Final

Site Investigation Report
Former Printing Plant, Building 2051, Parcel 173(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 the Former Printing Plant, Building 2051, Parcel 173(7) at Fort McClellan, Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the Former Printing Plant, Building 2051, Parcel 173(7) and, if present, whether the concentrations would present an unacceptable risk to human health or the environment. The SI at the Former Printing Plant, Building 2051, Parcel 173(7), consisted of the sampling and analyses of surface soil samples, subsurface soil samples, groundwater samples, and a depositional soil sample. In addition, two temporary groundwater monitoring wells were installed in the residuum groundwater zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information.

IT collected one depositional soil sample, three surface soil samples, three subsurface soil samples, and two groundwater samples during the SI at the Former Printing Plant, Building 2051, Parcel 173(7). The analytical results indicate that metals, volatile organic compounds (VOC), and semivolatile organic compounds (SVOC) were detected in the environmental media sampled. The analytical results were compared to human health site-specific screening levels (SSSL) and ecological screening values (ESV) developed by IT as part of the human health and ecological risk evaluations associated with SIs being performed under the Base Realignment and Closure Environmental Restoration Program at FTMC. Additionally, metals results exceeding the SSSLs and ESVs were compared to media-specific background metals concentrations, and SVOC concentrations exceeding SSSLs and ESVs in surface soils and depositional soils were compared to polynuclear aromatic hydrocarbon background screening values developed for FTMC.

Ten metals were detected at one groundwater sample location at concentrations exceeding both SSSLs and background concentrations; however, these results were from a water sample with elevated turbidity. The well was resampled in July 2000 as part of a groundwater resampling study to evaluate the effect of elevated turbidity on metals concentrations. The turbidity of the sample was reduced below 10 nephelometric turbidity units using the low-flow sample technique. The resampled analytical results indicate that nine previously detected metals were not detected, and that of the remaining metals detected, only iron was present at a concentration exceeding SSSLs. No metals exceeded background concentrations in the resampled well. VOCs

and SVOCs were not detected in groundwater samples at concentrations exceeding residential human health SSSLs.

The potential impact to human receptors is expected to be minimal. The metals that exceeded residential human health SSSLs were within background concentrations or the range of background values, and thus do not pose an unacceptable risk to future human receptors. SVOCs and VOCs were not detected in any samples at concentrations exceeding residential human health SSSLs. Although the site is projected for industrial land use, screening against the more conservative residential human health SSSLs indicates that the potential threat to human health would be very low in the residential scenario.

Several metals were detected in site media at concentrations exceeding ESVs and background concentrations. In addition, two SVOCs exceeded ESVs. However, the potential impact to ecological receptors is expected to be minimal based on the existing viable habitat. The site is a well-developed area and is projected for continued industrial use. Viable ecological habitat is presently limited and is not expected to increase in the future land-use scenario. Consequently, the threat to potential ecological receptors is expected to be low.

Based on the results of the SI, past operations at the Former Printing Plant, Building 2051, Parcel 173(7), do not appear to have adversely impacted the environment. The metals and organic compounds detected in site media do not pose an unacceptable risk to human health or the environment in either the industrial or residential land-use scenario. Therefore, IT recommends "No Further Action" and unrestricted reuse with regard to hazardous, toxic, and radioactive waste, at the Former Printing Plant, Building 2051, Parcel 173(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 has contracted with IT Corporation (IT) to perform the site investigation (SI) at the Former Printing Plant, Building 2051, Parcel 173(7), through Prime Contract Number DACA21-96-D-0018, Task Order CK05.

This SI report has been prepared to present specific information and results compiled from the SI, including field sampling and analysis and monitoring well installation activities conducted at the Former Printing Plant, Building 2051, Parcel 173(7).

1.1 Project Description

The Former Printing Plant, Building 2051, Parcel 173(7), was identified as an area to be investigated prior to property transfer. The Former Printing Plant, Building 2051, Parcel 173(7), was identified as a Category 7 site in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

A site-specific field sampling plan (SFSP) attachment and a site-specific safety and health plan (SSHP) attachment were finalized in December 1998 (IT, 1998a). The SFSP and SSHP were prepared to provide technical guidance for sample collection and analysis at the Former Printing Plant, Building 2051, Parcel 173(7). The SFSP was used in conjunction with the SSHP as attachments to the installation-wide work plan (IT, 1998b), and the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan and quality assurance plan (QAP).

The SI included field work to collect one depositional soil sample, three surface soil samples, three subsurface soil samples, and two groundwater samples to determine if potential site-specific chemicals (PSSC) are present at the Former Printing Plant, Building 2051, Parcel 173(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 Former Printing Plant, Building 2051, Parcel 173(7) at concentrations that would present an unacceptable risk to human health or the environment. The conclusions of the SI in Section 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 screening values are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). The PAH background screening values were developed by IT at the direction of the 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 BRAC Cleanup Team will decide to propose "No Further Action" at the site or to conduct additional work at the site.

1.3 Site Description and History

The Former Printing Plant, Building 2051, Parcel 173(7), is located in the west-central portion of Main Post (Figure 1-1). The site is on the corner of 10th Avenue and 20th Street (Figure 1-2). This building is one of four former printing plants at FTMC. Printing operations moved to this building in 1974 from Building 144, and remained through 1975. Printing operations were reportedly conducted in the basement; however, during an October 1998 site visit, IT observed that this building does not have a basement. This building is not currently occupied. Spills or releases are not known to have occurred at this site, and this site is unevaluated. The building has approximately 17,500 feet of floor space and has been adapted for current use as an administration building.

The building is situated on a paved lot at approximately 775 feet elevation (a knoll or rise) that slopes primarily to the east (Figure 1-2). Cane Creek is located approximately 700 feet to the northeast. South Branch Cane Creek is located approximately 700 feet to the west, and joins

Cane Creek at the southern end of the golf course. Cane Creek flows in a northwesterly direction near the site. There are double doors and single doors along both sides of the building, a loading platform at the rear of the building, and a loading ramp on the west end (southwest corner). There are small grassy areas at both ends immediately adjacent to the building. A small offset room or shed is attached to the front of the building just west of center. Stains and surface water runoff patterns were evident on the front parking lot leading toward the lowest point on the parcel which is the northeast corner. A stormwater drain located on the southeast corner appears to collect runoff water from near the building, loading platform, and the rear parking lot.

