Final

Site Investigation Report
Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), consisted of the sampling and analysis of 27 surface soil samples, 12 subsurface soil samples, 5 surface water and sediment samples, and 14 groundwater samples. In addition, 9 permanent groundwater monitoring wells and 5 temporary wells were installed in the residuum groundwater zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information. As part of this investigation, IT incorporated data previously collected by QST Environmental, Inc. at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7).

The analytical results indicate that metals, volatile organic compounds (VOC), semivolatile organic compounds (SVOC), chlorinated pesticides, and polychlorinated biphenyls 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 impact to human receptors is expected to be minimal. Although the site is projected for recreational and industrial reuse, the soils and groundwater data were screened against residential human health SSSLs to evaluate the site for possible unrestricted future use. In soils, with the exception of iron in one sample, the metals that exceeded residential human health SSSLs were below their respective background concentrations or within the range of background values and thus do not pose an unacceptable risk to future human receptors. Several polynuclear aromatic hydrocarbon (PAH) compounds were detected in surface soil samples at concentrations exceeding SSSLs and PAH background values. However, the presence of PAH compounds is probably a result of anthropogenic conditions (i.e., asphalt pavement and a railroad spur) at the Contractor Laydown Area and Former Tar Plant.

In groundwater, several metals were detected in seven samples at concentrations exceeding SSSLs and background concentrations. However, these groundwater samples exhibited high turbidity at the time of sample collection that caused the elevated metals concentrations. Evaluation of six low-turbidity groundwater samples collected at the site indicates that metals have not adversely impacted groundwater.

The pesticide aldrin (0.000031 to 0.000055 milligrams per liter [mg/L]) exceeded its SSSL (0.0000039 mg/L) in three groundwater samples. Currently, there is no established U.S. Environmental Protection Agency (EPA) drinking water standard or lifetime health advisory value for aldrin. Human health risk estimated from the SSSL for aldrin, however, is within the EPA risk management range generally considered to be acceptable. Based on its low concentration and limited spatial distribution at the site, aldrin is not expected to pose an unacceptable human health risk.

Three metals (beryllium, mercury, and nickel) were detected in a limited number of surface soil and sediment samples at concentrations exceeding ESVs and the range of background values. In addition, PAHs, VOCs, pesticides, and one PCB compound exceeded ESVs in site media. However, the potential threat to ecological receptors is expected to be low based on site conditions. The site, which is located within the developed area of the Main Post, is mostly covered by asphalt and is surrounded by roads and buildings. The site does not support substantial ecological habitat.

Based on the results of the SI, past operations at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). QST prepared an SI work plan (QST, 1998) and conducted field activities in May 1998. QST collected soil, surface water, and sediment samples and installed five of 12 proposed temporary groundwater monitoring wells using direct-push technology (DPT). Seven of the DPT boreholes were dry and groundwater samples were not collected at these locations. Also, additional surface soil samples were required in the Former Tar Plant area to fully assess the potential contamination. Therefore, the USACE contracted IT to install and collect groundwater samples from nine permanent monitoring wells and to collect two additional surface soil samples at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7).

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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7).

1.1 Project Description

The Contractor Laydown Area and Former Tar Plant were identified as areas to be investigated prior to property transfer. The sites were classified as Category 7 sites in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

IT performed SI field activities 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 to collect 27 surface soil samples (2 by IT and 25 by QST), 12 subsurface soil samples (QST), 14 groundwater samples (9 by IT and 5 by QST), and 5 surface water/sediment samples (QST) to determine if potential site-specific chemicals are present at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7).

1.2 Purpose and Objectives

The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(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, ESVs, and polynuclear aromatic hydrocarbon (PAH) background values are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). The PAH background values were developed by IT at the direction of the BRAC Cleanup Team (BCT) to address the occurrence of PAH compounds in surface soils as a result of anthropogenic activities at FTMC. Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

Based on the conclusions presented in this SI report, the 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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), is located in the west-central portion of the FTMC Main Post (Figure 1-1). The Contractor Laydown Area

(Parcel 86[7]) is a rectangular parcel situated along a railroad spur north of Nautica Way (formerly 18th Street) and east of Waverly Road. The Former Tar Plant (Parcels 99[7] and 32[7]) is adjacent to the Contractor Laydown Area to the north (Figure 1-2).

Site elevation is approximately 800 feet above mean sea level. Cave Creek, an intermittent stream, is located along the site's northwestern border and flows to the west-southwest (Figure 1-2).

Contractor Laydown Area, Parcel 86(7). This site occupies approximately 10 acres and consists of open ground and asphalt bordered by woods to the east, the Former Tar Plant to the north, and Nautica Way to the west. A railroad spur transects the parcel northwest to southeast. The site was used for storing contractor equipment and supplies. From an unknown date until base closure, the site has been used for a variety of storage operations. Documented items that were stored here included:

- Paints, paint thinners (mineral spirits), and solvents (naphtha)
- Empty fog oil drums
- Drummed petroleum, oils, and lubricants (POL) and POL waste
- Five excavated underground storage tanks (UST)
- Gasoline pumps
- Creosote and pentachlorophenol (PCP)-treated telephone poles
- Landfarmed POL-contaminated soils
- Investigation-derived wastes (IDW)
- Coal for boiler plants.

