

Final

Site Investigation Report
Former Smoke Area R, Parcel 105(6)

Fort McClellan
Calhoun County, Alabama

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See Attachment 1 - List of Abbreviations and Acronyms.

Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK05, IT Corporation completed a site investigation (SI) at Former Smoke Area R, Parcel 105(6) at Fort McClellan, Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at Former Smoke Area R, Parcel 105(6) and, if present, whether the concentrations would present an unacceptable risk to human health or the environment. The SI at Former Smoke Area R, Parcel 105(6) consisted of the sampling and analyses of two surface soil samples and two subsurface soil samples.

Chemical analyses of samples collected at Former Smoke Area R, Parcel 105(6) indicate that metals, volatile organic compounds, and semivolatile organic compounds were detected in the environmental media sampled. To evaluate whether the detected constituents pose an unacceptable risk to human health or the environment, analytical results were compared to 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. Iron was detected at one sample location (surface and subsurface soil) at concentrations exceeding the residential human health SSSL and background concentration. The iron concentration in the subsurface soil sample exceeded the background range by approximately 10 percent.

Several metals and one volatile organic compound (acetone) were detected in surface soils at concentrations exceeding ESVs. However, with the exception of beryllium in one sample, the metals concentrations that exceeded ESVs were within the range of background concentrations. The beryllium concentration (1.2 milligrams per kilogram [mg/kg]) exceeded the ESV (1.1 mg/kg) and the range of background values (0.87 mg/kg). In one surface soil sample, the acetone concentration (3.2 mg/kg) exceeded the ESV (2.5 mg/kg). Based on the small size of the parcel, only limited ecological habitat may be present within the parcel boundary. Therefore, the potential threat to ecological receptors is expected to be minimal.

Groundwater was not investigated at the Former Smoke Area R, Parcel 105(6); impacts to groundwater are not anticipated from site-related smoke training activities. However, groundwater contamination has been detected at Training Area T-38, Former Technical Escort

Reaction Area, Parcel 186(6), located approximately 2,000 feet northwest of Former Smoke Area R. This contamination is being addressed as part of a remedial investigation currently being conducted at that site.

Although site-related impacts to groundwater are not anticipated at Former Smoke Area R, Parcel 105(6), offsite contamination from Training Area T-38 could impact groundwater at the site. Therefore, potential groundwater impacts to the Former Smoke Area R, Parcel 105(6) can not be positively identified until the completion of the remedial investigation at Parcel 186(6).

Based on the results of the SI, past operations at the Former Smoke Area R, Parcel 105(6) do not appear to have adversely impacted the environment. Therefore, IT recommends “No Further Action” and unrestricted land reuse with regard to hazardous, toxic, and radioactive waste at the Former Smoke Area R, Parcel 105(6).

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 with IT Corporation (IT) to perform the site investigation (SI) at Former Smoke Area R, Parcel 105(6) under Prime Contract DACA21-96-D-0018, Task Order CK05.

This SI report presents specific information and results compiled from the SI, including unexploded ordnance (UXO) avoidance activities, and field sampling and analysis, conducted at Former Smoke Area R, Parcel 105(6).

1.1 Project Description

Former Smoke Area R, Parcel 105(6) was identified as an area to be investigated prior to property transfer. Former Smoke Area R, Parcel 105(6), was identified as a Category 6 site in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 6 sites are areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented.

A site-specific field sampling plan (SFSP) attachment (IT, 1998a) and a site-specific safety and health plan (SSHP) attachment were finalized in October 1998. The SFSP and SSHP provide technical guidance for sample collection and analysis at the Former Smoke Area R, Parcel 105(6). The SFSP was used in conjunction with the SSHP as attachments to the installation-wide work plan (IT, 1998b) and the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan and quality assurance plan.

The SI included fieldwork to collect two surface soil samples and two subsurface soil samples. Data from the field investigation were used to determine whether potential site-specific chemicals are present at Former Smoke Area R, Parcel 105(6).

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 Former Smoke Area R, Parcel 105(6) at concentrations that would present an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL) ecological screening values (ESV), and background screening values for FTMC. The SSSLs and ESVs were developed by IT as part of the human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs and ESVs are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

Based on the conclusions presented in this SI report, the BRAC Cleanup Team will decide to propose “No Further Action” at the site or to conduct additional work at the site.