This parcel is covered with soils from the Montevallo Series which consists of shallow, well-drained, strongly acid soils (U.S. Department of Agriculture, 1961). These soils are fairly extensive in the northern part, but occur throughout the county. They have developed in the residuum of interbedded shale and fine-grained sandstone or limestone. Where these soils are not eroded, the surface soil is very dark grayish-brown to very dark brown shaly silt loam. The subsoil is yellowish-brown shaly silt loam. Fragments of shale less than 2 inches square are commonly on and in the soil. There are some eroded places. Runoff, internal drainage, and permeability are rapid. Infiltration is medium. The capacity for available moisture is low. The specific soil type from the Montevallo Series at this site is Montevallo shaly silty clay loam, 10 to 40 percent slopes, severely eroded (MtD3). This type has more runoff and more severe erosion.

2.0 Previous Investigations

ESE conducted an EBS to document current environmental conditions of all FTMC property (ESE, 1998). The study identified sites that, based on available information, have no history of contamination and comply with DOD guidance on 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, Alabama Department of Environmental Management (ADEM), U.S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historic maps and aerial photographs were reviewed to document historic land uses. Personal and telephone interviews of past and present FTMC employees and military

personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels. The Former Printing Plant, Building 2051, Parcel 173(7), was identified as a Category 7 CERFA parcel: areas that are not evaluated or require additional evaluation. Previous environmental studies have not been conducted at this site.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT at the Former Printing Plant, Building 2051, Parcel 173(7), including environmental sampling and analysis and groundwater monitoring well installation.

3.1 Environmental Sampling

The environmental sampling performed during the SI at the Former Printing Plant, Building 2051, Parcel 173(7), included the collection of one depositional soil sample, three surface soil samples, three subsurface soil samples, and two groundwater samples for chemical analysis. The sample locations were determined by observing site physical characteristics noted 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 were submitted for laboratory analyses of site-related parameters listed in Section 3.3.

3.1.1 Surface and Depositional Soil Sampling

Surface soil samples were collected from three locations and a depositional soil sample was collected from one location at the Former Printing Plant, Building 2051, Parcel 173(7), as shown on Figure 3-1. Surface soil and depositional soil sampling locations and rationale are presented in Table 3-1. Surface soil and depositional soil sample designations and quality assurance/quality control (QA/QC) samples are listed in Table 3-2. Surface soil and depositional 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 and overhead utilities.

Sample Collection. Surface soil and depositional soil samples were collected from the upper 1 foot of soil with a 3-inch diameter stainless-steel hand auger using the methodology specified in Section 4.9 of the SAP (IT, 2000a). Surface soil and depositional soil samples were collected by first removing surface debris, such as rocks and vegetation, from the immediate sample area. At sample locations PPMP-173-GP02 and PPMP-173-GP03, a small section of pavement and subpavement were cut and removed before the samples were collected. The soil was collected with the sampling device and screened with a photoionization detector (PID) in accordance with Section 4.7.1.1 of the SAP (IT, 2000a). Samples for volatile organic compound (VOC) analyses were collected directly from the sampler with three EnCore® samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3. Sample collection logs are included in Appendix A.

Table 3-1

Sampling Locations and Rationale
Former Printing Plant, Building 2051, Parcel 173(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
PPMP-173-GP01	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil, and groundwater samples were collected at the northeast end of the building for downgradient coverage to determine if site-specific contaminants are present.
PPMP-173-GP02	Surface Soil Subsurface Soil	Surface soil and subsurface soil samples were collected at the drain on the southeast corner of the building to determine if site-specific contaminants are present via runoff.
PPMP-173-GP03	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil, and groundwater samples were collected at the southwest corner of the building near the ramp to determine if site-specific contaminants are present via runoff and percolation.
PPMP-173-DEP01	Depositional Soil	A depositional soil sample was collected approximately 70 feet to the southeast of the drain at the southeast corner of the building to determine if site-specific contaminants are present in sediments via runoff.

Table 3-2

Depositional Soil, Surface Soil, and Subsurface Soil Sample Designations and QA/QC Samples
Former Printing Plant, Building 2051, Parcel 173(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
PPMP-173-DEP01	PPMP-173-DEP01-DEP-KF0009-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals
PPMP-173-GP01	PPMP-173-GP01-SS-KF0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals
	PPMP-173-GP01-DS-KF0002-REG	5-7	PPMP-173-GP01-DS-KF0003-FD	PPMP-173-GP01-DS-KF0004-FS		
PPMP-173-GP02	PPMP-173-GP02-SS-KF0005-REG	0-1			PPMP-173-GP02-SS-KF0005-MS	TCL VOCs, TCL SVOCs, TAL Metals
	PPMP-173-GP02-DS-KF0006-REG	1-3			PPMP-173-GP02-SS-KF0005-MSD	
PPMP-173-GP03	PPMP-173-GP03-SS-KF0007-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals
	PPMP-173-GP03-DS-KF0008-REG	10-12				

FD - Field duplicate.
FS - Field split.
ft bgs - Feet below ground surface.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

3.1.2 Subsurface Soil Sampling

Subsurface soil samples were collected from three soil borings at the Former Printing Plant, Building 2051, Parcel 173(7), at the locations shown on Figure 3-1. Subsurface sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations, depths, and QA/QC samples are listed in Table 3-2. Soil boring sampling locations were determined in the field by the on-site geologist based on the sampling rationale, presence of surface structures, site topography, and buried and overhead utilities. IT contracted TEG, Inc., a direct-push technology subcontractor, to assist in subsurface soil sample collection.

Sample Collection. Subsurface soil samples were collected from soil borings at a depth greater than 1 foot below ground surface (bgs) in the unsaturated zone. The soil borings were advanced and soil samples collected using the direct-push sampling procedures specified in Section 4.9.1.1 of the SAP (IT, 2000a). Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3.