Dates of storage for many of these items are undocumented (ESE, 1998).

Five excavated USTs were removed from other locations at FTMC and were stored at the Contractor Laydown Area from 1990 to 1993. During this period, the tanks remained uncovered and collected rainwater.

In the preliminary assessment prepared by Roy F. Weston in 1990, it was reported that POL-contaminated soils were landfarmed in the central area of the Contractor Laydown Area and fuel was observed leaking from the soil onto the asphalt. Soils were stained in the southeast corner of the site where fog oil drums were stored and in the northeast corner of the site where telephone poles treated with creosote and PCP were stored.

According to the EBS, no excavated USTs, fog oil drums, or landfarmed soil were reported present at the site (ESE, 1998). Treated telephone poles were stored on racks, and no significant surface soil staining was noted. No other information was available regarding site activities (ESE, 1998).

Former Tar Plant, Parcels 99(7) and 32(7). The Former Tar Plant (Parcel 99[7]) occupies approximately 2 acres and consists of open ground within a fenced storage area surrounding Building 4437. The parcel is bordered by woods to the north and east, Nautica Way to the west, and the Contractor Laydown Area to the south. A railroad spur originates behind Building 4437 and extends southeast into the Contractor Laydown Area. Facilities at the Former Tar Plant consisted of the boiler house (Building 4437), a tank for containing tar, steam piping, and a dispenser pipe. The volume of the tar tank is not known. Tar was heated using steam from the boiler plant and was transferred onto trucks via the dispenser pipe for application to roads at FTMC. Use of the Former Tar Plant ceased in the late 1960s. The tar tank has been removed, and only Building 4437 and steam piping remain at the site.

A confirmed release at this site was reported in the EBS. In the late-1960s, the tar tank was drained as a result of vandalism, and a large volume of tar flowed across the site, into Cane Creek, and reportedly off post. During the response to the release, a soil berm was built to contain as much tar as possible. The berm is still visible on the north side of the site between Building 4437 and Cane Creek. At the time of the EBS, the fenced storage area was being used to temporarily store electrical transformers (ESE, 1998).

Parcel 32(7) consists of a 2,500-gallon UST near Building 4437. This UST stored heating oil until its closure in 1991. A closure report for the 2,500-gallon UST was not available (ESE, 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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). Therefore, the parcels were classified as Category 7 CERFA sites: areas that are not evaluated or require further evaluation.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT and QST at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), including environmental sampling and analysis and groundwater monitoring well installation activities.

3.1 Environmental Sampling

The environmental sampling performed by IT and QST during the SI at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), included the collection of surface 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. Samples collected by IT are designated with the prefix "GSBP-86" or "GSBP-99," and samples collected by QST are designated with the prefix "SI09" or "SI10." 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

A total of 27 surface soil samples were collected during the SI at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). IT collected two surface soil samples, and QST collected 25 surface soil samples. Soil sampling locations and rationale are presented in Table 3-1. Sampling locations are shown on Figure 3-1. Sample designations and quality assurance/quality control (QA/QC) samples are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on the sampling rationale, presence of surface structures, site topography, and buried utilities.

IT Sample Collection. IT collected two surface soil samples at Parcel 99(7) from the upper 1 foot of soil using either DPT or a stainless-steel hand auger following the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000a). The soil collected in the sampler was screened with a photoionization detector (PID) in accordance with Section 4.7.1.1 of the SAP (IT, 2000a). The volatile organic compound (VOC) sample fraction was collected directly from the sampler with three EnCore® samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers.

The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3. The sample collection logs are included in Appendix A.

QST Sample Collection. QST collected 25 surface soil samples at Parcels 86(7), 99(7), and 32(7), from 0 to 1 foot below ground surface (bgs) with either DPT or a stainless-steel hand auger 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 a total of 12 subsurface soil samples at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), as shown in Figure 3-1. At the Contractor Laydown Area (Parcel 86[7]), QST collected eight subsurface soil samples from eight soil borings. At the Former Tar Plant (Parcels 99[7] and 32[7]), QST collected four subsurface soil samples from three soil borings. Two of the subsurface soil samples at the Former Tar Plant were collected from one boring (SI09-SS03). 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 the sampling rationale, presence of surface structures, site topography, and proximity to buried and overhead utilities.

QST contracted Graves Service Company, Inc. to complete the soil borings. QST collected subsurface soil samples at depths of 3 to 4 feet bgs (except SI09-SS03B, which was collected at 10 to 11 feet bgs) using a DPT sampling system in accordance with procedures outlined in the QST work plan (QST, 1998).

3.1.3 Well Installation

A total of 14 groundwater monitoring wells were installed at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), as shown on Figure 3-1. IT installed nine permanent groundwater monitoring wells, and QST installed five temporary groundwater monitoring wells. Table 3-3 summarizes construction details of the wells installed at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). The well construction logs are included in Appendix B.