1.3 Site Description and History

Former Smoke Area R, Parcel 105(6) is located east of the central part of the Main Post (Figures 1-1 and 1-2). Former Smoke Area R, Parcel 105(6) was used as a training area from 1952 to 1970 for troops using fog oil to operate smoke-generating equipment. Former Smoke Area R was used only when Smoke Area S, Parcel 106(6) was occupied. Smoke Area S, Parcel 106(6) is located approximately 900 feet northwest of Former Smoke Area R, Parcel 105(6). Currently, Former Smoke Area R, Parcel 105(6) is a restricted access area.

Former Smoke Area R is evident on historical aerial photographs dating from 1964. Army personnel reportedly policed the Smoke Areas in 1973 when the U.S. Army Chemical School departed FTMC. There are not any buildings or structures at the site. Several old and new oil filters (for vehicles) were observed on the ground during the EBS site visit.



LEGEND	
	UNIMPROVED ROADS AND PARKING
	PAVED ROADS AND PARKING
	BUILDING
	TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FEET)
	TREES / TREELINE
	PARCEL BOUNDARY
	BRIDGE
	CULVERT WITH HEADWALL
	SURFACE DRAINAGE / CREEK
	FENCE
	UTILITY POLE

PARCEL 105(6)

FIGURE 1-2
SITE MAP
FORMER SMOKE AREA R
PARCEL 105(6)

U. S. ARMY CORPS OF ENGINEERS
 MOBILE DISTRICT
 FORT MCCLELLAN
 CALHOUN COUNTY, ALABAMA
 Contract No. DACA21-96-D-0018



Former Smoke Area R falls within the “Possible Explosive Ordnance Impact Area” shown on Plate 10 of the FTMC Archives Search Report, Maps (USACE, 1998). Therefore, IT conducted UXO avoidance activities, including surface sweeps and downhole surveys of soil borings.

The site and surrounding area is mostly undeveloped or wooded. The site is located on a west-facing slope and covers an area approximately 50 feet by 100 feet. Site elevation is approximately 880 to 890 feet above sea level. The closest surface water source is an unnamed tributary located approximately 350 feet northwest of the site. The tributary eventually meets Cane Creek, located over 2,000 feet to the south of the site. Shallow groundwater at the site is probably controlled by surface drainage and/or topography. Figure 1-2 is a site map that shows site boundaries and topography.

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 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 of release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken
5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken
6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented
7. Areas that are not evaluated or require further 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 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.

There have not been any investigations identified for Former Smoke Area R. The site is classified as a Category 6 CERFA site: areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented..

3.0 Current Site Investigation Activities

This chapter describes the SI activities conducted by IT at Former Smoke Area R, Parcel 105(6), including UXO avoidance, environmental sampling, and analysis activities.

3.1 UXO Avoidance

UXO avoidance was performed at Former Smoke Area R, Parcel 105(6) following methodology outlined in Section 4.1.7 of the SAP (IT, 2000a). IT UXO personnel used a Schonstedt Heliflux Magnetic Locator to perform a surface sweep of the parcel prior to site access. After the parcel was cleared for access, sample locations were cleared using a Foerster Ferex Electromagnetic Detector following procedures outlined in Section 4.1.7.3 of the SAP.

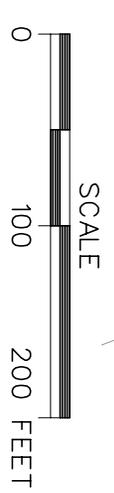
3.2 Environmental Sampling

The environmental sampling performed during the SI at Former Smoke Area R, Parcel 105(6), included the collection of surface soil and subsurface soil samples for chemical analysis. The sample locations were determined by observing site physical characteristics noted during a site walkover, by reviewing historical documents pertaining to activities conducted at the site, and based on UXO avoidance activities. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figure 3-1. Samples were submitted for laboratory analyses of site-related parameters listed in Section 3.4.