Soil samples were collected continuously to 12 feet bgs or until direct-push sampler refusal was encountered. Subsurface soil samples were field screened using a PID in accordance with Section 4.7.1.1 of the SAP (IT, 2000a) to measure samples for volatile organic vapors. The sample showing the highest reading was selected and sent to the laboratory for analysis; however, at those locations where PID readings were not greater than background, the deepest sample interval above groundwater was submitted for analyses. Samples to be analyzed for VOCs were collected directly from the sampler with three EnCore® samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. Samples submitted for laboratory analyses are summarized in Table 3-2. The on-site geologist at each borehole constructed a detailed lithological log. The lithological log for each borehole is included in Appendix B.

At the completion of soil sampling, borehole PPMP-173-GP03 was abandoned with bentonite chips and hydrated with potable water following borehole abandonment procedures summarized in Appendix B of the SAP (IT, 2000a).

3.1.3 Well Installation

Two temporary wells were installed in the residuum groundwater zone at the Former Printing Plant, Building 2051, Parcel 173(7), to collect groundwater samples for laboratory analyses. The well/groundwater sample locations are shown on Figure 3-1. Table 3-3 summarizes construction

Table 3-3

Temporary Well Construction Summary
Former Printing Plant, Building 2051, Parcel 173(7)
Fort McClellan, Calhoun County, Alabama

Temporary Well	Northing	Easting	Ground Elevation (ft msl)	TOC Elevation (ft msl)	Screen Length (ft)	Screen Interval (ft bgs)	Well Material
PPMP-173-GP01	1169879.716	670240.670	784.42	785.88	15	8.75 - 23.75	2" ID Sch. 40 PVC
PPMP-173-GP03	1169706.483	669988.893	787.70	787.47	15	9.75 - 24.75	2" ID Sch. 40 PVC

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

details of the temporary wells installed at the Former Printing Plant, Building 2051, Parcel 173(7). The temporary well construction logs are included in Appendix B.

IT contracted Miller Drilling, Inc., to install the temporary wells with a hollow-stem auger rig in January 1999 at the well/groundwater sample 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 at the well location. The borehole was augered to the depth of direct-push sampler refusal, and samples were collected at the depth of direct-push refusal to the bottom of the borehole. A 2-foot long, 2-inch ID carbon steel split-spoon sampler was driven at 5-foot intervals to collect residuum for observing and describing lithology. Where spoon refusal was encountered, the auger was advanced until the first water-bearing zone was encountered. The on-site geologist logging the auger boreholes continued the detailed lithological log for each borehole from the depth of split-spoon sampler refusal to the bottom of the auger borehole by logging the drill cuttings. The drill cuttings were logged to determine lithologic changes and the approximate depth of groundwater encountered during drilling. This information was used to determine the optimal placement of the monitoring well screen interval and to provide site-specific geologic and hydrogeologic information. The lithological log for each borehole is included in Appendix B.

Upon reaching the target depth, a 15-foot length of 2-inch ID, 0.010-inch factory slotted, Schedule 40 polyvinyl chloride (PVC) screen with a 3-inch PVC end cap was placed through the auger to the bottom of the borehole. The screen and end cap were attached to 2-inch ID, flush-threaded Schedule 40 PVC riser. A number 1 filter sand (environmentally safe, clean fine sand, sieve size 20 to 40) was tremied around the well screen to approximately 2 feet above the top of the well screen as the augers were removed. The wells were surged approximately 10 minutes using a solid PVC surge block, or until no more settling of the filter sand occurred inside the borehole. A bentonite seal consisting of approximately 2 feet of bentonite chips was placed immediately on top of the filter sand and hydrated with potable water. If the bentonite seal was installed below the water table surface, the bentonite chips, were allowed to hydrate in the groundwater. The bentonite seal, placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). A locking well cap was placed on the PVC well casing. The temporary well surface completion included attaching plastic sheeting around the PVC riser using duct tape. Additionally, sand bags were used to secure the sheeting to the ground surface around the temporary well.

The temporary wells were developed by surging and pumping with a 2-inch diameter submersible pump, in accordance with methodology outlined in Section 4.8 and Appendix C of the SAP (IT, 2000a). The submersible pump being used for well development is moved in an up-and-down fashion to encourage any residual well installation materials to enter the well. These materials are then pumped out of the well in order to re-establish the natural hydraulic flow conditions. Development was performed until the water turbidity was equal to or less than 20 nephelometric turbidity units or for a maximum of 4 hours. The well development logs are included in Appendix C.

3.1.4 Water Level Measurements

The depth to groundwater was measured in all temporary, permanent, and existing monitoring wells installed at FTMC on March 13 and 14, 2000, following procedures outlined in Section 4.18 of the SAP (IT, 2000a). Depth to groundwater was measured with electronic water level meters. Each meter probe and cable were cleaned 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 each well casing. A summary of groundwater level measurements in the vicinity of the Former Printing Plant, Building 2051, Parcel 173 and nearby Parcel 144, is presented in Table 3-4.

3.1.5 Groundwater Sampling

Groundwater was sampled from the temporary wells installed at the Former Printing Plant, Building 2051, Parcel 173(7). The well/groundwater sampling 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.

Sample Collection. Groundwater sampling was performed at the temporary well locations following procedures outlined in Section 4.9 of the SAP (IT, 2000a). Groundwater was sampled after purging a minimum three well volumes and field parameters including temperature, pH, specific conductivity, oxidation-reduction potential, and turbidity stabilized. Purging and sampling were performed using a peristaltic pump equipped with Teflon™ tubing. Field parameters were measured using a calibrated water quality meter. Field parameter readings are summarized in Table 3-6. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.3.

Table 3-4

Groundwater Elevations
Former Printing Plant, Building 2051, Parcel 173(7)
Fort McClellan, Calhoun County, Alabama

Well Location	Date	Depth to Water (ft btoc)	Ground Elevation (ft msl)	TOC Elevation (ft msl)	Groundwater Elevation (ft msl)
PPMP-173-GP01	14-Mar-00	13.39	784.42	785.88	772.49
PPMP-173-GP03	14-Mar-00	22.33	787.70	787.47	765.14
FTA-144-GP01	13-Mar-00	20.28	775.27	774.85	754.57
FTA-144-GP02	13-Mar-00	16.56	770.75	770.45	753.89
FTA-144-GP03	13-Mar-00	6.50	760.82	760.38	753.88
FTA-144-GP04	13-Mar-00	12.90	767.08	766.76	753.86
FTA-144-GP05	13-Mar-00	13.98	768.06	767.74	753.76
FTA-144-GP07	13-Mar-00	10.60	764.16	763.84	753.24

Elevations referenced to the North American Vertical Datum of 1988.
btoc - Below top of casing.
ft - Feet.
msl - Mean sea level.
TOC - Top of casing.