IT Well Installation. IT installed seven permanent monitoring wells (in the residuum groundwater zone) at the Contractor Laydown Area and two permanent monitoring wells at the Former Tar Plant to collect groundwater samples for laboratory analysis.

IT contracted Miller Drilling, Inc. to install the wells with a hollow-stem auger rig at the locations shown on Figure 3-1. The wells were installed following procedures outlined in Section 4.7 and Appendix C of the SAP (IT, 2000a). The boreholes at these locations were advanced with a 4.25-inch inside diameter (ID) hollow-stem auger from ground surface to the first water-bearing zone in residuum. 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 constructed a lithological log for the 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 lithological logs for the boreholes are included in Appendix B.

Upon reaching the target depth in each borehole, a 10- or 15-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 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. 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 2 feet of bentonite pellets, was placed immediately on top of the sand pack and hydrated with potable water. If the bentonite seal was installed below the water table surface, the bentonite pellets were allowed to hydrate in the groundwater. The bentonite seal placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). The remaining annular space of the well was filled with 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.

The wells were developed by surging and pumping with a submersible pump in accordance with methodology outlined in Section 4.8 and Appendix C of the SAP (IT, 2000a). 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 continued until the water turbidity was equal to or less than 20 nephelometric turbidity units, until the well had been pumped dry and allowed to recharge repeatedly, or for a maximum of 8 hours. The well development logs are included in Appendix C.

QST Well Installation. QST installed a total of five temporary monitoring wells at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), using DPT. QST installed one well (in the residuum groundwater zone) at the Contractor Laydown Area and four wells at the Former Tar Plant. The temporary wells were installed in accordance with procedures outlined in the QST work plan (QST, 1998). Table 3-3 summarizes construction details of the wells installed by QST at the site. The well construction logs are included in Appendix B.

QST contracted Graves Service Company, Inc. to install the temporary wells at Parcels 86(7), 99(7), and 32(7) with DPT at the locations shown on Figure 3-1. The 1-inch diameter temporary wells were installed, purged, sampled, and removed within 24 hours. Initially, a 2-inch diameter borehole for each temporary well was installed using DPT. The 2-inch borehole was advanced up to 5 feet into the uppermost water-bearing zone. Soil descriptions were prepared by the QST geologist and are presented in Appendix B of this SI report. Upon reaching the target depth in each borehole, a 10-foot length of 1-inch (nominal) diameter Schedule 40 PVC slotted screen (0.010-inch) was attached to a 1-inch (nominal) PVC riser and lowered into the borehole. A sand pack consisting of 20/40 silica sand was placed into the annular space to the ground surface. A well cap was installed on top of the PVC well casing.

3.1.4 Water Level Measurements

The depth to groundwater was measured in the permanent wells installed by IT at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), on March 13, 2000, following procedures outlined in Section 4.18 of the SAP (IT, 2000a). Depth to groundwater was measured with an electronic water level meter. Measurements were referenced to the top of the well casing (Table 3-4).

3.1.5 Groundwater Sampling

IT and QST collected a total of 14 groundwater samples at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). At the Contractor Laydown Area, IT collected groundwater samples from seven permanent monitoring wells (GSBP-86-MW01 through GSBP-86-MW07) and QST collected a groundwater screening sample from one DPT temporary well (SI10-GWS01). At the Former Tar Plant, IT collected groundwater samples from two permanent monitoring wells (GSBP-99-MW01 and GSBP-99-MW02) and QST collected groundwater samples from four DPT temporary wells (SI09-GWS01 through SI09-GWS04). The well locations are shown on Figure 3-1. The groundwater sampling locations and rationale are listed in Table 3-1. The groundwater sample designations and QA/QC samples are listed in Table 3-5.

IT Sample Collection. Groundwater sample collection 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 (temperature, pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, and turbidity) stabilized. Purging and sampling were performed using either a Teflon™ bailer or a submersible 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 A. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.3.

QST Sample Collection. QST collected groundwater samples immediately following completion of well purging using a peristaltic pump and vacuum jar. Groundwater sample parameters were recorded for pH, conductivity, and temperature (turbidity, dissolved oxygen, and oxidation-reduction potential were not monitored). Field parameter readings are summarized in Table 3-6. QST sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.3.

3.1.6 Surface Water Sampling

QST collected two surface water samples at the Contractor Laydown Area and three surface water samples at the Former Tar Plant at the locations shown on Figure 3-1. The surface water sampling locations and rationale are listed in Table 3-1. The surface water sample designations are listed in Table 3-7. The sampling locations were determined in the field, based on drainage pathways and actual field observations.

Sample Collection. The surface water samples were collected in accordance with procedures specified in the QST work plan (QST, 1998). The samples were collected by dipping a clean sample container in the water until it was filled and then pouring the water into the appropriate sample containers. Surface water field parameters were recorded for specific conductivity, temperature, and pH, as summarized in Table 3-6. The sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.3.