3.2.1 Surface Soil Sampling

Surface soil samples were collected from two locations at Former Smoke Area R, Parcel 105(6). Surface soil sampling locations and rationale are presented in Table 3-1. Surface soil sample designations are listed in Table 3-2. Sampling locations were determined in the field by the on-site geologist based on the sampling rationale, UXO avoidance, access, site topography, and drainage features.

Sample Collection. Surface 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 samples were collected by first removing surface debris, such as rocks and vegetation, from the immediate sample area. The soil was collected with the sampling device and screened with a photoionization detector (PID) in accordance with Section 4.7.1.1 of the SAP. Samples for volatile organic compound (VOC) analyses were collected directly from the sampler with three EnCore[®] samplers. The remaining portion of the soil was transferred to a



- LEGEND**
- UNIMPROVED ROADS AND PARKING
 - PAVED ROADS AND PARKING
 - BUILDING
 - TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FEET)
 - TREES / TREELINE
 - PARCEL BOUNDARY
 - BRIDGE
 - CULVERT WITH HEADWALL
 - SURFACE DRAINAGE / CREEK
 - FENCE
 - UTILITY POLE
 - SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION

FIGURE 3-1
SAMPLE LOCATION MAP
FORMER SMOKE AREA R
PARCEL 105(6)

U. S. ARMY CORPS OF ENGINEERS
 MOBILE DISTRICT
 FORT MCCELLAN
 CALHOUN COUNTY, ALABAMA
 Contract No. DACA21-96-D-0018



Table 3-1

**Sampling Locations and Rationale
Former Smoke Area R, Parcel 105(6)
Fort McClellan, Calhoun County, Alabama**

Sample Location	Media Sampled	Sample Location Rationale
FTA-105-GP01	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected at the west end of the parcel near probable former smoke generator or fog oil storage points. The sampling location represents a possible contaminant source point.
FTA-105-GP02	Surface Soil Subsurface Soil	Surface and subsurface soil samples were collected on the east end of the parcel, near a probable smoke generator or fog oil storage point.

Table 3-2

**Surface Soil and Subsurface Soil Sample Designations and QA/QC Samples
Former Smoke Area R, Parcel 105(6)
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Samples ^a			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
FTA-105-GP01	FTA-105-GP01-SS-FC0001-REG	0-1				TCL VOCs, TCL SVOCs TAL Metals
	FTA-105-GP01-DS-FC0002-REG	2-4				
FTA-105-GP02	FTA-105-GP02-SS-FC0003-REG	0-1				TCL VOCs, TCL SVOCs TAL Metals
	FTA-105-GP02-DS-FC0004-REG	2-4				

^aPer the approved site-specific field sampling plan, no QA/QC samples were collected at this parcel.

ft bgs - feet below ground surface

MS/MSD - Matrix spike/matrix spike duplicate.

REG - Field sample

QA/QC - Quality assurance/quality control.

SVOC - Semivolatile organic compound.

TAL - Target analyte list.

TCL - Target compound list.

VOC - Volatile organic compound.

clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.4. Sample collection logs are included in Appendix A.

3.2.2 Subsurface Soil Sampling

Subsurface soil samples were collected from two soil borings at the Former Smoke Area R, Parcel 105(6). 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, UXO avoidance, access, and site topography. 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 depths of 2 to 4 feet 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). The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.4 of this SI report. Sample collection logs are included in Appendix A.

Soil samples were collected continuously 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 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 soil 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 constructed a detailed lithological log for each soil boring. The lithological log for each borehole is included in Appendix B.

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

3.3 Surveying of Sample Locations

Sample locations were surveyed using global positioning system survey techniques described in Section 4.3 of the SAP (IT, 2000a), and conventional civil survey techniques described in Section 4.19 of the SAP. 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 C.

3.4 Analytical Program

Samples collected during the SI were analyzed for various chemical parameters. The specific suite of analyses performed was based on the potential site-specific chemicals historically at the site and EPA, ADEM, FTMC, and USACE requirements. Samples collected from Former Smoke Area R, Parcel 105(6) were analyzed for the following parameters:

- Target Compound List VOCs – EPA Method 5035/8260B
- TCL Semivolatile Organic Compounds (SVOC) – EPA Method 8270C
- Target Analyte List Metals – EPA 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 D. The Data Validation Summary Report is included as Appendix E.