Table 3-5

Groundwater Sample Designations and QA/QC Samples
Former Printing Plant, Building 2051, Parcel 173(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft btoc)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
PPMP-173-GP01	PPMP-173-GP01-GW-KF3001-REG	20.80-25.01	PPMP-173-GP01-GW-KF3002-FD	PPMP-173-GP01-GW-KF3003-FS	PPMP-173-GP01-GW-KF3001-MS PPMP-173-GP01-GW-KF3001-MSD	TCL VOCs, TCL SVOCs TAL Metals
PPMP-173-GP03	PPMP-173-GP03-GW-KF3004-REG	23.52-24.52				TCL VOCs, TCL SVOCs TAL Metals

FD - Field duplicate.
FS - Field split.
ft btoc - Feet below top of casing.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 3-6

Groundwater Field Parameters
Former Printing Plant, Building 2051, Parcel 173(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Date	Media	Specific Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	Temperature (^{o}C)	Turbidity (NTU)	pH (SU)
PPMP-173-GP01	16-Feb-99	GW	0.546	1.92	84	20.47	0.10	6.72
PPMP-173-GP03	17-Feb-99	GW	0.204	1.79	249	20.87	211.4	6.27
PPMP-173-GP03[a]	5-Jul-00	GW	0.243	*	140	25.80	8.64	5.89

mS/cm - MilliSiemens per centimeter.
mg/L - Milligrams per liter.
mV - Millivolt.
^{o}C - Degree Celsius.
NTU - Nephelometric turbidity unit.
SU - Standard unit.
GW - Groundwater.
[a] Resampled for metals using low-flow technique.
* - Instrument malfunction.

3.2 Surveying of Sample Locations

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

3.3 Analytical Program

Samples collected during the SI were analyzed for various chemical properties. The specific suite of analyses performed is based on the PSSCs historically at the site and EPA, ADEM, FTMC, and USACE requirements. Samples collected from the Former Printing Plant, Building 2051, Parcel 173(7), were analyzed for the following parameters:

- Target compound list VOCs - Method 5035/8260B
- TCL semivolatile organic compounds (SVOC) - Method 8270C
- Target analyte list metals - Method 6010B/7000.

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

3.4 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping followed requirements specified in Section 4.13.2 of the SAP (IT, 2000a). Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in Section 5.0, Table 5-1, of Appendix B of the SAP (IT, 2000a). Sample documentation and chain-of-custodies were recorded as specified in Section 4.13 of the SAP (IT, 2000a).

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

3.5 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 from the field sampling at the Former Printing Plant, Building 2051, Parcel 173(7) was segregated as follows:

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

Solid IDW was stored inside the fenced area surrounding Buildings 335 and 336 in lined rolloff bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analyses. Based on the results, drill cuttings and PPE generated during the SI at the Former Printing Plant, Building 2051, Parcel 173(7), were disposed as nonregulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

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

3.6 Variances/Nonconformances

3.6.1 Variances

There were not any variances to the SFSP recorded during completion of the SI at the Former Printing Plant, Building 2051, Parcel 173(7).

3.6.2 Nonconformances

There were not any nonconformances to the SFSP recorded during completion of the SI at the Former Printing Plant, Building 2051, Parcel 173(7).

3.7 Data Quality

The field sample results data are presented in tabular form in Appendix E. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan; the FTMC SAP and QAP; and standard, accepted methods and procedures. Sample collection logs pertaining to the collection of the samples were reviewed and organized for this report and are included in Appendix A. As discussed in Section 3.6, there were not any variances or nonconformances identified either in the field or during the review of sample collection logs that may have impacted the usability of the data.

Data Validation. A complete (100 percent) Level III data validation effort was performed on the reported analytical data. Appendix F consists of a data validation summary report that was prepared to discuss the results of the validation. Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices during the validation effort. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System™ database for tracking and reporting. The qualified data were used in the comparison to the SSSLs and ESVs developed by IT. Rejected data (assigned an "R" qualifier) were not used in the comparison to the SSSLs or ESVs. The 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 Former Printing Plant, Building 2051, Parcel 173(7), provided soil, bedrock, and groundwater data. These data were 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 is comprised of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated,

greenish-gray and black mudstone makes up the Nichols Formation with thin interbeds of siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

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

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

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

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in

Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weathers to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

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

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

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

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

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

4.1.2 Site Geology

Soils underlying the Former Printing Plant, Building 2051, Parcel 173(7), are mapped as Montevallo (MtD3) (U.S. Department of Agriculture, 1961). Montevallo soils are severely eroded, shaly silty clay soils. These soils are formed in the residuum of interbedded shale and fine-grained sandstone or limestone.

Bedrock beneath the Former Printing Plant, Building 2051, Parcel 173(7), is mapped as the Ordovician/Mississippian Athens Shale, and Floyd Shale, undifferentiated. These units occur within the eroded “window” in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Three borings were installed at the Former Printing Plant, Building 2051, Parcel 173(7), to collect lithologic data and characterize the underlying geology. Total depth of the borings ranged from 3 to 26 feet bgs across the site. Based on this information, predominately clay and silt residuum weathered from the underlying shale cover the site. Underlying the clay and silt, weathered black to gray, dry shale was encountered at depths of 3 feet to greater than 26 feet bgs.

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. The major surface water features at the Main Post of FTMC include Remount Creek, Cane Creek, and Cave Creek.

These waterways flow in a general northwest to westerly direction towards the Coosa River on the western boundary of Calhoun County.

The Former Printing Plant, Building 2051, Parcel 173(7), is located on a topographic high and surface runoff follows the site topography. Runoff generally flows to the east-northeast and the west-southwest. A storm drain is located on the southeastern corner of the Former Printing Plant, Building 2051.

4.2.2 Hydrogeology

During boring and well installation activities, groundwater was encountered in the clay soils of one of the borings (PPMP-173-GP03). Groundwater was not apparent during drilling of the other two borings, however groundwater is present in both monitoring wells at the site.