3.1.7 Sediment Sampling

QST collected two sediment samples at the Contractor Laydown Area and three sediment samples at the Former Tar Plant. The sediment sampling locations are shown on Figure 3-1. Sediment sampling locations and rationale are presented in Table 3-1. The sediment sample designations are listed in Table 3-7. The sediment sampling locations were determined in the field, based on drainage pathways and actual field observations.

Sample Collection. QST sediment sample collection was conducted in accordance with procedures outlined in the QST work plan (QST, 1998). Sediment samples were collected with a stainless-steel spoon and placed on a piece of heavy-duty aluminum foil. Once enough sediment had been collected for the required analyses, the fraction for VOC analysis was immediately containerized. Following VOC sample collection, the remaining sediment was thoroughly mixed and then placed into the appropriate sample containers using a stainless-steel spoon. Sample collection logs are included in Appendix A. The sediment samples were analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.3.

3.2 Surveying of Sample Locations

IT 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 D.

QST surveyed sample locations 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 Universal Transverse Mercator or State Planar grid to within ±3 feet (±1 meter).

3.3 Analytical Program

Samples collected during the SI were analyzed for various chemical and physical parameters. The specific suite of analyses performed was based on the potential site-specific chemicals historically at the site and on EPA, ADEM, FTMC, and USACE requirements. Target analyses for samples collected at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), included:

- Target compound list VOCs – EPA Method 8260B
- Target compound list SVOCs – EPA Method 8270C
- Target analyte list metals – EPA Method 6010B/7000
- Chlorinated pesticides – EPA Method 8081A
- Polychlorinated biphenyls (PCB) – EPA Methods 8081A and 8082
- Total organic carbon (TOC) – EPA Method 9060
- Biological oxygen demand (BOD) – EPA Method 405.1 (surface water only).

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

3.4 Sample Preservation, Packaging, and Shipping

IT preserved, packaged, and shipped samples following 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 Chapter 5.0, Table 5-1, of Appendix B of the SAP. Sample documentation and chain-of-custody records were recorded as specified in Section 4.13 of the SAP. Completed analysis request and chain-of-custody records (Appendix A of this report) were secured and included with each shipment of sample coolers to Quanterra Environmental Services in Knoxville, Tennessee.

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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), was segregated as follows:

- Drill cuttings
- Purge water from well development, sampling activities, and decontamination fluids
- Spent well materials and 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 at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), were disposed as nonregulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

Liquid IDW was contained in the existing 20,000-gallon sump associated with the Building T-338 vehicle 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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7).

3.7 Data Quality

IT Data. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan; the FTMC SAP and quality assurance plan; and standard, accepted methods and procedures. Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 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. A summary of validated analytical data is included in Appendix E. A complete (100 percent) Level III data validation effort was performed on the reported analytical data. Appendix F includes data validation summary reports that discuss the results of the IT data validation. Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System™ (ITEMS™) database for tracking and reporting.

QST Data. QST data were submitted to the Installation Restoration Data Management Information System (IRDMIS) database at the conclusion of SI 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 ITEMS database.

The field sample analytical data are presented in tabular form in Appendix E. QST hard-copy analytical data packages were validated during a complete (100 percent) Level III data validation effort. Appendix F includes data validation summary reports that discuss 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.

After the QST data validation was complete and the results were updated, the IT and QST data were merged using ITEMS for inclusion in this SI report. The qualified data were used in the comparisons to the SSSLs and ESVs developed by IT. The IT and 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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), provided soil, geologic, and groundwater data used to characterize the geology and hydrogeology 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 consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper, undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated, greenish-gray and black mudstone makes up the Nichols Formation, with thin interbeds of siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies 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 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 shales, with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale on the basis of fossil data.

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

4.1.2 Site Geology

The soils mapped at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), consist of Rarden silty clay loam (ReB3), shallow, 2 to 6 percent slopes. The Rarden series consists of moderately well drained, strongly acidic soils that generally occur in large areas on wide shale ridges. They have developed from the residuum of shale and fine-grained platy sandstone or limestone. Concretions and fragments of sandstone (up to 0.5-inch in diameter) are commonly found within the soil (U.S. Department of Agriculture, 1961).

The Contractor Laydown Area and Former Tar Plant site is situated less than one mile west of the Jacksonville Fault. Bedrock beneath the site is primarily mapped as Mississippian/Ordovician Floyd and Athens shale, undifferentiated, although a small portion of the northern end of the site is underlain by Quaternary Alluvium. The area to the east of the site (east of the fault) is underlain by the Cambrian Shady Dolomite. Figure 4-1 is a geologic map showing the bedrock units in the vicinity of the site.

Based on DPT and hollow-stem auger boring data collected during the SI, residuum beneath the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), consists of predominantly silt and clay with some sand and gravel overlying weathered shale. Competent bedrock was not encountered during drilling. A geologic cross section (Figure 4-2) depicts the subsurface units along a line tending northwest to southeast between monitoring wells GSBP-99-MW02 and GSBP-86-MW07.