3.5 Sample Preservation, Packaging, and Shipping

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

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.

3.6 Investigation-Derived Waste Management and Disposal

Investigation-derived waste (IDW) was managed and disposed as outlined in Appendix D of the SAP (IT, 2000a). The IDW generated from the field sampling at Former Smoke Area R, Parcel 105(6) was segregated as follows:

- Drill cuttings
- Personal protective equipment
- Decontamination fluids.

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 analyses. Based on the results, drill cuttings and personal protective equipment generated during the SI at Former Smoke Area R, Parcel 105(6) 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.

3.7 Variances/Nonconformances

There were not any variances or nonconformances to the SFSP during completion of the SI at Former Smoke Area R, Parcel 105(6).

3.8 Data Quality

The field sample results are presented in tabular form in Appendix D. 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. Sample collection logs pertaining to the collection of these samples were reviewed and organized for this report, and are included in Appendix A. As discussed in Section 3.7, 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 E consists of a data validation summary report that was prepared to discuss the validation results. Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System™ database for tracking and reporting. The qualified data were used in the comparison to the SSSLs and ESVs developed by IT. Rejected data (assigned an “R” qualifier) were not used in the comparison to the SSSLs and ESVs. The data presented in this report, except where qualified, meet the principle data quality objective for this SI.

4.0 Site Characterization

Subsurface investigations performed at Former Smoke Area R, Parcel 105(6) provided soil and geological data used to characterize the site. There were not any wells installed at the parcel and a hydrogeological characterization of Former Smoke Area R, Parcel 105(6) was not performed.

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 on the basis of fossil data.

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

4.1.2 Site Geology

Soils underlying Former Smoke Area R, Parcel 105(6) are mapped as Montevallo Series (U.S. Department of Agriculture, 1961). These soils are characterized as severely eroded, shaly, silty clay soils.

Bedrock beneath Former Smoke Area R, Parcel 105(6), is mapped as Cambrian Weisner Formation. This unit occurs east of the eroded "window" in the uppermost structural thrust sheet at FTMC and underlies much of the topographic high areas of the Main Post. The Weisner Formation consists of interlayered red and green shale and siltstone, thinly interbedded light gray sandstone, quartzite, and conglomerate.

Based on direct-push soil boring data collected during the SI, sediments beneath Former Smoke Area R, Parcel 105(6) consist of predominantly yellowish-brown clay overlying weathered, mottled-brown to light-gray shale, and yellowish-brown silt with pink to dark-red sandstone fragments. Direct-push sampler refusal was encountered in both borings at 4 feet bgs. Bedrock was not encountered during direct-push activities.

4.2 Site 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 closest surface water source is an unnamed tributary located approximately 350 feet northwest of the site. The tributary eventually meets Cane Creek, located over 2,000 feet to the south of the site.

5.0 Summary of Analytical Results

The results of the chemical analyses of samples collected at Former Smoke Area R, Parcel 105(6) indicate that metals, VOCs, and SVOCs have been detected in site media. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metal concentrations exceeding the SSSLs and ESVs were subsequently compared to background metals screening values (background concentrations) (SAIC, 1998) to determine if the metals concentrations are within natural background concentrations. Summary statistics for background metals samples collected at FTMC (SAIC, 1998) are included in Appendix F.

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

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

5.1 Surface Soil Sample Results

Two surface soil samples were collected for chemical analyses at Former Smoke Area R, Parcel 105(6). 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, as presented in Table 5-1.

Metals. Sixteen metals were detected in surface soil samples collected at Former Smoke Area R, Parcel 105(6). Aluminum, arsenic, chromium, iron, and manganese concentrations exceeded residential human health and ESVs. With the exception of iron in one sample (FTA-105-GP01), the metals concentrations that exceeded residential human health SSSLs were within background concentrations. The iron concentration (40,100 mg/kg) at sample location FTA-105-GP01 exceeded its SSSL and background screening value, but was within the range of background iron values (2,510 mg/kg to 56,300 mg/kg) determined by SAIC (1998) (Appendix F). Beryllium and selenium concentrations at sample location FTA-105-GP01 exceeded their ESVs and background concentrations but were below residential human health SSSLs.

Volatile Organic Compounds. Six VOCs, including 2-butanone, acetone, bromomethane, methylene chloride, p-cymene, and toluene were detected in surface soil samples collected at Former Smoke Area R, Parcel 105(6). Each of the detected VOCs was present in the sample collected from location FTA-105-GP02. The methylene chloride results were flagged with a “B” data qualifier, indicating that the compound was also detected in an associated laboratory or field blank. All of the other VOC analytical results were flagged with a “J” data qualifier signifying that the results were greater than the method detection limit but less than the RL.

The acetone concentration at sample location FTA-105-GP02 exceeded its ESV but was below the residential human health SSSL. None of the other detected VOCs was present at a concentration exceeding residential human health SSSLs or ESVs.

Semivolatile Organic Compounds. SVOCs were not detected in surface soil samples collected at Former Smoke Area R, Parcel 105(6).

5.2 Subsurface Soil Sample Results

Two subsurface soil samples were collected for chemical analyses at Former Smoke Area R, Parcel 105(6). 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 and background concentrations, as presented in Table 5-2.

Table 5-1

Surface Soil Analytical Results
Former Smoke Area R, Parcel 105(6)
Fort McClellan, Calhoun County, Alabama

(Page 1 of 2)

Chemical		Units	Bkg ^a	Human Health Screening Values Resident		Ecological Screening Values		FTA-105 FTA-105-GP01 FC0001 29-Oct-98 Start Depth = 0 End Depth = 1			FTA-105 FTA-105-GP02 FC0003 29-Oct-98 Start Depth = 0 End Depth = 1						
				Noncancer SSSL	Cancer SSSL	USEPA Region IV Values ^b	Supp. Values	Result	Qual	>Bkg	>SSSL	>ESV	Result	Qual	>Bkg	>SSSL	>ESV
Metals																	
Aluminum	mg/kg	1.63E+04	7.80E+03	NA	5.00E+01	--	1.00E+04			YES	YES	7.99E+03			YES	YES	
Arsenic	mg/kg	1.37E+01	2.34E+00	4.26E-01	1.00E+01	--	1.02E+01			YES	YES	3.00E+00			YES		
Barium	mg/kg	1.24E+02	5.47E+02	NA	1.65E+02	--	8.89E+01					1.10E+02					
Beryllium	mg/kg	8.00E-01	9.60E+00	NA	1.10E+00	--	1.20E+00	YES			YES	5.70E-01					
Chromium	mg/kg	3.70E+01	2.32E+01	NA	4.00E-01	--	2.88E+01			YES	YES	1.72E+01				YES	
Cobalt	mg/kg	1.52E+01	4.68E+02	NA	2.00E+01	--	1.32E+01					1.32E+01					
Copper	mg/kg	1.27E+01	3.13E+02	NA	4.00E+01	--	1.22E+01					4.40E+00					
Iron	mg/kg	3.42E+04	2.34E+03	NA	2.00E+02	--	4.01E+04	YES	YES	YES		9.58E+03			YES	YES	
Lead	mg/kg	4.01E+01	4.00E+02	NA	5.00E+01	--	2.27E+01					1.71E+01					
Manganese	mg/kg	1.58E+03	3.63E+02	NA	1.00E+02	--	1.26E+03			YES	YES	1.21E+03			YES	YES	
Mercury	mg/kg	8.00E-02	2.33E+00	NA	1.00E-01	--	ND					4.00E-02					
Nickel	mg/kg	1.03E+01	1.54E+02	NA	3.00E+01	--	1.25E+01	YES				5.10E+00					
Potassium	mg/kg	8.00E+02	Essential Nutrient		no data	no data	1.04E+03	YES				ND					
Selenium	mg/kg	4.80E-01	3.91E+01	NA	8.10E-01	--	8.30E-01	YES		YES		ND					
Vanadium	mg/kg	5.88E+01	5.31E+01	NA	2.00E+00	--	1.11E+01			YES		1.18E+01				YES	
Zinc	mg/kg	4.06E+01	2.34E+03	NA	5.00E+01	--	4.47E+01	YES				1.91E+01	B				
Volatile Organic Compounds																	
2-Butanone	mg/kg	NA	4.66E+03	NA	no data	8.96E+01	6.00E-03	J				1.50E-02	J				
Acetone	mg/kg	NA	7.76E+02	NA	no data	2.50E+00	9.00E-02	J				3.20E+00	J			YES	
Bromomethane	mg/kg	NA	1.09E+01	NA	no data	no data	7.40E-03	J				6.60E-03	J				
Methylene chloride	mg/kg	NA	4.66E+02	8.41E+01	2.00E+00	--	3.70E-03	B				5.00E-03	B				
p-Cymene	mg/kg	NA	1.55E+03	NA	no data	no data	ND					3.60E-03	J				
Toluene	mg/kg	NA	1.55E+03	NA	5.00E-02	--	ND					2.90E-03	J				

Table 5-1

**Surface Soil Analytical Results
Former Smoke Area R, Parcel 105(6)
Fort McClellan, Calhoun County, Alabama**

(Page 2 of 2)

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

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-2

**Subsurface Soil Analytical Results
Former Smoke Area R, Parcel 105(6)
Fort McClellan, Calhoun County, Alabama**

		Bkg ^a	Human Health Screening Values Resident ^b		FTA-105 FTA-105-GP01 FC0002 29-Oct-98 Start Depth = 2 End Depth = 4				FTA-105 FTA-105-GP02 FC0004 29-Oct-98 Start Depth = 2 End Depth = 4			
Chemical	Units		Noncancer	Cancer	Result	Qual	>Bkg	>SSSL	Result	Qual	>Bkg	>SSSL
			SSSL	SSSL								
Metals												
Aluminum	mg/kg	1.36E+04	7.80E+03	NA	9.76E+03			YES	7.76E+03			
Arsenic	mg/kg	1.83E+01	2.34E+00	4.26E-01	1.53E+01			YES	2.10E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	NA	5.40E+01				2.64E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	NA	2.10E+00		YES		ND			
Chromium	mg/kg	3.83E+01	2.32E+01	NA	1.39E+01				9.80E+00			
Cobalt	mg/kg	1.75E+01	4.68E+02	NA	1.76E+01		YES		ND			
Copper	mg/kg	1.94E+01	3.13E+02	NA	2.91E+01		YES		6.70E+00			
Iron	mg/kg	4.48E+04	2.34E+03	NA	5.38E+04		YES	YES	1.09E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	NA	2.35E+01				7.90E+00			
Manganese	mg/kg	1.36E+03	3.63E+02	NA	2.44E+02				3.69E+01			
Nickel	mg/kg	1.29E+01	1.54E+02	NA	2.94E+01		YES		ND			
Potassium	mg/kg	7.11E+02	Essential Nutrient		1.86E+03		YES		ND			
Selenium	mg/kg	4.70E-01	3.91E+01	NA	1.40E+00		YES		ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	NA	ND				1.07E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	NA	8.16E+01		YES		1.64E+01	B		
Volatile Organic Compounds												
Acetone	mg/kg	NA	7.76E+02	NA	2.60E-02	B			1.10E-01	J		
Methylene chloride	mg/kg	NA	4.66E+02	8.41E+01	5.20E-03	B			3.10E-03	B		
Semivolatile Organic Compounds												
bis(2-Ethylhexyl)phthalate	mg/kg	NA	1.56E+02	4.52E+01	7.00E-02	B			ND			

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

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

^b Residential Human Health Site-Specific Screening Levels (SSSLs) and Ecological Screening Values (ESVs) as given in IT Corporation (2000b), *Final Human Health 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.

SSSL - Site-specific screening level.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Metals. Fifteen metals were detected in subsurface soil samples collected at Former Smoke Area R, Parcel 105(6). Each of the detected metals except vanadium was present in the sample collected from sample location FTA-105-GP01.

Aluminum, arsenic, and iron concentrations exceeded residential human health SSSLs in subsurface soils. However, with the exception of iron in one of the samples (FTA-105-GP01), the concentrations of these metals were within background concentrations. The iron concentration at sample location FTA-105-GP01 exceeded its residential human health SSSL and background screening value.

Volatile Organic Compounds. Acetone and methylene chloride were detected in subsurface soil samples collected at Former Smoke Area R, Parcel 105(6). The methylene chloride results and one of the acetone results were flagged with a “B” data qualifier signifying that these compounds were also detected in an associated laboratory or field blank. The acetone and methylene chloride concentrations were below residential human health SSSLs.

Semivolatile Organic Compounds. The SVOC bis(2-ethylhexyl)phthalate was detected at sample location FTA-105-GP01. The analytical result was flagged with a “B” data qualifier signifying that the compound was also detected in an associated laboratory or field blank. The bis(2-ethylhexyl)phthalate concentration was below its residential human health SSSL.

6.0 Summary and Conclusions and Recommendations

IT, under contract with USACE, completed an SI at Former Smoke Area R, Parcel 105(6) at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at Former Smoke Area R, Parcel 105(6) and, if present, whether the concentrations would present an unacceptable risk to human health or the environment. The SI at Former Smoke Area R, Parcel 105(6) consisted of the sampling and analyses of two surface soil samples and two subsurface soil samples.

Chemical analyses of samples collected at Former Smoke Area R, Parcel 105(6) indicate that metals, VOCs, and SVOCs were detected in the environmental media sampled. Analytical results were compared to the residential human health SSSLs, and, where available, ESVs. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC. Additionally, metals results exceeding the SSSLs and ESVs were compared to media-specific background concentrations (SAIC, 1998).

The potential impact to human receptors is expected to be minimal. Iron was detected at one sample location (surface and subsurface soil) at concentrations exceeding its residential human health SSSL and background screening values. The iron concentration in the subsurface soil sample (53,800 mg/kg) exceeded the background range (48,000 mg/kg) by roughly 10 percent. With the exception of iron in one sample (FTA-105-GP01), the metals concentrations that exceeded residential human health SSSLs were within background concentrations. The iron concentration (40,100 mg/kg) at sample location FTA-105-GP01 exceeded its SSSL and background screening value but was within the range of background values (56,300 mg/kg). Beryllium and selenium concentrations at sample location FTA-105-GP01 exceeded their ESVs and background concentrations but were below residential human health SSSLs.

Several metals and one VOC (acetone) were detected in surface soils at concentrations exceeding ESVs. However, with the exception of beryllium in one sample, the metals concentrations that exceeded ESVs were within the range of background concentrations. The beryllium concentration (1.2 mg/kg) exceeded the ESV (1.1 mg/kg) and the range of background values (0.87 mg/kg). The acetone concentration (3.2 mg/kg) in one surface soil sample exceeded the ESV (2.5 mg/kg). Based on the small size of the parcel, only limited ecological habitat may be

present within the parcel boundary. Therefore, the potential threat to of ecological receptors is expected to be very low.

Groundwater was not investigated at the Former Smoke Area R, Parcel 105(6); impacts to groundwater are not anticipated from site-related smoke training activities. However, groundwater contamination has been detected at Training Area %-38, Former Technical Escort Reaction Area, Parcel 186(6), located approximately 2,000 feet northwest of Former Smoke Area R. This contamination is being addressed as part of a remedial investigation currently being conducted at that site.

Although site-related impacts to groundwater are not anticipated at Former Smoke Area R, Parcel 105(6), offsite contamination from Training Area T-38 could impact groundwater at the site. Therefore, potential groundwater impacts to the Former Smoke Area R, Parcel 105(6) can not be positively identified until the completion of the remedial investigation at Parcel 186(6).

Based on the results of the SI, past operations at the Former Smoke Area R, Parcel 105(6) do not appear to have adversely impacted the environment. Therefore, IT recommends “No Further Action” and unrestricted land reuse with regard to hazardous, toxic, and radioactive waste at the Former Smoke Area R, Parcel 105(6).

7.0 References

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APPENDIX A
SAMPLE COLLECTION LOGS

APPENDIX B
BORING LOGS

APPENDIX C
SURVEY DATA

APPENDIX D
SUMMARY OF VALIDATED ANALYTICAL DATA

APPENDIX E
DATA VALIDATION SUMMARY REPORT

APPENDIX F

**SUMMARY STATISTICS FOR BACKGROUND MEDIA,
FORT MCCLELLAN, ALABAMA**