Static groundwater levels were measured on March 13 and 14, 2000 as summarized in Table 3-4. Static groundwater elevations from monitoring wells located at Parcel 144 were used in the construction of the groundwater elevation map for Parcel 173(7), to allow accurate representation of groundwater elevations and flow for Parcel 173(7). In addition, installation-wide monitoring well groundwater elevations were utilized to create the groundwater elevation map for Parcel 173(7). Groundwater elevations were calculated by measuring the depth to groundwater relative to the surveyed top-of-casing elevations. A groundwater elevation map constructed from data from March 13 and 14, 2000 is shown on Figure 4-1. Based on the March groundwater levels, horizontal groundwater flow at the site is generally to the west and follows the slope of the surface topography, with a gradient of approximately 0.034 feet per foot.

Static groundwater levels summarized in Table 3-4 for the wells at Parcel 173(7) are at shallower depths than depth to water data from the drilling logs (Appendix B). This is indicative of upward-vertical hydraulic head.

5.0 Summary of Analytical Results

The results of the chemical analyses of samples collected at the Former Printing Plant, Building 2051, Parcel 173(7), indicate that metals, VOCs, and SVOCs have been detected in the various site media. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, detected constituent concentrations were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metal concentrations exceeding the SSSLs and ESVs were subsequently compared to background metals screening values (SAIC, 1998) to determine if the metals concentrations are within natural background concentrations. Summary statistics for background metals samples collected at FTMC (SAIC, 1998) are included in Appendix G. Additionally, SVOC concentrations in surface soils that exceeded the 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 2 categories of surface soils: beneath asphalt and adjacent to asphalt. The PAH background screening values for soils adjacent to asphalt are the more conservative (i.e. lower) of the PAH background values and are the values used herein for comparison.

Six compounds were quantified by both SW-846 Method 8260B (as VOC) and Method 8270C (as SVOC), including 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobutadiene, and naphthalene. Method 8260B yields an 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 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 5-3 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background concentrations. Complete analytical results are presented in Appendix E.

5.1 Surface Soil Sample Results

Three surface soil samples and one depositional soil sample were collected for chemical analyses at the Former Printing Plant, Building 2051, Parcel 173(7). Surface soil samples and the depositional soil sample 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 concentrations, as presented in Table 5-1.

Metals. Twenty-one metals were detected in surface soil and depositional soil samples collected at the Former Printing Plant, Building 2051, Parcel 173(7). With the exception of cadmium, cobalt, selenium, and silver, the detected metals were present in each of the samples.

The concentrations of aluminum (PPMP-173-GP01 and PPMP-173-GP03), arsenic (all four locations), chromium (PPMP-173-GP03), iron (all four locations), and manganese (PPMP-173-GP02) exceeded residential human health SSSLs but were within background concentrations. Aluminum (PPMP-173-GP01 and PPMP-171-GP03); arsenic (PPMP-173-GP03), iron (all four locations), and manganese (PPMP-171-GP02) concentrations exceeded both residential human health SSSLs and ESVs but were within background concentrations. Vanadium (all four locations) was detected at concentrations exceeding ESVs but within background concentrations. Four metals (copper, mercury, selenium, and zinc) were detected at concentrations above both ESVs and background concentrations but below residential human health SSSLs. However, none of the metals detected in surface soils exceeded both residential human health SSSLs and background concentrations.

Volatile Organic Compounds. Eight VOCs were detected in surface and depositional soil samples collected at the Former Printing Plant, Building 2051, Parcel 173(7). Every detected VOC was present in the sample from location PPMP-173-GP03; however, the samples from the other sample locations contained a maximum of two of the detected VOCs. None of the detected VOCs was present at a concentration exceeding residential human health SSSLs or ESVs.

Table 5-1

Surface Soil and Depositional Soil Analytical Results
Former Printing Plant, Building 2051, Parcel 173(7)
Fort McClellan, Calhoun County, Alabama

