTMC Report, Anniston, Alabama, Report No. 110A* (ESE, 1984), which recommended prohibiting intrusive activities (e.g., excavation) because of the potential for isolated pockets of chemical agent. Details of the Army sampling event, such as sample locations and collection techniques, were not provided.

***SAIC (1991/1992).*** SAIC conducted an SI at Range I, Parcel 201(7), in October 1991 and April 1992 (SAIC, 1993). A total of four soil samples were collected from two soil borings for field screening and laboratory analysis. The soil borings were advanced to a depth of 67 inches below ground surface (bgs). Two samples were collected from each soil boring: one sample from 9 to 12 inches bgs, and one sample from 60 to 67 inches bgs. The soil boring locations shown on Figure 2-1 were approximated based on information in the SI report (SAIC, 1993). The samples were field screened using a Miniature Continuous Air Monitoring System (MINICAMS) analyzer for the presence of HD, sarin (GB), and nerve agents. The MINICAMS results did not indicate the presence of chemical agents (Table 2-1). The soil samples were also laboratory analyzed for the degradation products of HD, GB, and nerve agents. The analytical results did not indicate the presence of chemical agents in the soil samples (Table 2-2).

Range I, Parcel 201(7), was categorized as a Category 7 CERFA site. Category 7 CERFA sites are areas that lack adequate documentation and therefore require additional evaluation to determine the environmental condition of the parcel.

# 3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT at Range I, Parcel 201(7), including unexploded ordnance (UXO) avoidance activities, geophysical survey, environmental sampling and analysis, and groundwater monitoring well installation activities.

## 3.1 UXO Avoidance

UXO avoidance was performed at Range I, Parcel 201(7), following methodology outlined in Section 4.1.7 of the SAP (IT, 2000a). IT UXO personnel used a low-sensitivity magnetometer to perform a surface sweep of the parcel prior to site access. After the parcel was cleared for access, sample locations were monitored following procedures outlined in Section 4.1.7.3 of the SAP (IT, 2000a).

## 3.2 Geophysical Survey

A geophysical survey was conducted at Range I, Parcel 201(7), to locate buried metal drums or munitions. The geophysical survey encompassed an area of approximately 40,000 square feet (0.92 acre), including the entire fenced area at Range I. The extent of the geophysical survey area is shown on 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 in Appendix A.

The survey was conducted using magnetic and electromagnetic (EM) techniques. An initial survey grid was established at the site to encompass the suspected disposal area. A detailed, hand-sketched site map was drawn 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., mounds, depressions, and fences). 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. The results of the geophysical survey are summarized in Section 4.1.

## 3.3 Environmental Sampling

The environmental sampling performed during the SI at Range I, Parcel 201(7), included the collection of surface and depositional soil samples, subsurface soil samples, groundwater samples, and surface water/sediment samples for chemical analysis. The sample locations were determined by observing site physical characteristics during a site walkover 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 Figures 3-2 and 3-3. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.5.

### 3.3.1 Surface and Depositional Soil Sampling

Ten surface soil samples and two depositional soil samples were collected at Range I, Parcel 201(7), at the locations shown on Figure 3-2. Soil sampling locations and rationale are presented in Table 3-1. Soil sample designations and analytical parameters are listed in Table 3-2. Sampling locations were determined in the field by the on-site geologist based on UXO avoidance activities, sampling rationale, presence of surface structures, and site topography. IT contracted Environmental Services Network, Inc., a direct-push technology (DPT) subcontractor, to assist in soil sample collection.

***Sample Collection.*** Surface and depositional soil samples were collected from the upper 1-foot of soil with either a stainless-steel hand auger or a DPT sampling system following the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000a). The samples were collected by first removing surface debris (e.g., rocks and vegetation) from the immediate sample area. The soil was then collected with the sampling device and screened with a photoionization detector (PID) in accordance with Section 4.7.1.1 of the SAP (IT, 2000a). The soil fraction for volatile organic compound (VOC) analysis was collected directly from the sampler using 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. Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.5.

### 3.3.2 Subsurface Soil Sampling

Subsurface soil samples were collected from 10 soil borings at Range I, Parcel 201(7), as shown on Figure 3-2. Subsurface soil sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations, depths, and analytical parameters are listed in Table 3-2. Soil boring sampling locations were determined in the field by the on-site geologist based on UXO avoidance activities, sampling rationale, presence of surface structures, and site topography.

***Sample Collection.*** Subsurface soil samples were collected from soil borings at depths greater than 1-foot below ground surface (bgs) in the unsaturated zone. The soil borings were advanced and samples collected using the DPT sampling procedures specified in Section 4.9.1.1

of the SAP (IT, 2000a). Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.5.

Subsurface soil samples were collected continuously to 12 feet bgs or until DPT sampler refusal was encountered. Samples were field screened using a PID in accordance with Section 4.7.1.1 of the SAP (IT, 2000a) to measure for volatile organic vapors. The sample displaying the highest reading was selected and sent to the laboratory for analysis; however, at those locations where PID readings were not greater than background, the deepest sample interval above the saturated zone was submitted for analysis. The soil fraction for VOC analysis was collected directly from the sampler using 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 on-site geologist constructed a detailed boring log for each soil boring (Appendix C).

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

### 3.3.3 Monitoring Well Installation

Four permanent monitoring wells were installed in the saturated zone at Range I, Parcel 201(7), to collect groundwater samples for laboratory analysis. The well locations are shown on Figure 3-2. Table 3-3 summarizes construction details of the wells installed at Range I, Parcel 201(7). The well construction logs are included in Appendix C.

IT contracted Miller Drilling Company to install the permanent wells with a hollow-stem auger rig at four of the DPT soil boring locations. The wells were installed following procedures outlined in Section 4.7 and Appendix C of the SAP (IT, 2000a). The borehole at each well location was advanced with a 4.25-inch inside diameter (ID) hollow-stem auger from ground surface to the saturated zone. The borehole was augured to the completion depth of the DPT boring and samples were collected from that depth 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 geological and hydrogeological information. The boring log for each borehole is included in Appendix C.

Upon reaching the target depth in each borehole, a 15- or 20-foot-length of 2-inch ID, 0.010-inch continuous slot, Schedule 40 polyvinyl chloride (PVC) screen with a 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 filter 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 5 feet above the top of the well screen as the augers were removed. The well was surged using a solid PVC surge block for approximately 10 minutes, or until no more settling of the filter sand occurred inside the borehole. A bentonite seal, consisting of approximately 3 feet of bentonite pellets, was placed immediately on top of the filter sand and hydrated with potable water. At wells where the bentonite seal was installed below the water table surface, the bentonite pellets were allowed to hydrate in the groundwater. The bentonite seal placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). Bentonite-cement grout was tremied into the remaining annular space of the well. A locking protective steel casing was placed over the PVC well riser and a concrete pad was constructed around the well. Four protective steel posts were installed around the well pad.

All monitoring wells except RNG-201-MW01 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 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 re-establish the natural hydraulic flow conditions. Development was performed until the water turbidity was less than or equal to 20 nephelometric turbidity units (NTU), for a maximum of 8 hours, or until the well had been pumped dry and allowed to recharge 3 times. An attempt was made to develop monitoring well RNG-201-MW01 using a bailer; however, the well did not produce sufficient water for development. The well development logs are included in Appendix D.

### 3.3.4 Water Level Measurements

The depth to groundwater was measured in the permanent wells at the site on January 7, 2002, following procedures outlined in Section 4.18 of the SAP (IT, 2000a). Depth to groundwater was measured with an electronic water level meter. Each meter probe and cable were cleaned between use at each well following decontamination methodology presented in Section 4.10 of the SAP (IT, 2000a). Measurements were referenced to the top of the PVC well casing. A summary of groundwater level measurements for Range I is presented in Table 3-4.