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 (U.S. Department of Commerce, 1998). The major surface water features at the Main Post of FTMC include Remount Creek, Cane Creek, and Cave Creek. These waterways flow in a general northwest to westerly direction towards the Coosa River on the western boundary of Calhoun County.

Surface runoff at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), follows the general topography and flows to the northwest into Cave Creek, which flows to the west-southwest.

4.2.2 Hydrogeology

On March 13, 2000, static groundwater levels were measured in the permanent monitoring wells installed by IT at the site (Table 3-4). As shown on Figure 4-3, groundwater flow at the site is predominantly to the west-northwest.

During boring and well installation activities, groundwater was encountered in residuum at depths ranging from 3 to 35.5 feet bgs. The static groundwater levels measured in the monitoring wells (Table 3-4) were approximately 0.5 to 30 feet above the depth-to-water data from the corresponding boring logs. This indicates that the groundwater has an upward hydraulic gradient and is under semiconfined conditions.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), indicate that metals, VOCs, SVOCs, chlorinated pesticides, and PCBs were detected in the various site media. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

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 G. Additionally, PAH concentrations in surface soils that exceeded SSSLs and ESVs were compared to PAH background screening values. The PAH background screening values were derived from PAH analytical data from 18 parcels at FTMC that were determined to represent anthropogenic activity (IT, 2000b). PAH background screening values were developed for two categories of surface soils: beneath asphalt and adjacent to asphalt. The PAH background screening values for soils adjacent to asphalt are the more conservative (i.e., lower) of the PAH background values and are the values used herein for comparison.

Six compounds were quantified by both SW-846 Method 8260B (as 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 (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 through 5-5 summarize the results of the comparisons of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix E.

5.1 Surface Soil Analytical Results

Twenty-seven surface soil samples were collected for chemical analysis at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(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 background screening values (metals and PAHs), as presented in Table 5-1.

Metals. Twenty-two metals were detected in surface soil samples collected at Parcels 86(7), 99(7), and 32(7). Two mercury results and two thallium results were flagged with a "B" data qualifier, signifying that these metals were also detected in an associated laboratory or field blank sample.

The concentrations of aluminum (at three locations), arsenic (27 locations), manganese (four locations), iron (27 locations), and thallium (six locations) exceeded SSSLs. With the exception of iron and manganese at one location (GSBP-99-GP01), the concentrations of these metals were below their respective background concentrations. The iron and manganese results at this location were within the range of background values determined by SAIC (1998) (Appendix G).

The concentrations of 14 metals (aluminum, arsenic, barium, beryllium, chromium, cobalt, iron, lead, manganese, mercury, nickel, thallium, vanadium, and zinc) exceeded ESVs. Of these metals, the concentrations of barium (in one sample), beryllium (three samples), iron (one sample), lead (one sample), mercury (one sample), nickel (one sample), and zinc (two samples) also exceeded their respective background concentrations. With the exception of the beryllium and nickel results, these metals concentrations were within the range of background values established by SAIC (Appendix G).

Volatile Organic Compounds. Seventeen VOCs were detected in surface soil samples collected at the site. One of the acetone and several methylene chloride results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample.

VOC concentrations in surface soils were below SSSLs. The concentrations of 1,1,2,2-tetrachloroethane (three locations), chloroform (two locations), ethylbenzene (one location), tetrachloroethene (15 locations), toluene (one location), trichloroethene (14 locations), and total xylene (four locations) exceeded ESVs. At two locations (SI09-SS06 and SI10-SS01) where 1,1,2,2-tetrachloroethane concentrations exceeded the ESV, the results were qualified with an "R" flag, indicating the results were rejected in data validation. More information about the data qualifiers assigned is found in the data validation report (Appendix F).

Semivolatile Organic Compounds. Twenty SVOCs, including sixteen PAH compounds, were detected in surface soil samples collected at Parcels 86(7), 99(7), and 32(7). SVOCs were not detected at two sample locations, and bis(2-ethylhexyl)phthalate was the only detected SVOC at four additional locations. SVOC data for 10 of 25 surface soil samples collected by QST on May 13, 1998, were rejected during the data validation process due to laboratory extraction errors. These errors were evidenced by the low percent recoveries of spiked compounds in the associated laboratory control samples which indicates a possible low bias in the reported sample concentrations. More information about the data validation qualifiers assigned is found in the data validation report (Appendix F). Sample locations with rejected data are distributed across the parcels.

PAH concentrations exceeded SSSLs in 18 of 25 surface soil sample locations. At these 18 locations, 10 samples contained rejected data which indicate the results may be biased low. At nine sample locations (GSBP-99-GP02, SI09-SS02, SI09-SS07, SI09-SS08, SI09-SS09, SI10-SS01, SI10-SS08, SI10-SS10, and SI10-SS13), the concentrations of one or more of five PAH compounds (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]-anthracene, and indeno[1,2,3-cd]pyrene) exceeded both SSSLs and PAH background values.