				Parcel	PPMP-173					PPMP-173					PPMP-173					PPMP-173				
				Sample Location	PPMP-173-DEP01					PPMP-173-GP01					PPMP-173-GP02					PPMP-173-GP03				
				Sample Number	KF0009					KF0001					KF0005					KF0007				
				Sample Date	8-Mar-99					12-Jan-99					29-Jan-99					11-Jan-99				
				Sample Depth (Feet)	0- 1					0- 1					0- 1					0- 1				
Parameter	Units	BKG[a]	SSSL[b]	ESV[b]	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																								
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	2.80E+03				YES	9.64E+03			YES	YES	5.60E+03				YES	1.22E+04			YES	YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	3.50E+00			YES		6.10E+00			YES		8.10E+00			YES		1.19E+01			YES	YES
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	3.91E+01					9.27E+01					1.35E+02	J	YES			2.98E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	2.50E-01	J				7.00E-01					9.90E-01		YES			9.90E-01		YES		
Cadmium	mg/kg	2.90E-01	6.25E+00	1.60E+00	5.90E-01		YES			ND					ND					ND				
Calcium	mg/kg	1.72E+03	NA	NA	4.05E+04		YES			7.77E+03		YES			1.59E+03					1.32E+04		YES		
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	1.23E+01				YES	1.61E+01				YES	2.28E+01	J			YES	2.72E+01			YES	YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	3.10E+00	J				ND					1.06E+01					ND				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	1.09E+01					2.84E+01		YES			3.62E+01		YES			4.86E+01		YES		YES
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	8.45E+03			YES	YES	2.33E+04			YES	YES	3.35E+04			YES	YES	3.18E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	3.76E+01					2.93E+01					4.88E+01	J	YES			1.91E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	2.31E+04		YES			4.49E+03		YES			4.64E+02	J				4.44E+03		YES		
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	2.82E+02				YES	2.12E+02				YES	7.60E+02			YES	YES	4.53E+01				
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	2.60E-01		YES		YES	6.20E-02					6.10E-02					5.50E-02				
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	5.10E+00					8.10E+00					8.40E+00					1.96E+01		YES		
Potassium	mg/kg	8.00E+02	NA	NA	1.12E+02	J				4.57E+02	J				2.48E+02	J				1.13E+03		YES		
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	ND					1.70E+00		YES		YES	1.70E+00		YES		YES	2.10E+00		YES		YES
Silver	mg/kg	3.60E-01	3.91E+01	2.00E+00	ND					1.20E+00		YES			ND					1.90E+00		YES		
Sodium	mg/kg	6.34E+02	NA	NA	2.77E+02	B				7.35E+01	B				8.39E+01	B				8.04E+01	B			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.33E+01				YES	1.43E+01				YES	3.16E+01				YES	1.83E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	3.70E+02		YES		YES	4.66E+01		YES			1.71E+02	J	YES		YES	6.78E+01		YES		YES
SEMIVOLATILE ORGANIC COMPOUNDS																								
Benzo(a)pyrene	mg/kg	1.42E+00	8.51E-02	1.00E-01	ND					ND					3.40E-02	J				ND				
Benzo(b)fluoranthene	mg/kg	1.66E+00	8.51E-01	5.98E+01	ND					ND					4.40E-02	J				ND				
Benzo(k)fluoranthene	mg/kg	1.45E+00	8.51E+00	1.48E+02	ND					ND					5.50E-02	J				ND				
Butyl benzyl phthalate	mg/kg	NA	1.56E+03	2.40E-01	4.90E-01	J			YES	ND					ND					ND				
Chrysene	mg/kg	1.40E+00	8.61E+01	4.73E+00	ND					ND					4.40E-02	J				ND				
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	2.50E-01	J				ND					ND					ND				
Fluoranthene	mg/kg	2.03E+00	3.09E+02	1.00E-01	ND					ND					4.60E-02	J				ND				
Pyrene	mg/kg	1.63E+00	2.33E+02	1.00E-01	ND					ND					4.10E-02	J				ND				
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	9.30E-01	1.10E+00	J			YES	5.50E-02	B				ND					5.40E-02	J			
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	1.00E-01	ND					ND					ND					4.30E-03	J			
1,2-Dimethylbenzene	mg/kg	NA	1.55E+04	5.00E-02	ND					ND					ND					2.50E-03	J			
Acetone	mg/kg	NA	7.76E+02	2.50E+00	ND					ND					ND					1.70E-02	J			
Bromomethane	mg/kg	NA	1.09E+01		ND					2.10E-03	B				ND					2.50E-03	B			
Ethylbenzene	mg/kg	NA	7.77E+02	5.00E-02	ND					ND					ND					2.20E-03	J			
Methylene chloride	mg/kg	NA	8.41E+01	2.00E+00	5.20E-03	B				2.50E-03	B				3.80E-03	B				3.30E-03	B			
Toluene	mg/kg	NA	1.55E+03	5.00E-02	4.10E-03	J				ND					ND					2.90E-03	J			
m,p-Xylenes	mg/kg	NA	1.55E+04	5.00E-02	ND					ND					ND					8.80E-03				

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

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

For SVOCs, value listed is the background screening criterion given in IT Corporation (2000b), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama, July.*

[b]Residential human health site-specific screening levels (SSSL) and ecological screening values (ESV) as given in IT Corporation (2000b), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama* , July.

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

J = Result is greater than stated method detection limit but less than or equal to specified reporting limit.

mg/kg = Milligrams per kilogram.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-2

Subsurface Soil Analytical Results
Former Printing Plant, Building 2051, Parcel 173(7)
Fort McClellan, Calhoun County, Alabama

				Parcel	PPMP-173			PPMP-173				PPMP-173			
				Sample Location	PPMP-173-GP01			PPMP-173-GP02				PPMP-173-GP03			
				Sample Number	KF0002			KF0006				KF0008			
				Sample Date	12-Jan-99			29-Jan-99				11-Jan-99			
				Sample Depth (Feet)	5-7			1-3				10-12			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS															
Aluminum	mg/kg	1.36E+04	7.80E+03	1.75E+04		YES	YES	8.24E+03			YES	1.22E+04			YES
Arsenic	mg/kg	1.83E+01	4.26E-01	7.90E+00			YES	8.00E+00			YES	8.90E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	3.20E+02		YES		2.72E+01	J			2.40E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	1.40E+00		YES		8.60E-01		YES		1.10E+00		YES	
Calcium	mg/kg	6.37E+02	NA	1.24E+02	J			6.74E+03		YES		1.53E+02	J		
Chromium	mg/kg	3.83E+01	2.32E+01	1.99E+01				2.16E+01	J			1.38E+01			
Cobalt	mg/kg	1.75E+01	4.68E+02	ND				2.80E+00	J			ND			
Copper	mg/kg	1.94E+01	3.13E+02	6.66E+01		YES		5.22E+01		YES		6.87E+01		YES	
Iron	mg/kg	4.48E+04	2.34E+03	3.50E+04			YES	3.84E+04			YES	3.38E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	2.55E+01				2.12E+01	J			2.38E+01			
Magnesium	mg/kg	7.66E+02	NA	3.14E+03		YES		4.51E+02	J			2.42E+02	J		
Manganese	mg/kg	1.36E+03	3.63E+02	4.16E+01				6.66E+01				8.09E+01			
Mercury	mg/kg	7.00E-02	2.33E+00	5.50E-02	J			3.80E-02	J			6.90E-02			
Nickel	mg/kg	1.29E+01	1.54E+02	1.99E+01		YES		7.30E+00				2.07E+01		YES	
Potassium	mg/kg	7.11E+02	NA	1.07E+03		YES		6.17E+02				1.11E+03		YES	
Selenium	mg/kg	4.70E-01	3.91E+01	2.40E+00		YES		2.50E+00		YES		2.40E+00		YES	
Silver	mg/kg	2.40E-01	3.91E+01	2.00E+00		YES		ND				2.00E+00		YES	
Sodium	mg/kg	7.02E+02	NA	9.11E+01	B			7.18E+01	B			7.82E+01	B		
Vanadium	mg/kg	6.49E+01	5.31E+01	1.12E+01				3.18E+01				1.37E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	7.58E+01		YES		6.26E+01	J	YES		5.68E+01		YES	
SEMIVOLATILE ORGANIC COMPOUNDS															
Pentachlorophenol	mg/kg	NA	5.25E+00	1.90E+00				ND				ND			
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	ND				ND				6.20E-02	J		
VOLATILE ORGANIC COMPOUNDS															
Acetone	mg/kg	NA	7.76E+02	6.60E-02	J			9.50E-01	B			9.40E-02	J		
Bromomethane	mg/kg	NA	1.09E+01	1.60E-03	B			ND				2.00E-03	B		
Methylene chloride	mg/kg	NA	8.41E+01	2.90E-03	B			3.90E-03	B			2.50E-03	B		

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

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

[b]Residential human health site-specific screening levels (SSSL) as given in IT Corporation (2000b), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

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

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

mg/kg - Milligrams per kilogram.