### *3.3.5 Groundwater Sampling*

Groundwater samples were collected from each of the four permanent wells installed at the site. The well/groundwater sampling locations are shown on Figure 3-2. The groundwater sampling locations and rationale are listed in Table 3-1. The groundwater sample designations and analytical parameters are listed in Table 3-5.

***Sample Collection.*** Groundwater sampling was performed following procedures outlined in Section 4.9.1.4 of the SAP (IT, 2000a). Groundwater was sampled after purging a minimum of three well volumes and after field parameters (i.e., temperature, pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, and turbidity) stabilized. Purging and sampling were performed with either a peristaltic pump or a bladder 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 3.5.

### *3.3.6 Surface Water Sampling*

One surface water sample was collected at Range I, Parcel 201(7), at the location shown on Figure 3-3. The surface water sampling location and rationale are listed in Table 3-1. The surface water sample designation and analytical parameters are listed in Table 3-7. The actual sampling location was determined in the field, based on drainage pathways and field observations.

***Sample Collection.*** The surface water sample was collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP (IT, 2000a). The surface water sample was collected by dipping a stainless-steel pitcher in the water and pouring the water into the sample containers. The surface water sample was collected after field parameters had been measured using a calibrated water quality meter. Surface water field parameters are listed in Table 3-6. The sample collection log is included in Appendix B. The sample was analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.5.

### *3.3.7 Sediment Sampling*

One sediment sample was collected at the same location as the surface water sample, as shown on Figure 3-3. The sediment sampling location and rationale are presented in Table 3-1. The sediment sample designation and analytical parameters are listed in Table 3-7. The actual sediment sampling location was determined in the field, based on drainage pathways and field observations.

***Sample Collection.*** The sediment sample was collected in accordance with the procedures specified in Section 4.9.1.2 of the SAP (IT, 2000a). Sediments were collected with a stainless-steel spoon and placed in a clean stainless-steel bowl. The sediment fraction for VOC analysis was immediately collected from the bowl using three EnCore samplers. The remaining portion of the sample was homogenized and placed in the appropriate sample containers. The sample collection log is included in Appendix B. The sediment sample was analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.5.

## 3.4 Surveying of Sample Locations

Monitoring well and sample locations were surveyed using global positioning system survey techniques described in Section 4.3 of the SAP and conventional civil survey techniques described in Section 4.19 of the SAP (IT, 2000a). Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix E.

## 3.5 Analytical Program

Samples collected during the SI were analyzed for various chemical and physical parameters based on potential site-specific chemicals and on EPA, ADEM, FTMC, and USACE requirements. Target analyses for samples collected at Range I, Parcel 201(7), included the following parameters:

- Target analyte list metals – EPA Method 6010B/7000
- Target compound list VOCs – EPA Method 8260B
- Target compound list SVOCs – EPA Method 8270C
- Nitroaromatic and nitramine explosives – EPA Method 8330
- CWM breakdown products – EPA Method 8270M/8321
- Lewisite breakdown products – EPA Method 8270 MOD (soil samples only)
- Total organic carbon – EPA Method 9060 (sediment sample 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).

### 3.6 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping followed requirements specified in Section 4.13.2 of the SAP (IT, 2000a). Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in Table 5-1 of Appendix B of the SAP (IT, 2000a). Sample documentation and chain-of-custody records were completed 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 EMAX Laboratories, Inc. in Torrance, California.

### 3.7 Investigation-Derived Waste Management and Disposal

Investigation-derived waste (IDW) was managed and disposed as outlined in Appendix D of the SAP (IT, 2000a). The IDW generated during the SI at Range I, Parcel 201(7), was segregated as follows:

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

Solid IDW was stored on site 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 of the analyses, soil boring cuttings and PPE 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 a portable frac tank at the site pending waste characterization by VOC, semivolatile organic compounds (SVOC), and metals analyses. Based on the analyses, liquid IDW was discharged as nonregulated waste.

### 3.8 Variances/Nonconformances

Two variances to the SFSP were recorded during completion of the SI at Range I, Parcel 201(7). The variances did not impact the intent of the SI or the sampling rationale presented in the SFSP. The variances are summarized in Table 3-8 and the variance reports are included in Appendix F.

No nonconformances were recorded during completion of the SI at Range I, Parcel 201(7).

### *3.9 Data Quality*

The field sample analytical data are presented in tabular form in Appendix G. 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. 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.

***Data Validation.*** The reported analytical data were validated in accordance with EPA National Functional Guidelines by Level III criteria except for the Lewisite breakdown products analytical data. The data validation results are summarized in a quality assurance report, which includes the data validation summary report (Appendix H). 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 (ITEMS™) database for tracking and reporting. The qualified data were used in comparing to the SSSLs and ESVs developed by IT. Rejected data (assigned an "R" qualifier) were not used in comparison to the SSSLs and ESVs. The data presented in this report, except where qualified, meet the principle data quality objective for this SI.

# 4.0 Site Characterization

This chapter discusses the results of geophysical survey and provides information on regional and site geology, and site hydrology for Range I, Parcel 201(7).

## 4.1 Geophysical Survey Results

The geophysical survey results indicate no geophysical anomalies potentially representing areas containing buried metal drums, munitions, or other buried debris at Range I, Parcel 201(7). The anomalies observed in the magnetic data are caused by the remnants of a wire fence and metal fence posts. The EM31 in-phase data show several anomalies that are caused by metal signs, remnants of the wire fence, and metal fence posts. The EM31 conductivity data show an increase in conductivity toward the northeast caused by subtle changes in geologic conditions. The geophysical interpretation map of the site (Figure 4-1) shows the anomaly locations and contains detailed information on permanent site reference features to aid in relocating the anomalies and survey area. The anomalies shown on Figure 4-1 correspond to those shown in the magnetic and EM data contour maps presented in the geophysical survey report (Appendix A). A detailed discussion of the data interpretation is included in the geophysical survey report.

## 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 (Osborne, et. al., 1988). These two formations are mapped only in the eastern part of the county.

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

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

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post as mapped by Warman and Causey (1962), and Osborne and Szabo

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

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

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

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

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

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark to light gray limestone with abundant chert nodules and greenish-gray to grayish-red phosphatic shale, with increasing amounts of calcareous chert 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 based on fossil data.

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

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

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

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

### *4.2.2 Site Geology*

Soils at Range I, Parcel 201(7), are made up of soil from the Rarden Series, which is part of the Rarden, Montevallo, and Lehew Association. The Rarden Series consists of moderately well drained, strongly acidic to very strongly acidic soils that generally form in large areas on wide shale ridges having slopes of 2 to 10 percent. The Rarden Series soils developed from the residuum of shale and fine grained platy sandstone or limestone. The Rarden, Montevallo, and Lehew Association of soil covers approximately 17 percent of Calhoun County, primarily in the northern and western portions. The Rarden Series soils alone comprise approximately 40 percent of the Association (U.S. Department of Agriculture [USDA], 1961).

The soil at the site is classified as Rarden gravelly loam, 6 to 10 percent slopes (USDA, 1961). This soil, distinguished from the Rarden silt loam, 6 to 10 percent slopes, has a gravelly, coarser-textured surface soil and slightly higher rate of infiltration. Sandstone, quartz, or chert gravel up to 3 inches in diameter are commonly found on and in the soil of the Rarden gravelly loam. A few places have been slightly to severely eroded, with shallow gullies common.

Bedrock beneath the site is mapped as the Parkwood Formation and Floyd Shale, Undifferentiated. The Parkwood Formation consists of medium to dark-gray silty clay shale and mudstone, interbedded with light to medium gray very fine to fine grained argillaceous, micaceous, and locally cross-bedded and ripple-marked sandstone (Raymond et. al, 1988). The Floyd Shale consists of dark gray clay shale with interbedded gray claystone. Thin beds of sandstone, limestone, and chert are locally present (Raymond et al., 1988). Approximately 900 feet southeast of Range I, the Frog Mountain Sandstone is thrust over the Parkwood Formation and Floyd Shale (Osborne et. al, 1988).

A geologic cross section was constructed from the DPT and hollow-stem auger boring data, as shown on Figure 4-2. The geologic cross section location is shown on Figure 3-2. The soil encountered during drilling activities at Range I consisted of dark reddish brown clay, with little sand and trace gravel (chert, fine-grained sandstone, and crystalline limestone). Hollow-stem auger refusal was encountered on competent rock at depths ranging from 34 to 39 feet bgs. At RNG-201-MW01, refusal was encountered on limestone, after drilling through approximately 10 feet of weathered sandstone. Auger refusal on sandstone was also encountered at RNG-201-MW04. The sandstone was described as angular to subangular, and medium to fine-grained. Auger refusal was not encountered at RNG-201-MW03; however, the interval from 39 to 39.5 feet bgs was described as highly weathered sandstone interbedded with shale.

## 4.3 Site Hydrology

### 4.3.1 Surface Hydrology

Precipitation in the form of rainfall averages about 53 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates (U.S. Department of Commerce, 1998). The major surface water feature at Pelham Range is Cane Creek, which flows to the west through the central portion of Pelham Range. Cane Creek and its associated tributaries drain almost all of Pelham Range. Other surface water features at Pelham Range include Lake Contreras, Cane Creek Lake, Willet Springs, and the Blue Hole (SAIC, 2000). Drainage from Cane Creek ultimately empties into the Coosa River on the western boundary of Calhoun County.

An intermittent stream is located approximately 200 feet east of Range I. When water is present, the stream flows south and empties into Cane Creek approximately 2,000 feet south of the site.

Surface water runoff from the site follows topography and flows generally to the south-southeast towards a tributary of Cane Creek.

### 4.3.2 Hydrogeology

Static groundwater levels were measured in the monitoring wells at the site on January 7, 2002 (Table 3-4). Groundwater elevations were calculated by measuring the depth to groundwater relative to the surveyed top-of-casing elevations. A groundwater flow map was constructed using the January 2002 data, as shown on Figure 4-3. At well locations RNG-201-MW01 and RNG-201-MW03, the aquifer appears to be perched, possibly on an interbedded layer of sandstone within the Parkwood Formation. During the most recent complete round of water level measurements, RNG-201-MW01 was recorded as dry, although, groundwater was present on January 31, 2002, when the well was sampled for the SI. Based on the January 2002 data, groundwater flow generally appears to follow the local topography, flowing to the southeast and east, towards the tributary of Cane Creek; and southwest around a topographic high just south of the parcel.

# 5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at Range I, Parcel 201(7), indicate that metals, VOCs, and SVOCs were detected in site media. Explosives, CWM breakdown products, and Lewisite breakdown products 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, the 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 on-going 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 to determine if the metals concentrations are within natural background concentrations (SAIC, 1998). Summary statistics for background metals samples collected at FTMC are included in Appendix I.

Six compounds were quantified by both SW-846 Method 8260B (as VOCs) and Method 8270C (as SVOCs), including 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 G.

## 5.1 Surface and Depositional Soil Analytical Results

Ten surface soil samples and two depositional soil samples were collected for chemical analysis at Range I, Parcel 201(7). Surface and depositional soil samples were collected from the upper 1-foot of soil at the locations shown on Figures 3-2 and 3-3. Metals, VOCs, and SVOCs were detected in surface and depositional soils. 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 and depositional soil samples collected at Range I. The concentrations of six metals (aluminum, arsenic, chromium, iron, manganese, and vanadium) exceeded SSSLs. Of these metals, aluminum (ten samples), arsenic (five samples), chromium (ten samples), manganese (four samples), and vanadium (four samples) also exceeded their respective background concentrations. With the exception of arsenic, the concentrations of these metals were within the range of background values established by SAIC (Appendix I). Arsenic concentrations (49.2, 66, and 338 mg/kg) exceeded the SSSL (0.426 mg/kg) and upper background range (49 mg/kg) in three samples (RNG-201-GP02, RNG-201-GP05, and RNG-201-GP06).

The concentrations of seven metals (aluminum, arsenic, chromium, iron, manganese, vanadium, and zinc) exceeded ESVs. Of these metals, aluminum (ten samples), arsenic (five samples), chromium (ten samples), manganese (four samples), vanadium (four samples), and zinc (three samples) also exceeded their respective background concentrations. With the exception of the aforementioned arsenic results, the concentrations of these metals were within the range of background values.

***Volatile Organic Compounds.*** Six VOCs (2-butanone, acetone, methylene chloride, trichlorofluoromethane, cis-1,2-dichloroethene, and trans-1,2-dichloroethene) were detected in surface and depositional soil samples collected at Range I. The methylene chloride and trichlorofluoromethane results were flagged with a "B" data qualifier indicating that these compounds were also detected in an associated laboratory or field blank sample. Excluding the common laboratory contaminants (i.e., 2-butanone, acetone, methylene chloride, and trichlorofluoromethane), the remaining VOCs (cis-1,2-dichloroethene and trans-1,2-dichloroethene) were detected in only one sample (RNG-201-GP02). VOC concentrations in the surface and depositional soil samples ranged from 0.0015 to 0.23 mg/kg, and were below SSSLs and ESVs.

***Semivolatile Organic Compounds.*** Bis(2-ethylhexyl)phthalate was the only detected SVOC in the surface and depositional soil samples collected. The compound was detected in four of the twelve samples at estimated concentrations ("J"-flagged) ranging from 0.066 to 0.11 mg/kg. The bis(2-ethylhexyl)phthalate concentrations were below the SSSL and ESV.

### *5.2 Subsurface Soil Analytical Results*

Ten subsurface soil samples were collected for chemical analysis at Range I, Parcel 201(7). Subsurface soil samples were collected at depths greater than 1-foot bgs at the locations shown on Figure 3-2. Metals, VOCs, and SVOCs were detected in subsurface soils. 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 Range I. The concentrations of six metals (aluminum, arsenic, chromium, iron, manganese, and vanadium) exceeded SSSLs. Of these metals, aluminum (ten samples), arsenic (two samples), chromium (eight samples), iron (five samples), and vanadium (eight samples) also exceeded their respective background concentrations. These metals concentrations were within the range of background values except for the following:

- Chromium (61 to 130 mg/kg) exceeded its SSSL (23 mg/kg) and upper background range (55 mg/kg) in six samples.

- Iron (55,000 mg/kg and 64,600 mg/kg) exceeded its SSSL (2,340 mg/kg) and upper background range (48,000 mg/kg) in two samples (RNG-201-GP02 and RNG-201-MW02).

- Vanadium (134 mg/kg) exceeded its SSSL (53 mg/kg) and upper background range (99 mg/kg) in one sample (RNG-201-GP02).

***Volatile Organic Compounds.*** Three VOCs (acetone, methylene chloride, and trichlorofluoromethane) were detected in subsurface soil samples collected at Range I. The methylene chloride results and a majority of the trichlorofluoromethane results were flagged with a "B" data qualifier indicating that these compounds were also detected in an associated laboratory or field blank sample. VOC concentrations in the subsurface soil samples ranged from 0.0016 to 0.044 mg/kg, and were below SSSLs.

***Semivolatile Organic Compounds.*** Bis(2-ethylhexyl)phthalate was the only detected SVOC in the subsurface soil samples collected. The compound was detected in three of the ten samples at estimated concentrations ranging from 0.066 to 0.083 mg/kg. The bis(2-ethylhexyl)phthalate concentrations were below the SSSL.

## 5.3 Groundwater Analytical Results

Four groundwater samples were collected for chemical analysis at Range I, Parcel 201(7), at the locations shown on Figure 3-2. Metals and VOCs were detected in groundwater. Analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-3.

***Metals.*** Nine metals were detected in groundwater samples collected at the site. Only manganese (in one sample) was detected at a concentration exceeding its SSSL. However, the manganese result was below its background concentration.

***Volatile Organic Compounds.*** Four VOCs (chloroform, methylene chloride, trichloroethene, and cis-1,2-dichloroethene) were detected in groundwater samples collected at the site. The chloroform and methylene chloride results were flagged with a "B" data qualifier indicating that these compounds were also detected in an associated laboratory or field blank sample. The remaining analytical results (trichloroethene and cis-1,2-dichloroethene) were flagged with a "J" data qualifier indicating that the compounds were positively identified but the concentrations were estimated. VOC concentrations in the groundwater samples ranged from 0.0003 to 0.00089 mg/L and were below SSSLs.

## 5.4 Surface Water Analytical Results

One surface water sample was collected for chemical analysis at Range I, Parcel 201(7), at the location shown on Figure 3-3. Metals were the only detected chemical constituents in surface water. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-4.

***Metals.*** Seven metals were detected in the surface water sample at concentrations below SSSLs. The concentrations of four metals (aluminum, barium, iron, and manganese) exceeded ESVs but were below their respective background concentrations.

## 5.5 Sediment Analytical Results

One sediment sample was collected for chemical analysis at Range I, Parcel 201(7), at the location shown on Figure 3-3. Metals and one VOC were the only detected chemical constituents in sediment. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-5.

***Metals.*** Eighteen metals were detected in the sediment sample at concentrations below SSSLs. The concentration of nickel (25.3 mg/kg) exceeded its ESV (15.9 mg/kg) and background concentration (13 mg/kg), but was within the range of background values.

***Volatile Organic Compounds.*** Acetone was the only VOC detected in the sediment sample. The analytical result was flagged with a "B" data qualifier indicating that acetone was also detected in an associated laboratory or field blank sample. The acetone concentration was below its SSSL and ESV.

***Total Organic Carbon.*** The sediment sample was analyzed for TOC. The TOC concentration in the sample was 53.9 mg/kg, as summarized in Appendix G.

## 6.0 Summary, Conclusions, and Recommendations

IT Corporation, under contract to USACE, completed an SI at Range I, Parcel 201(7), at FTMC 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 Range I, Parcel 201(7), consisted of a geophysical survey and the sampling and analysis of ten surface soil samples, two depositional soil samples, ten subsurface soil samples, four groundwater samples, and one surface water/sediment sample. In addition, four permanent monitoring wells were installed in the saturated zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information.

The geophysical survey results did not indicate evidence of buried metal drums or munitions at the site.

Chemical analysis of samples collected at the site indicates that metals, VOCs, and SVOCs were detected in the environmental media sampled. Explosives, CWM breakdown products, and Lewisite breakdown products were not detected in any of the samples collected. Analytical results were compared to the 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).

Arsenic was detected at concentrations (49.2, 66, and 338 mg/kg) exceeding its SSSL (0.426 mg/kg), ESV (10 mg/kg), and upper background range (49 mg/kg) in three surface soil samples. In addition, the concentrations of chromium, iron, and vanadium exceeded their respective SSSLs and upper background ranges in subsurface soils. The elevated chromium, iron, and vanadium concentrations are probably not related to historical activities conducted at the site and likely reflect variations in naturally occurring levels of these metals. Arsenic, however, is clearly a site-related contaminant present at concentrations that require additional study. Therefore, IT recommends further investigation to determine the extent of arsenic contamination in surface soil at Range I, Parcel 201(7).

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