PAH concentrations exceeded ESVs in 17 of 25 surface soil sample locations, of which 10 samples contain rejected data, indicating the results may be biased low. At 16 of the 17 locations, one or more of nine PAH compounds (acenaphthene, anthracene, benzo[a]anthracene, benzo[b]pyrene, chrysene, fluoranthene, naphthalene, phenanthrene, and pyrene) also exceeded PAH background values.

Pesticides/PCBs. The ten surface soil samples collected at the Former Tar Plant, Parcels 99(7) and 32(7), were analyzed for PCBs but not pesticides. The 17 surface soil samples collected at the Contractor Laydown Area, Parcel 86(7), were analyzed for both pesticides and PCBs. PCB Aroclor 1260 was detected in two surface soil samples at concentrations below its SSSL but exceeding its ESV in one sample (SI09-SS01A).

A total of eight pesticides were detected in five of the 17 surface soil samples collected at the Contractor Laydown Area, Parcel 86(7). Pesticides were not detected in the remaining samples. Pesticide concentrations in surface soils were below SSSLs. The concentrations of five pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, and endrin) exceeded ESVs in one sample each. The concentrations of the pesticides that exceeded ESVs ranged from 0.003 to 0.0154 mg/kg.

Total Organic Carbon. Six of the surface soil samples (GSBP-99-GP01, GSBP-99-GP02, SI09-GWS02, SI10-SS03, SI10-SS04, and SI10-SS08) were analyzed for TOC content. TOC concentrations in the samples ranged from 769 to 24,900 mg/kg, as presented in Appendix E.

5.2 Subsurface Soil Analytical Results

Twelve subsurface soil samples were collected for chemical analysis at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-2.

Metals. Twenty-two metals were detected in subsurface soil samples collected at Parcels 86(7), 99(7), and 32(7). The concentrations of six metals (aluminum, arsenic, chromium, iron, manganese, and thallium) exceeded SSSLs. Of these metals, aluminum (three locations), iron (one location), and thallium (one location) also exceeded their respective background concentrations. With the exception of iron in one sample (SI10-SS08), these metals results were within the range of background concentrations (Appendix G).

Volatile Organic Compounds. Fifteen VOCs were detected in subsurface soil samples collected at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). Two methylene chloride results were flagged with a "B" data qualifier, signifying that this compound was also detected in an associated laboratory or field blank sample. VOC concentrations in the subsurface soil samples ranged from 0.00044 to 0.465 mg/kg.

The VOC concentrations in subsurface soils were below SSSLs.

Semivolatile Organic Compounds. Eighteen SVOCs, including 15 PAH compounds, were detected in subsurface soil samples collected at Parcels 86(7), 99(7), and 32(7). SVOCs were not detected in one sample (SI09-SS03), and bis(2-ethylhexyl)phthalate was the only detected SVOC in eight additional samples. Sample location SI09-SS03 contained 17 of the 18 detected SVOCs. SVOC data for five of the 12 subsurface soil samples collected by QST on May 13, 1998, were rejected during the data validation process due to laboratory extraction errors. These errors were evidenced by the low percent recoveries of spiked compounds in the associated laboratory control samples, which indicates a possibly-low bias in the reported sample concentrations. More information about the data validation qualifiers assigned is presented in the data validation report (Appendix F). Sample locations with rejected data are distributed across the parcels.

With the exception of benzo(a)pyrene in one sample, the SVOC results were below SSSLs. The benzo(a)pyrene concentration (0.209 mg/kg) exceeded the SSSL (0.085 mg/kg) in sample SI09-SS03.

Total Organic Carbon. Seven of the subsurface soil samples (SI09-GWS02, SI09-SS03, SI10-SS01, SI10-SS02, SI10-SS03, SI10-SS04, and SI10-SS08) were analyzed for TOC content. TOC concentrations in the samples ranged from 1,800 to 37,800 mg/kg, as summarized in Appendix E.

5.3 Groundwater Analytical Results

A total of 14 groundwater samples were collected at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), 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 5-3.

Metals. Twenty-two metals were detected in groundwater samples collected at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). Two sample locations (GSBP-86-MW02 and GSBP-86-MW03) each contained 20 of the 22 detected metals. Four locations (SI09-GWS02, SI09-GWS03, SI09-GWS04, and SI10-GWS01) contained 17, 18, 18, and 17 metals, respectively, of the 22 detected metals. One sample (SI09-GWS01) was only analyzed for mercury because of limited groundwater sample volume.

Several metals were detected in seven of the groundwater samples at concentrations exceeding SSSLs and background concentrations. Four samples with elevated metals concentrations were collected from 1-inch DPT wells. Because DPT well construction uses a limited amount of filter-pack sand in the annular space of the well, adequate filtration does not occur in soils with fine-grained silt and clay particles. Although purge records from these wells did not indicate turbidity levels, it is suspected that the groundwater samples collected from these wells had high turbidity at the time of sample collection that caused the elevated metals concentrations Three of the remaining samples with high metals concentrations were collected from permanent monitoring wells that had elevated turbidity measurements (200 nephelometric turbidity units [NTU] to greater than 1,000 NTUs) at the time of the sample collection. The effect of high turbidity on metals concentrations in groundwater has been previously demonstrated in a groundwater resampling study conducted by IT at FTMC (IT, 2000c) (Appendix H).

Groundwater samples from six of the permanent wells had turbidity measurements less than 20 NTUs. In these samples, only manganese (three locations) and thallium (GSBP-99-MW02) were detected at concentrations exceeding their SSSLs and background concentrations. The thallium result exceeded the range of background values determined by SAIC (1998) (Appendix G).

Volatile Organic Compounds. Eleven VOCs were detected in groundwater samples collected at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). VOCs were not detected in three samples; acetone and/or methylene chloride, both of which are common laboratory contaminants, were the only detected VOCs in six additional samples. Nine of the 10 acetone results and all four 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. Sample location SI09-GWS02 contained six of the 11 detected VOCs. VOC concentrations in the groundwater samples ranged from 0.00011 to 0.295 micrograms per liter (mg/L).

VOCs concentrations in groundwater were below SSSLs, except the acetone, bromomethane, and chloromethane concentrations detected in sample SI09-GWS02. Acetone, bromomethane, and chloromethane are likely laboratory contaminants.

Semivolatile Organic Compounds. A total of four SVOCs, including two PAH compounds, were detected in three of the groundwater samples collected at the site. SVOCs were not detected in the other groundwater samples collected.

The SVOC concentrations in groundwater were below SSSLs.

Pesticides. The eight groundwater samples collected at the Contractor Laydown Area, Parcel 86(7), were analyzed for pesticides. A total of six pesticides (4,4'-DDD, aldrin, endosulfan I, endosulfan sulfate, endrin ketone, and delta-BHC) were detected in three of the eight groundwater samples. The analytical results were flagged with a "J" data qualifier, indicating that the compounds were positively identified but the concentrations were estimated. Each of the detected pesticides was present in the sample collected at GSBP-86-MW03. The pesticide concentrations in the three samples ranged from 0.000014 to 0.000055 mg/L.

With the exception of aldrin, the pesticide concentrations in groundwater were below SSSLs. Aldrin concentrations (0.000031 to 0.000055 mg/L) exceeded the SSSL (0.0000039 mg/L) in each of the three samples.

5.4 Surface Water Analytical Results

Five surface water samples were collected for chemical analysis at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), at the sample locations shown on Figure 3-1. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-4.

Metals. Fifteen metals were detected in the surface water samples collected at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). The metals concentrations in surface water were below SSSLs. Aluminum, barium, iron, lead, and manganese concentrations exceeded ESVs but were below their respective background concentrations.

Volatile Organic Compounds. Acetone and methylene chloride were detected in the surface water samples at concentrations below SSSLs and ESVs. All reported results were flagged with a "B" qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample.

Semivolatile Organic Compounds. The two surface water samples collected at the Contractor Laydown Area (Parcel 86[7]) were analyzed for SVOCs. Two SVOCs were detected, di-n-butylphthalate and bis(2-ethylhexyl)phthalate. These results were flagged with a "B" qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. The bis(2-ethylhexyl)phthalate results were below the SSSL but exceeded the ESV in both samples.

Pesticides. The two surface water samples collected at the Contractor Laydown Area (Parcel 86[7]) were analyzed for pesticides. The pesticide 4,4'-DDT was detected in one surface water sample (SI10-SW02) at a concentration below its SSSL but exceeding its ESV.

Biological Oxygen Demand. The BOD in sample SI09-SW02 was 2.5 mg/L, as summarized in Appendix E.

5.5 Sediment Analytical Results

Five sediment samples were collected for chemical analysis at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). Samples were collected from the upper 0.5-foot of sediment at the sample locations shown on Figure 3-1. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-5.

Metals. Nineteen metals were detected in sediment samples collected at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). Each of the detected metals was present in the two samples collected at the Contractor Laydown Area, Parcel 86(7). Seventeen of nineteen detected metals were present in sediment samples SI09-SED02 and SI09-SED03. Eighteen of nineteen metals were detected in sediment sample SI09-SED01.

The metals concentrations in sediments were below SSSLs. The concentrations of arsenic, copper, mercury, and nickel exceeded ESVs. All of these concentrations, with the exception of arsenic in one of the samples (SI09-SED03), were above their respective background screening values. Except for the concentrations of two metals, mercury (SI10-SED01 and SI10-SED02) and nickel (SI09-SED02), all of the values were within the range of background values (Appendix G).

Volatile Organic Compounds. Twelve VOCs were detected in sediment samples collected at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). Two sediment samples (SI09-SED02 and SI09-SED03) each contained 11 of the 12 detected VOCs. VOC concentrations in the sediment samples ranged from 0.00055 to 0.396 mg/kg.

VOC concentrations in the sediment samples were below SSSLs and ESVs.

Semivolatile Organic Compounds. Eighteen SVOCs, including fifteen PAH compounds, were detected in sediment samples collected at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7). Seventeen of the eighteen detected SVOCs were present in each of the samples collected at SI09-SED02 and SI09-SED03. SVOC data for the three sediment samples collected by QST on May 13, 1998 at Parcel 99(7) were rejected during the data validation process as a result of laboratory extraction errors. These errors were evidenced by the low percent recoveries of spiked compounds in the associated laboratory sample concentrations. More information about the data validation qualifiers assigned is found in the data validation report (Appendix F).

SVOC concentrations in sediments were below SSSLs. The concentrations of several PAH compounds exceeded ESVs in four of the samples.

Pesticides/PCBs. The two sediment samples collected at the Contractor Laydown Area, Parcel 86(7), were analyzed for both PCBs and pesticides. The three sediment samples collected at the Former Tar Plant, Parcels 99(7) and 32(7), were analyzed for PCBs but not pesticides. PCB Aroclor 1260 was detected in two sediment samples at concentrations below its SSSL but exceeding its ESV in one sample (SI09-SED01).

Three pesticides (4,4'-DDD, 4,4'-DDE, and 4,4'-DDT) were detected in one sediment sample (SI10-SED02) at concentrations below SSSLs. The 4,4'-DDD concentration, however, exceeded its ESV.

6.0 Summary, Conclusions, and Recommendations

IT, under contract with the USACE, completed an SI at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), consisted of the sampling and analysis of 27 surface soil samples, 12 subsurface soil samples, 5 surface water and sediment samples, and 14 groundwater samples. In addition, 9 permanent groundwater monitoring wells and 5 temporary wells were installed in the residuum groundwater zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information. As part of the investigation, IT incorporated data previously collected by QST at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7).

Chemical analysis of samples collected at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7), indicates that metals, VOCs, SVOCs, chlorinated pesticides, and PCBs were detected in the various 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), and PAH concentrations in surface soils were compared to PAH background values (IT, 2000b).

The potential impact to human receptors is expected to be minimal. Although the site is projected for recreational and industrial reuse, the soils and groundwater data were screened against residential human health SSSLs to evaluate the site for possible unrestricted future use. In soils, with the exception of iron in one sample, the metals that exceeded residential human health SSSLs were below their respective background concentrations or within the range of background values and thus do not pose an unacceptable risk to future human receptors. Several PAH compounds were detected in surface soils at concentrations exceeding SSSLs and PAH background values. However, the presence of PAH compounds was probably the result of anthropogenic conditions at the Contractor Laydown Area and Former Tar Plant. Much of the site is covered by asphalt. In addition, a railroad spur runs through the site. VOC, pesticide, and PCB concentrations in soils were below SSSLs.

In groundwater, several metals were detected in seven samples at concentrations exceeding SSSLs and background concentrations. However, these groundwater samples exhibited high turbidity at the time of sample collection that caused the elevated metals concentrations. Evaluation of six low-turbidity groundwater samples collected at the site indicates that metals have not adversely impacted groundwater.

The pesticide aldrin (0.000031 to 0.000055 mg/L) exceeded its SSSL (0.0000039 mg/L) in three groundwater samples. Currently, there is no established EPA drinking water standard or lifetime health advisory value for aldrin. Human health risk estimated from the SSSL for aldrin, however, is within the EPA risk management range generally considered to be acceptable. Based on its low concentration and limited spatial distribution at the site, aldrin is not expected to pose an unacceptable human health risk.

Three metals (beryllium, mercury, and nickel) were detected in a limited number of surface soil and sediment samples at concentrations exceeding ESVs and the range of background values. In addition, PAHs, VOCs, pesticides, and one PCB compound exceeded ESVs in site media. However, the potential threat to ecological receptors is expected to be low based on site conditions. The site, which is located within the developed area of the Main Post, is mostly covered by asphalt and is surrounded by roads and buildings. The site does not support substantial ecological habitat.

Based on the results of the SI, past operations at the Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(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 Contractor Laydown Area and Former Tar Plant, Parcels 86(7), 99(7), and 32(7).

7.0 References

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

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

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

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

IT Corporation (IT), 2000c, Letter to Ellis Pope (USACE) from Jeanne Yacoub (IT), "Groundwater Resampling Results", August 7.

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

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

Osborne, W. E., 1999, Personal Communication with John Hofer (IT), November 16.

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

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

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

QST Environmental Inc. (QST), 1998, ***Final Site Investigation Work Plan, Fort McClellan, Alabama***, March.

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

Szabo, M. W., Osborne, W. E., Copeland, C. W., Jr., and Neathery, T. L., compilers, 1988, ***Geologic Map of Alabama***, Alabama Geological Survey Special Map 220, scale 1:250,000, 5 sheets.

U.S. Army Corps of Engineers (USACE), 1994, ***Requirements for the Preparation of Sampling and Analysis Plans***, Engineer Manual EM 200-1-3, September.

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

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

Warman, J. C, and Causey, L. V., 1962, ***Geology and Ground-Water Resources of Calhoun County, Alabama***, Alabama Geological Survey County Report 7, 77 p.