ND - Not detected.

NA - Not available.

Qual - Data validation qualifier.

Table 5-3

Groundwater Analytical Results
Former Printing Plant, Building 2051, Parcel 173(7)
Fort McClellan, Calhoun County, Alabama

				Parcel	PPMP-173			PPMP-173				PPMP-173			
				Sample Location	PPMP-173-GP01			PPMP-173-GP03				PPMP-173-GP03			
				Sample Number	KF3001			KF3004				KF3004R			
				Sample Date	16-Feb-99			17-Feb-99				5-Jul-00			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS															
Aluminum	mg/L	2.34E+00	1.56E+00	1.40E-01	B			1.98E+01		YES	YES	3.08E-01			
Arsenic	mg/L	1.78E-02	4.00E-05	ND				5.09E-02		YES	YES	ND			
Barium	mg/L	1.27E-01	1.10E-01	5.42E-02	J			2.08E-01		YES	YES	3.34E-02	B		
Beryllium	mg/L	1.24E-03	3.12E-03	ND				5.80E-03		YES	YES	ND			
Cadmium	mg/L	2.51E-03	7.80E-04	ND				7.50E-03		YES	YES	ND			
Calcium	mg/L	5.65E+01	NA	5.94E+01		YES		3.61E+01				4.28E+01			
Chromium	mg/L	NA	4.69E-03	ND				1.98E-02			YES	ND			
Cobalt	mg/L	2.34E-02	9.39E-02	ND				6.84E-02		YES		ND			
Copper	mg/L	2.55E-02	6.26E-02	ND				4.31E-02		YES		ND			
Iron	mg/L	7.04E+00	4.69E-01	2.98E-01	J			8.49E+01		YES	YES	6.42E-01			YES
Lead	mg/L	7.99E-03	1.50E-02	ND				4.22E-02		YES	YES	ND			
Magnesium	mg/L	2.13E+01	NA	2.47E+01		YES		9.14E+00				7.30E+00			
Manganese	mg/L	5.81E-01	7.35E-02	3.98E-01			YES	1.78E+00		YES	YES	1.09E-02	B		
Mercury	mg/L	NA	4.60E-04	ND				1.10E-04	J			ND			
Nickel	mg/L	NA	3.13E-02	ND				4.37E-01			YES	6.20E-03	B		
Potassium	mg/L	7.20E+00	NA	4.70E+00	J			4.13E+00	J			3.70E-01	B		
Sodium	mg/L	1.48E+01	NA	2.04E+01		YES		4.29E+00	J			3.48E+00	B		
Vanadium	mg/L	1.70E-02	1.10E-02	ND				3.98E-02	J	YES	YES	ND			
Zinc	mg/L	2.20E-01	4.69E-01	ND				1.06E+00		YES	YES	1.76E-02	B		
VOLATILE ORGANIC COMPOUNDS															
Acetone	mg/L	NA	1.56E-01	1.40E-03	B			ND				NR			

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

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

[b]Residential human health site-specific screening level (SSSL) as given in IT Corporation (2000b), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

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

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

mg/L - Milligrams per liter.

ND - Not detected.

NA - Not available.

NR - Not requested.

Semivolatile Organic Compounds. Nine SVOCs were detected in surface and depositional soil samples collected at the Former Printing Plant, Building 2051, Parcel 173(7). The surface soil collected from sample location PPMP-173-GP02 contained six of the detected SVOCs. None of the other sample locations contained more than three of the detected SVOCs. The SVOC analytical results were flagged with a "J" data qualifier, signifying that the result is greater than the method detection limit but less than the specified reporting limit.

The butyl benzyl phthlate and the bis(2-ethylhexyl)phthlate concentrations at sample location PPMP-173-DEP01 exceeded ESVs, but were below residential human health SSSLs. Butyl benzyl phthlate was not detected in any of the other samples collected and the bis(2-ethylhexyl)phthlate results in two other samples were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample.

5.2 Subsurface Soil Sample Results

Three subsurface soil samples were collected for chemical analyses at the Former Printing Plant, Building 2051, Parcel 173(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 background concentrations, as presented in Table 5-2.

Metals. Twenty metals were detected in subsurface soil samples collected at the Former Printing Plant, Building 2051, Parcel 173(7). The detected metals were present in each of the samples. The concentrations of three metals (aluminum, arsenic, and iron) exceeded residential human health SSSLs. However, the concentration of these metals were within background concentrations or the range of background values.

Volatile Organic Compounds. Acetone, bromomethane, and methylene chloride were detected in each of the subsurface soil samples collected at the Former Printing Plant, Building 2051, Parcel 173(7). The bromomethane and methylene chloride analytical results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. None of the detected VOCs were present at a concentration exceeding residential human health SSSLs.

Semivolatile Organic Compounds. Pentachlorophenol and bis(2-ethylhexyl)phthalate were detected in subsurface soil samples collected at the Former Printing Plant, Building 2051, Parcel 173(7). None of the detected SVOCs were present at a concentration exceeding residential human health SSSLs.

5.3 Groundwater Sample Results

Two monitoring wells were sampled at the Former Printing Plant, Building 2051, Parcel 173(7) at the sample locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and background concentrations, as presented in Table 5-3.

Metals. Nineteen metals, including aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, sodium, vanadium, and zinc, were detected in groundwater samples collected at the Former Printing Plant, Building 2051, Parcel 173(7). Sample location PPMP-173-GP03 contained all of the detected metals while sample location PPMP-173-GP01 contained only eight of the nineteen detected metals.

The concentrations of 12 metals exceeded residential human health SSSLs in the groundwater samples. Ten of these metals (aluminum, arsenic, barium, beryllium, cadmium, iron, lead, manganese, vanadium, and zinc) were present at concentrations also exceeding background concentrations. All ten of the metals exceeding residential human health SSSLs; however background concentrations were present in the original sample collected at PPMP-173-GP03. At sample location PPMP-173-GP01, only manganese exceeded residential human health SSSLs, but it was within background concentrations. The sample collected from PPMP-173-GP01 contained less than half the number of detected metals. Additionally, none of the metals detected in PPMP-173-GP01 exceeded the residential human health SSSLs or the background concentrations.

Monitoring well PPMP-173-GP03 was resampled on July 7, 2000 as part of the groundwater resampling study to evaluate the effect of elevated turbidity on metals concentrations (IT, 2000c). The turbidity of the resample was reduced below 10 nephelometric turbidity units using the low-flow sample technique. The analytical results indicate that nine previously detected metals were not detected in the resample. Of the detected metals, only iron was present at a concentration exceeding the SSSLs. No metals exceeded the background concentrations in the resampling of PPMP-173-GP03.

Volatile Organic Compounds. Acetone was detected at sample location PPMP-173-GP01. The acetone results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. VOCs were not detected at the other groundwater sample location. The acetone concentration was below residential human health SSSLs.

Semivolatile Organic Compounds. SVOCs were not detected in any of the groundwater samples.

6.0 Summary and Conclusions and Recommendations

IT, under contract with USACE, completed an SI at the Former Printing Plant, Building 2051, Parcel 173(7), at FTMC, Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the Former Printing Plant, Building 2051, Parcel 173(7) and, if present, whether the concentrations would present an unacceptable risk to human health or the environment. The SI at the Former Printing Plant, Building 2051, Parcel 173(7) consisted of the sampling and analyses of three surface soil samples, three subsurface soil samples, two groundwater samples, and a depositional soil sample. In addition, two monitoring wells were installed in the residuum groundwater zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information.

Chemical analyses of samples indicate that metals, VOCs, and SVOCs were detected in the environmental media sampled. Analytical results were compared to the residential human health SSSLs and ESVs. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing site investigations being performed under the BRAC Environmental Restoration Program at FTMC. Additionally, metals results exceeding the SSSLs and ESVs were compared to media-specific background concentrations (SAIC, 1998), and SVOC concentrations exceeding SSSLs and ESVs in surface and depositional soils were compared to PAH background screening values (IT, 2000b).

Aluminum, arsenic, chromium, iron, and manganese were detected in surface and depositional soil samples at concentrations exceeding residential human health SSSLs but below background concentrations. Four metals (copper, mercury, selenium, and zinc) were detected at concentrations exceeding ESVs and background but below residential human health SSSLs. Vanadium was detected at concentrations exceeding ESVs but below background concentrations. The SVOCs benzyl butyl phthlate and bis(2-ethylhexyl)phthlate were detected at the depositional soil sample location (PPMP-173-DEP01) at concentrations exceeding ESVs, but below residential human health SSSLs. VOCs were not detected at concentrations exceeding SSSLs or ESVs.

Aluminum, arsenic, and iron were detected in subsurface soil samples at concentrations exceeding residential human health SSSLs but below background concentrations or the range of

background values. VOCs and SVOCs were not detected in subsurface soil samples at concentrations exceeding residential human health SSSLs.

Ten metals were detected at one groundwater sample location at concentrations exceeding both SSSLs and background concentrations; however, these results were from a water sample with elevated turbidity. The well was resampled in July 2000 as part of a groundwater resampling study to evaluate the effect of elevated turbidity on metals concentrations. The turbidity of the resample was reduced below 10 nephelometric turbidity units using the low-flow sample technique. The resample analytical results indicate that nine previously detected metals were not detected and that of the remaining metals detected only iron was present at a concentration exceeding SSSLs. No metals exceeded background concentrations in the resampled well. VOCs and SVOCs were not detected in groundwater samples at concentrations exceeding residential human health SSSLs.

The potential impact to human receptors is expected to be minimal. The metals that exceeded residential human health SSSLs were within background concentrations or the range of background values, and thus, do not pose an unacceptable risk to future human receptors. SVOCs and VOCs were not detected in any of the samples at concentrations exceeding residential human health SSSLs. Although the site is projected for industrial land-use, screening against the more conservative residential human health SSSLs indicates that the potential threat to human health would be very low in the residential scenario.

Several metals were detected in site media at concentrations exceeding ESVs and background concentrations. In addition, two SVOCs exceeded ESVs. However, the potential impact to ecological receptors is expected to be minimal based on the existing viable habitat. The site is a well-developed area and is projected for continued industrial use. Viable ecological habitat is presently limited and is not expected to increase in the future land-use scenario. Consequently, the threat to potential ecological receptors is expected to be low.

Based on the results of the SI, past operations at the Former Printing Plant, Building 2051, Parcel 173(7), do not appear to have adversely impacted the environment. The metals and organic compounds detected in site media do not pose an unacceptable risk to human health or the environment in either the industrial or residential land-use scenario. Therefore, IT recommends "No Further Action" and unrestricted reuse with regard to hazardous, toxic, and radioactive waste, at the Former Printing Plant, Building 2051, Parcel 173(7).

7.0 References

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APPENDIX A

SAMPLE COLLECTION LOGS

APPENDIX B

BORING LOGS AND WELL LOGS

APPENDIX C

WELL DEVELOPMENT LOGS

APPENDIX D

SURVEY DATA

Appendix D

Survey Data
Former Printing Plant, Building 2051, Parcel 173(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Northing	Easting	Ground Elevation (ft msl)	TOC Elevation (ft msl)
PPMP-173-DEP01	1169795.190	670303.000	776.72	NA
PPMP-173-GP01	1169879.716	670240.670	784.42	785.88
PPMP-173-GP02	1169794.981	670238.815	779.50	NA
PPMP-173-GP03	1169706.483	669988.893	787.70	787.47

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

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

ft msl - Feet mean sea level.
NA - Not applicable.
TOC - Top of casing.

APPENDIX E

SUMMARY OF VALIDATED ANALYTICAL DATA

APPENDIX F

DATA VALIDATION SUMMARY REPORT

APPENDIX G

SUMMARY STATISTICS FOR BACKGROUND MEDIA, FORT McCLELLAN, ALABAMA

ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS