Final

Site Investigation Report
Anniston Army Depot, Former Shell Tapping Area
Parcel 208(7)

Fort McClellan
Calhoun County, Alabama

Prepared for:

U.S. Army Corps of Engineers, Mobile District
109 St. Joseph Street
Mobile, Alabama 36602

Prepared by:

IT Corporation
312 Directors Drive
Knoxville, Tennessee 37923

Task Orders CK03/CK12
Contract No. DACA21-96-D-0018
IT Project No. 773019

May 2002

Revision 0

Table of Contents

Page

Table of Contents *(Continued)*

Page

List of Appendices

List of Tables

List of Figures

Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Orders CK03/CK12, IT Corporation (IT) completed a site investigation (SI) at the Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7), at Fort McClellan (FTMC) in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site at concentrations that present an unacceptable risk to human health or the environment. The SI at Parcel 208(7) consisted of the sampling and analysis of three surface soil samples, three subsurface soil samples, two groundwater samples, one surface water sample, and one sediment sample. In addition, two permanent monitoring wells were installed at the site to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information.

Chemical analysis of samples collected at the site indicates that metals, volatile organic compounds, semivolatile organic compounds (SVOC), and explosive compounds were detected in the environmental media sampled. Chemical warfare material breakdown products were not detected in any of the samples collected. To evaluate whether the detected constituents pose an unacceptable risk to human health or the environment, the analytical results were compared to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC. Additionally, a preliminary risk assessment (PRA) was conducted to further characterize potential human health risk.

The potential threat to human receptors is expected to be minimal. Although Pelham Range is projected for continued military training reuse, the analytical data were screened against residential human health SSSLs to evaluate the site for possible unrestricted future use. Chemicals of potential concern identified in the PRA were limited to arsenic and 2,4-dinitrotoluene in subsurface soil and bis(2-ethylhexyl)phthalate in groundwater. Arsenic concentrations (38.1 and 50.8 milligrams per kilogram [mg/kg]) exceeded the SSSL (0.426 mg/kg) and upper background range (38 mg/kg) in two subsurface soil samples. 2,4-dinitrotoluene (0.94 mg/kg) slightly exceeded its SSSL (0.927 mg/kg) in only one subsurface soil sample. Bis(2-ethylhexyl)phthalate, a common sample contaminant, exceeded its SSSL in one groundwater sample. The PRA concluded that exposure to site media does not pose an unacceptable threat to human health for either the National Guardsperson or the on-site resident.

The potential threat to ecological receptors is expected to be very low. Constituents of potential ecological concern were limited to arsenic (in one surface soil sample and in the sediment

sample), and 2,6-dinitrotoluene (in one surface soil sample). The arsenic results, however, were within the range of background values indicating that arsenic is present at naturally occurring levels. Although 2,6-dinitrotoluene (0.48 mg/kg) exceeded its ESV (0.033 mg/kg) in one surface soil sample, the compound was not detected in the remaining surface soil samples or in the surface water/sediment samples. Given the conservatism inherent in the ESVs and its relatively low concentration in one sample, 2,6-dinitrotoluene is not expected to pose a significant threat to ecological receptors.

Based on the results of the SI, past operations at Parcel 208(7) have not adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health and the environment. Therefore, IT recommends "No Further Action" and unrestricted land reuse with regard to hazardous, toxic, and radioactive waste at the Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7).

1.0 Introduction

The U.S. Army has selected Fort McClellan (FTMC), located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE), Mobile District. The USACE contracted IT Corporation (IT) to perform the site investigation (SI) at the Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7), under Contract Number DACA21-96-D-0018, Task Orders CK03/CK12.

This SI report presents specific information and results compiled from the SI, which included field sampling and analysis and monitoring well installation activities, conducted at the Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7).

1.1 Project Description

The Anniston Army Depot, Former Shell Tapping Area, was identified as an area to be investigated prior to property transfer. The site was classified as a Category 7 site in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

A site-specific field sampling plan (SFSP) attachment (IT, 1999) and a site-specific safety and health plan (SSHP) attachment were finalized in November 1999. The SFSP and SSHP were prepared to provide technical guidance for sample collection and analysis at the Former Shell Tapping Area. The SFSP was used in conjunction with the SSHP as attachments to the installation-wide work plan (IT, 1998) and the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan and quality assurance plan.

The SI included fieldwork to collect three surface soil samples, three subsurface soil samples, two groundwater samples, one surface water sample, and one sediment sample. Data from the field investigation were used to determine whether potential site-specific chemicals are present at

the site and to provide data useful for supporting any future corrective measures and closure activities.

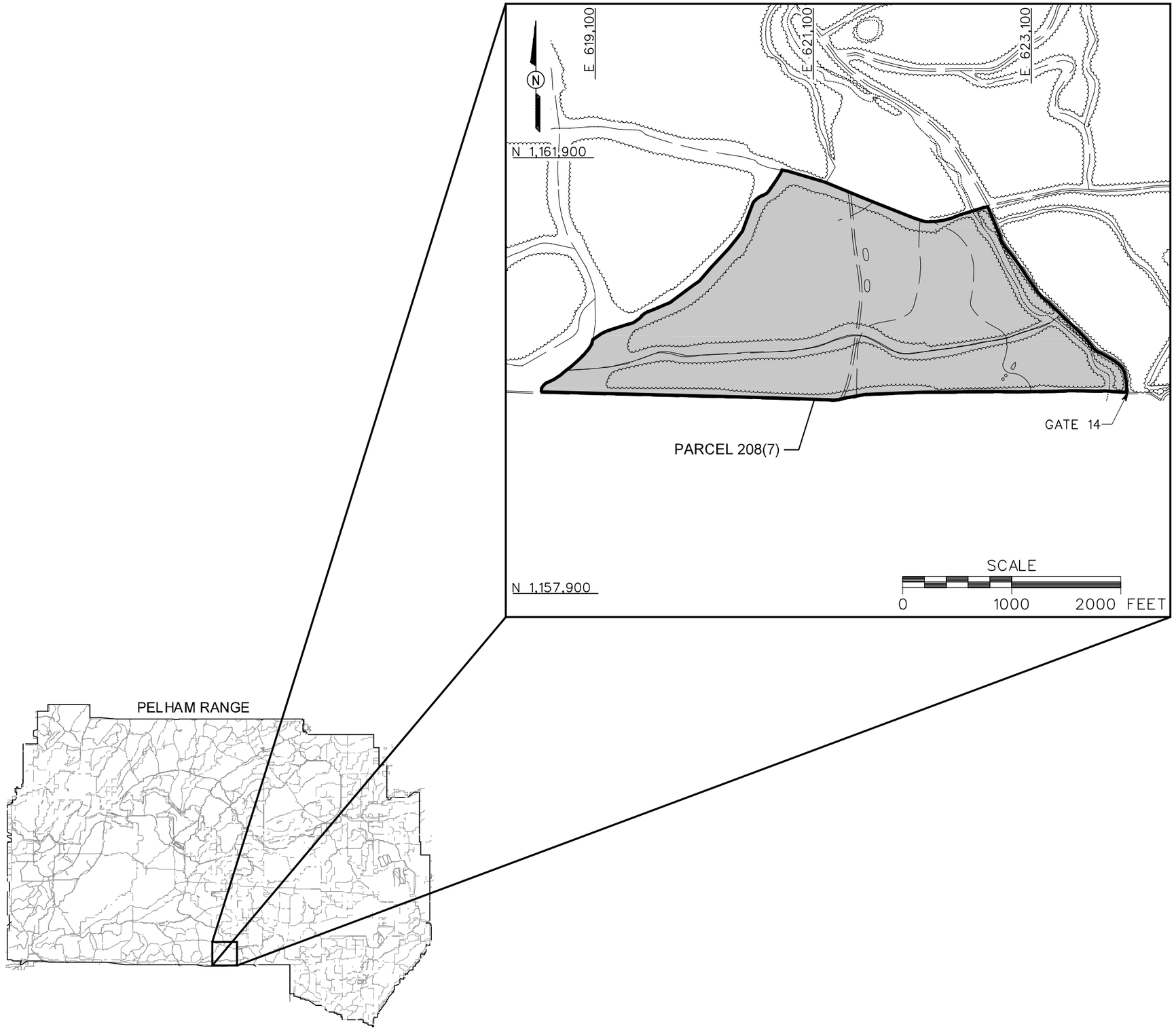
1.2 Purpose and Objectives

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

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

1.3 Site Description and History

The Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7), is located along the south-central border of Pelham Range, northwest of historical Gate No. 14 (Figure 1-1). The parcel is irregularly shaped and encompasses over 90 acres of wooded terrain on a hillside that slopes to the northwest, north, and northeast (Figure 1-2). Elevation at the site ranges from approximately 650 to 850 feet above mean sea level (msl). FTMC personnel have indicated that this site was the location of suspected chemical warfare material (CWM) shell tapping disposal or decontamination activities (ESE, 1998). During a site walk conducted by IT, mounds were observed at several locations near the central portion of the site. In addition, spent 40mm artillery rounds and two depressions, approximately 5 feet by 10 feet in area and 2 feet in depth, were observed in the southeast portion of the site (Figure 1-2). No other information is available regarding site usage.



LEGEND

- UNIMPROVED ROADS, PATHS AND PARKING
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK

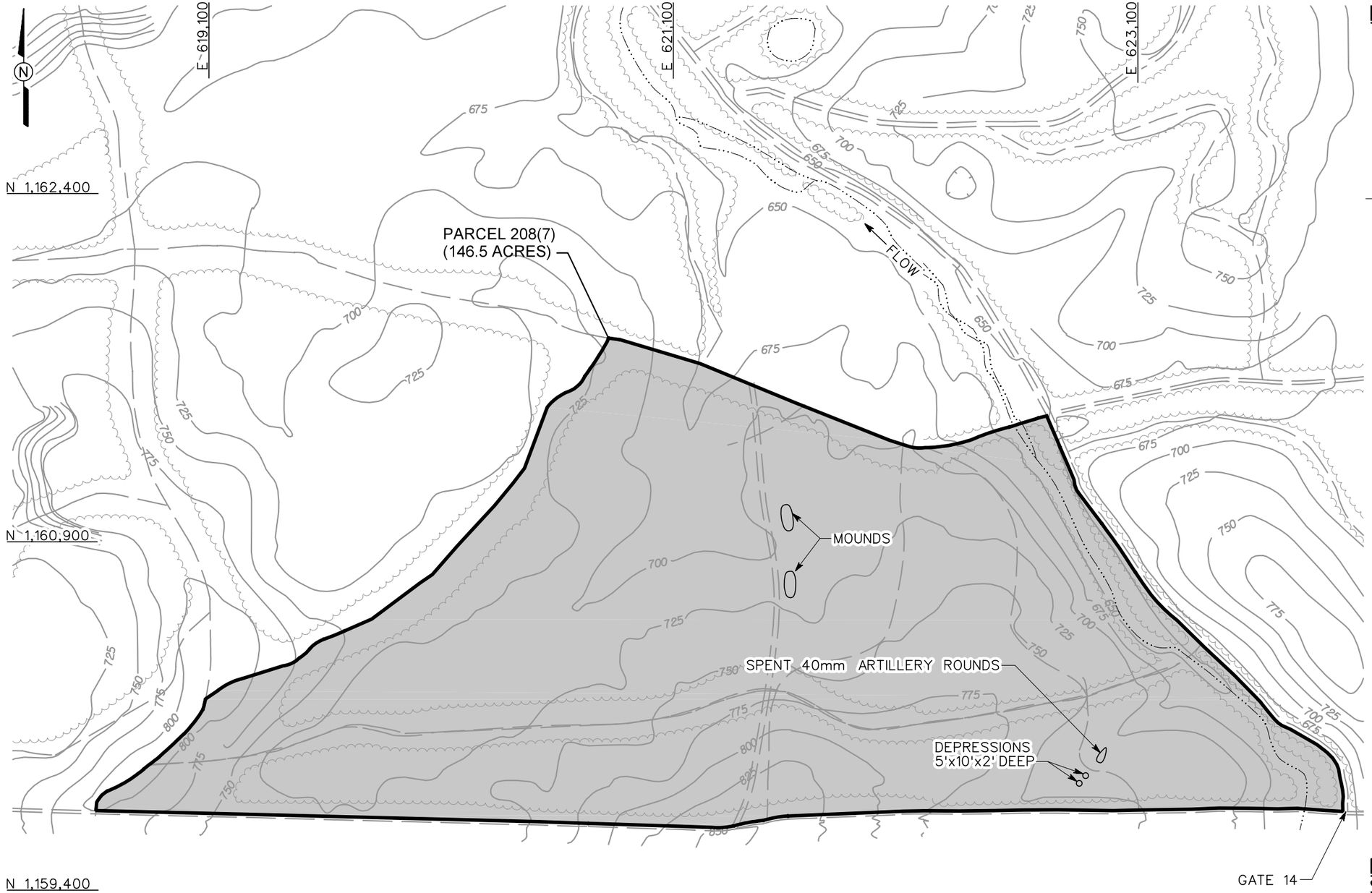
FIGURE 1-1
SITE LOCATION MAP
ANNISTON ARMY DEPOT
FORMER SHELL TAPPING AREA
PARCEL 208(7)

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

IT CORPORATION
A Member of The IT Group

DBILLING 05/14/02 03:29:47 PM c:\cadd\design\773019es.028

DRAFT. CHCK. BY:	DATE LAST REV.:
ENGR. CHCK. BY: S. MORAN	DRAWN BY:
PROJ. MGR.: J. YACOUB	STARTING DATE: 04/01/02
INITIATOR: L. O'HARE	DRAWN BY: C. BENTLEY
DWG. NO.: ...\773019es.028	PROJ. NO.: 773019



SCALE
0 500 1000 FEET

FIGURE 1-2
SITE MAP
ANNISTON ARMY DEPOT
FORMER SHELL TAPPING AREA
PARCEL 208(7)

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

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY:
ENGR. CHCK. BY: S. MORAN
INITIATOR: L. O'HARE
PROJ. MGR.: J. YACOUB
DWG. NO.: ...\77309es.029
PROJ. NO.: 774645
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 04/01/02
DRAWN BY: C. BENTLEY
05/15/02 02:08:59 PM
DBILLING
c:\cadd\design\773019es.029

2.0 Previous Investigations

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

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas)

2. Areas where only release or disposal of petroleum products has occurred

3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response

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

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

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

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

The EBS was conducted in accordance with Community Environmental Response Facilitation Act (CERFA) protocols (CERFA-Public Law 102-426) and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, Alabama Department of Environmental Management (ADEM), the U.S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historical maps and aerial photographs were reviewed to document historical land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

Parcel 208(7) was classified as a CERFA Category 7 parcel: areas that are not evaluated or require additional evaluation. The parcel required additional evaluation to determine its environmental condition.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT at the Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7), including unexploded ordnance (UXO) avoidance activities, environmental sampling and analysis, and groundwater monitoring well installation activities.

3.1 UXO Avoidance

UXO avoidance was performed at Parcel 208(7) following methodology outlined in Section 4.1.7 of the SAP (IT, 2000a). IT UXO personnel used a low-sensitivity magnetometer to perform a surface sweep of the parcel prior to site access. After the parcel was cleared for access, sample locations were monitored, following procedures outlined in Section 4.1.7.3 of the SAP (IT, 2000a).

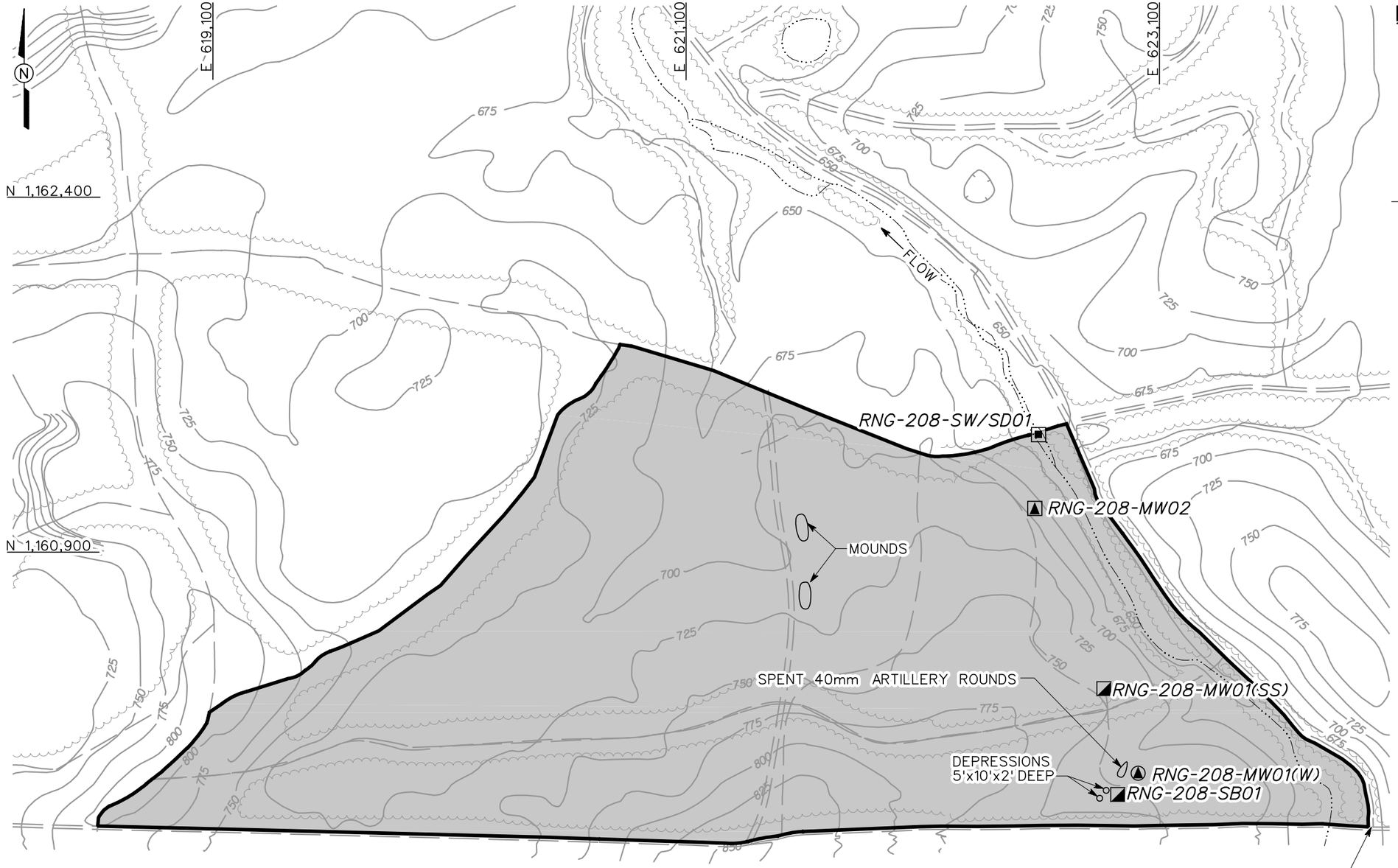
3.2 Environmental Sampling

The environmental sampling performed during the SI at Parcel 208(7) included the collection of surface soil samples, subsurface soil samples, groundwater samples, and surface water/sediment samples for chemical analysis. The sample locations were determined by observing site physical characteristics during a site walkover and by reviewing historical documents pertaining to activities conducted at the site. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figure 3-1. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.4.

3.2.1 Surface Soil Sampling

Three surface soil samples were collected at Parcel 208(7) as shown on Figure 3-1. Soil sampling locations and rationale are presented in Table 3-1. Soil sample designations and analytical parameters are listed in Table 3-2. Sampling locations were determined in the field by the on-site geologist based on UXO avoidance activities, sampling rationale, presence of surface structures, and site topography.

Sample Collection. Surface soil samples were collected from the upper 1 foot of soil using a stainless-steel hand auger or stainless-steel split-spoon following the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000a). The samples were collected by first removing surface debris (e.g., rocks and vegetation) from the immediate sample area. The soil was then collected with the sampling device and screened with a photoionization detector (PID) in accordance with Section 4.7.1.1 of the SAP (IT, 2000a). The soil fraction for volatile organic compound (VOC) analysis was collected directly from the sampler using three EnCore® samplers. The remaining



LEGEND

- UNIMPROVED ROADS AND PARKING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 25 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- SURFACE WATER/SEDIMENT SAMPLE LOCATION
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- GROUNDWATER SAMPLE LOCATION

SCALE
0 500 1000 FEET

FIGURE 3-1
SAMPLE LOCATION MAP
ANNISTON ARMY DEPOT
FORMER SHELL TAPPING AREA
PARCEL 208(7)

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

IT CORPORATION
A Member of The IT Group

DBILLING
c:\cadd\design\773019es.030
05/15/02 02:12:15 PM
DRAFT. CHCK. BY:
ENGR. CHCK. BY: S. MORAN
PROJ. MGR.: J. YACOUB
INITIATOR: L. O'HARE
STARTING DATE: 04/01/02
DRAWN BY: C. BENTLEY
DATE LAST REV.:
DRAWN BY:
DWG. NO.: ...\773019es.030
PROJ. NO.: 774645

Table 3-1

Sampling Locations and Rationale
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sampling Location Rationale
RNG-208-MW01	Groundwater.	A groundwater sample was collected in the southeast portion of the site at the location of spent 40mm artillary rounds to determine if chemicals of concern are present. The monitoring well location was used to determine site-specific geology and provide information on groundwater quality in the residuum aquifer.
RNG-208-MW01 (ss)	Surface soil and subsurface soil.	Surface soil and subsurface soil samples were collected in the east-central portion of the site, approximately 500 feet north of the RNG-208-MW01 groundwater sample location to determine if site-specific chemicals are present.
RNG-208-MW02	Surface soil, subsurface soil, and groundwater.	Surface soil, subsurface soil, and groundwater samples were collected east of the mounds, in the northeast portion of the parcel, to determine if chemicals of concern are present. The monitoring well location was used to determine site-specific geology and provide information on groundwater quality in the residuum aquifer.
RNG-208-SB01	Surface soil and subsurface soil.	Surface and subsurface soil samples were collected east of two depressions in the southeast portion of the parcel to determine if chemicals of concern are present.
RNG-208-SW/SD01	Surface water and sediment.	Surface water and sediment samples were collected from the intermittent creek located on the northeast side of the parcel to determine if chemicals of concern are present from surface runoff from the site.

Table 3-2

Soil Sample Designations and Analytical Parameters
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(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	
RNG-208-MW01(ss)	RNG-208-MW01-SS-RP0001-REG RNG-208-MW01-DS-RP0004-REG	0-1 4-7			RNG-208-MW01-SS-RP0005-MS RNG-208-MW01-SS-RP0005-MSD	VOCs, SVOCs, Metals, Explosives, and CWM breakdown products.
RNG-208-MW02	RNG-208-MW02-SS-RP0005-REG RNG-208-MW02-DS-RP0006-REG	0-1 8-12	RNG-2083-MW02-SS-RP0002-FD			VOCs, SVOCs, Metals, Explosives, and CWM breakdown products.
RNG-208-SB01	RNG-208-SB01-SS-RP0007-REG RNG-208-SB01-DS-RP0008-REG	0-1 10-12				VOCs, SVOCs, Metals, Explosives, and CWM breakdown products.

bgs - Below ground surface.
ft- Feet.
CWM- Chemical warfare material.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field Sample.
SVOC - Semivolatile organic compound.
VOC - Volatile organic compound.

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

3.2.2 Subsurface Soil Sampling

Subsurface soil samples were collected from three soil borings at Parcel 208(7), as shown on Figure 3-1. Subsurface soil sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations, depths, and analytical parameters are listed in Table 3-2. Soil boring sampling locations were determined in the field by the on-site geologist based on UXO avoidance activities, sampling rationale, presence of surface structures, and site topography. IT contracted Miller Drilling, Inc. to assist in subsurface soil sample collection.

Sample Collection. Subsurface soil samples were collected from soil borings at depths greater than 1 foot below ground surface (bgs) in the unsaturated zone. The soil borings were advanced and samples collected using hollow-stem auger (HSA) 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 3.4.

Subsurface soil samples were collected during monitoring well installation activities. From ground surface to 12 feet bgs, soil samples were continuously collected using a stainless-steel split-spoon sampler in accordance with Section 4.9.1.1 of the SAP (IT, 2000a). Samples were field screened using a PID in accordance with Section 4.7.1.1 of the SAP (IT, 2000a) to measure for volatile organic vapors. The sample displaying the highest reading was selected and sent to the laboratory for analysis; however, at those locations where PID readings were not greater than background, the 10-to-12-foot bgs sample interval was submitted for analysis. The soil fraction for VOC analysis was collected directly from the split-spoon sampler using three EnCore samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The on-site geologist constructed a detailed boring log for each soil boring (Appendix B). After soil sampling was completed, drilling procedures continued for the purpose of monitoring well installation.

3.2.3 Monitoring Well Installation

Two permanent groundwater monitoring wells were installed in the saturated zone at Parcel 208(7) to collect groundwater samples for laboratory analysis. The well/groundwater sampling locations are shown on Figure 3-1. Table 3-3 summarizes construction details of the wells

Table 3-3

Monitoring Well Construction Summary
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Well Location	Northing	Easting	Ground Elevation (ft amsl)	TOC Elevation (ft amsl)	Well Depth (ft bgs)	Sump Length (ft)	Screen Length (ft)	Screen Interval (ft bgs)	Well Material
RNG-208-MW01	1159956.42	623016.98	732.05	734.52	91	NA	20	70.7 - 90.7	2" ID Sch. 40 PVC
RNG-208-MW02	1161076.82	622581.64	710.86	713.75	101	2	20	79 - 99	2" ID Sch. 40 PVC

Monitoring wells installed using hollow-stem auger and air-rotary drilling techniques.
Horizontal coordinates referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983 (NAD83).
Elevations referenced to the North American Vertical Datum of 1988 (NAVD88).
2" ID Sch. 40 PVC - 2-inch inside diameter, Schedule 40, polyvinyl chloride.

amsl - Above mean sea level.
bgs - Below ground surface.
ft - Feet.
NA - Not applicable.

installed at the Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7). The well construction logs are included in Appendix B.

IT contracted Miller Drilling, Inc. to install the permanent wells using a combination of HSA and air-rotary drilling techniques. IT attempted to install the well RNG-208-MW01 at the location of direct-push soil sample collection. However, the drill rig could not access the direct-push location; therefore, the well was installed approximately 500 feet south of the direct-push location. The groundwater sample location remained RNG-208-MW01 and the soil sampling location was identified with "(ss)." The wells were installed following procedures outlined in Section 4.7 and Appendix C of the SAP (IT, 2000a). The borehole at each well location was advanced with a 4.25-inch inside diameter (ID) HSA from ground surface until auger refusal was encountered. A 2-foot-long, 2-inch ID carbon steel split-spoon sampler was driven at 5-foot intervals to collect residuum for observing and describing lithology. Where split-spoon refusal was encountered, the hollow-stem auger was advanced until refusal. At the depth of HSA refusal, an air-rotary drill with an 8- or 10-inch ID tri-cone rotary bit was used to advance the borehole to the approximate depth of bedrock. The on-site geologist logging the auger boreholes continued the lithological log for each borehole from the depth of split-spoon refusal to the bottom of the auger borehole by logging the drill cuttings. The drill cuttings were logged to determine lithologic changes and the approximate depth of groundwater encountered during drilling. This information was used to determine the optimal placement of the monitoring well screen interval and to provide site-specific geological and hydrogeological information. The boring log for each borehole is included in Appendix B.

Upon reaching the target depth in each borehole, a 20-foot length of 2-inch ID, 0.010-inch continuous slot, Schedule 40 polyvinyl chloride (PVC) screen with a PVC end cap or a 2-foot Schedule 40 PVC sump was placed through the auger to the bottom of the borehole. The screen and end cap (or sump) were attached to 2-inch ID, flush-threaded Schedule 40 PVC riser. A filter pack consisting of number 1 filter sand (environmentally safe, clean fine sand, sieve size 20 to 40) was tremied around the well screen to approximately 3 feet above the top of the well screen as the augers were removed. The well was surged using a solid PVC surge block for approximately 10 minutes, or until no more settling of the filter sand occurred inside the borehole. A bentonite seal, consisting of approximately 2 feet of bentonite pellets, was placed immediately on top of the sand pack and hydrated with potable water. If the bentonite seal was installed below the water table surface, the bentonite pellets were allowed to hydrate in the groundwater. Bentonite seal placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). The remaining annular space of the well was filled with bentonite-cement grout. The well surface completion included installing a protective steel casing and concrete

surface pad around the PVC well casing. A locking well cap was placed on the protective steel casing.

3.2.4 Well Development

The monitoring wells were developed by surging and pumping with a submersible pump in accordance with methodology outlined in Section 4.8 and Appendix C of the SAP (IT, 2000a). The submersible pump used for well development was moved in an up-and-down fashion to encourage any residual well installation materials to enter the well. These materials were then pumped out of the well to re-establish the natural hydraulic flow conditions. Development continued until the water turbidity was equal to or less than 20 nephelometric turbidity units, or for a maximum of 8 hours. The well development logs are included in Appendix C.

3.2.5 Water Level Measurements

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

3.2.6 Groundwater Sampling

Groundwater samples were collected from the two permanent monitoring wells installed at Parcel 208(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 analytical parameters are listed in Table 3-5.

Sample Collection. Groundwater sampling was performed following procedures outlined in Section 4.9.1.4 of the SAP (IT, 2000a). Groundwater was sampled after purging a minimum of three well volumes and after field parameters stabilized, including temperature, pH, specific conductivity, oxidation-reduction potential, dissolved oxygen, and turbidity. Purging and sampling were performed with a submersible pump equipped with Teflon™ tubing. Groundwater field parameters were measured after the completion of purging and prior to sample collection 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 3.4.

Table 3-4

Groundwater Elevations
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Well Location	Date	Depth to Water (ft BTOC)	Top of Casing Elevation (ft amsl)	Ground Elevation (ft amsl)	Groundwater Elevation (ft amsl)
RNG-208-MW01	7-Jan-02	85.13	734.52	732.05	649.39
RNG-208-MW02	7-Jan-02	71.12	713.75	710.86	642.63

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

BTOC - Below top of casing.
ft - Feet.
amsl - Above mean sea level.

Table 3-5

Groundwater Sample Designations and Analytical Parameters
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation*	QA/QC Samples			Analytical Suite
		Field Duplicates	Field Splits	MS/MSD	
RNG-208-MW01	RNG-208-MW01-GW-RP3001-REG	RNG-208-MW01-GW-RP3002-FD			VOCs, SVOCs, Metals, Explosives, and CWM breakdown products.
RNG-208-MW02	RNG-208-MW02-GW-RP3004-REG			RNG-208-MW02-GW-RP3004-MS RNG-208-MW02-GW-RP3004-MSD	VOCs, SVOCs, Metals, Explosives, and CWM breakdown products.

* Groundwater samples collected from the approximate midpoint of the saturated screened interval of the monitoring well.

CWM- Chemical warfare material.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
VOC - Volatile organic compound.

Table 3-6

Groundwater and Surface Water Field Parameters
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Date	Media	Specific Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)	Turbidity (NTU)	pH (SU)
RNG-208-MW01	21-Jun-00	GW	0.254	3.96	145	18.1	8.6	6.99
RNG-208-MW02	21-Jun-00	GW	0.229	2.50	145	17.9	29.7	7.03
RNG-208-SW/SD01	8-Mar-00	SW	0.111	3.88	105	19.1	18.1	7.20

°C - Degrees Celsius.
GW - Groundwater.
mg/L - Milligrams per liter.
mS/cm - Millisiemens per centimeter.
mV - Millivolts.
NTU - Nephelometric turbidity units.
ORP - Oxidation-reduction potential.
SU - Standard units.
SW - Surface water.

3.2.7 Surface Water Sampling

One surface water sample was collected at Parcel 208(7) at the location shown on Figure 3-1. The surface water sample location and rationale are listed in Table 3-1. The surface water sample designation and analytical parameters are listed in Table 3-7. The sampling location was determined in the field, based on drainage pathways and actual field observations.

Sample Collection. The surface water sample was collected in accordance with procedures specified in Section 4.9.1.3 of the SAP (IT, 2000a). The sample was collected by dipping a stainless-steel pitcher in the water and pouring the water into the sample containers or by dipping the sample containers in the water and allowing the water to fill the containers. The surface water sample was collected after field parameters had been measured using a calibrated water-quality meter. Surface water field parameters are listed in Table 3-6. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.4.

3.2.8 Sediment Sampling

One sediment sample was collected at the same location as the surface water sample presented in Section 3.2.7. The sediment sample location is shown on Figure 3-1. The sediment sampling location and rationale are presented in Table 3-1. The sample designation and analytical parameters are listed in Table 3-7. The actual sediment sampling location was determined in the field, based on drainage pathways and actual field observations.

Sample Collection. The sediment sample was collected in accordance with procedures specified in Section 4.9.1.2 of the SAP (IT, 2000a). Sediments were collected with a stainless-steel spoon and placed in a clean stainless-steel bowl. Samples for VOC analysis were then immediately collected from the stainless-steel bowl with three EnCore® samplers. The remaining portion of the sample was homogenized and placed in the appropriate sample containers. Sample collection logs are included in Appendix A. The sediment samples were analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.4.

3.3 Surveying of Sample Locations

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

Table 3-7

Surface Water and Sediment Sample Designations and Analytical Parameters
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	QA/QC Samples[a]			Analytical Suite
		Field Duplicates	Field Splits	MS/MSD	
RNG-208-SW/SD01	RNG-208-SW/SD01-SD-RP1001-REG RNG-208-SW/SD01-SW-RP2001-REG				VOCs, SVOCs, Metals, Explosives, and CWM breakdown products; TOC and Grain Size (sediment only).

[a] No QA/QC samples specified in site-specific field sampling plan.

CWM- Chemical warfare material.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TOC - Total organic carbon.
VOC - Volatile organic compound.

North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix D.

3.4 Analytical Program

Samples collected during the SI were analyzed for various chemical parameters based on potential site-specific chemicals and on EPA, ADEM, FTMC, and USACE requirements. Samples collected at Parcel 208(7) were analyzed for the following parameters:

- Target analyte list metals – EPA Method 6010B/7471A
- Target compound list VOCs – EPA Method 8260B
- Target compound list semivolatile organic compounds (SVOC) – EPA Method 8270C
- Nitroaromatic and nitramine explosives – EPA Method 8330
- CWM breakdown products – EPA Method 8321/8271CWM.

In addition, the sediment sample was analyzed for:

- Total organic carbon (TOC) – EPA Method 9060
- Grain Size – American Society for Testing and Materials Method D422.

The samples were analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Table 6-1 in Appendix B of the SAP (IT, 2000a).

3.5 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 Table 5-1 of Appendix B of the SAP (IT, 2000a). Sample documentation and chain-of-custody records were completed as specified in Section 4.13 of the SAP (IT, 2000a).

Completed analysis request and chain-of-custody records (Appendix A) were secured and included with each shipment of sample coolers to Quanterra Environmental Services, 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 during the SI at Parcel 208(7) was segregated as follows:

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

Solid IDW was stored on site in a designated lined roll-off bin 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 Parcel 208(7) were disposed as nonregulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

Liquid IDW was contained in the 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

Two variances to the SFSP were recorded during completion of the SI. The variances did not alter the scope or intent of the investigation. The variance reports are summarized in Table 3-8 and included in Appendix E. No nonconformances to the SFSP were recorded during completion of the SI at Parcel 208(7).

3.8 Data Quality

The validated analytical data are presented in tabular form in Appendix F. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan; the FTMC SAP and installation-wide quality assurance plan; and standard, accepted methods and procedures. Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of Appendix B of the SAP [IT, 2000a]). Chemical data were reported via hard-copy data packages by the laboratory using Contract Laboratory Program-like forms.

Data Validation. The reported analytical data were validated in accordance with EPA National Functional Guidelines by Level III criteria. The data validation results are summarized in a quality assurance report, which includes the data validation summary report (Appendix G). Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System (ITEMS™) database for tracking and reporting. The qualified data were

Table 3-8

Variances to the Site-Specific Field Sampling Plan
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Variance to the SFSP	Justification for Variance	Impact to Site Investigation
Sample location RNG-208-MW01 was relocated approximately 1,000 feet southeast of the proposed location for soil sample collection. RNG-208-MW01 was relocated a second time, approximately 500 feet south of the soil sample location and a monitoring well for groundwater sample collection was installed.	The direct push drill rig could not access the proposed location, therefore, the location was moved approlximately 1,000 feet southeast. Several attempts were made to install a well at the soil sample location; however, all attempts were unsuccessful. Therefore, the monitoring well location was moved 500 feet south of the direct-push location.	None. Soil and groundwater samples were collected to determine if potential chemicals of concern were present at the site.
Soil sample location RNG-208-SB01 was moved approximately 1,700 feet east of the proposed sample location.	Figures presented in the SFSP depicted site features west of the actual locations. Therefore, the soil sample location was relocated approximately 1,700 feet east of the proposed location to the actual location of the site features.	None. The surface soil and subsurface soil samples were collected to determine if potential chemicals of concern were present at the site.

SFSP - Site-Specific Field Sampling Plan.

used in comparisons to the SSSLs and ESVs developed by IT. Rejected data (assigned an "R" qualifier) were not used in comparisons 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 Parcel 208(7) provided soil and groundwater data used to characterize the geology and hydrogeology of the site.

4.1 Regional and Site Geology

4.1.1 Regional Geology

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

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

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

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

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

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

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

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

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

(Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

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

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

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

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

The Pennsylvanian Parkwood Formation overlies the Floyd Shale and consists of a medium to dark gray, silty, clay shale and mudstone with interbedded light to medium gray, very fine to fine

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

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

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

The eastern three-quarters of Pelham Range is located within the Pell City thrust sheet, while the remaining western quarter of Pelham is located within the Coosa deformed belt. The Pell City thrust sheet, a large-scale thrust sheet containing Cambrian and Ordovician rock, is relatively less structurally complex than the Coosa deformed belt (Thomas and Neathery, 1982). The Pell City thrust sheet is exposed between the traces of the Jacksonville and Pell City faults along the western boundary of the FTMC window and along the trace of the Pell City fault on Pelham Range (Thomas and Neathery, 1982; Osborne et al., 1988). The Coosa deformed belt is a narrow

(approximately 5 to 20 miles wide) northeast-to-southwest-trending linear (approximately 90 miles in length) zone of complex structure consisting mainly of thin, imbricate thrust slices. The structure within these imbricate thrust slices is often internally complicated by small-scale folding and additional thrust faults (Thomas and Drahovzal, 1974).

4.1.2 Site Geology

Soils at Parcel 208(7) are mapped as the Clarksville-Fullerton stony loams. The Clarksville series consists of strongly acidic, well-drained soils that have developed from cherty limestone or dolomite residuum on steep side slopes and narrow ridgetops (U.S. Department of Agriculture [USDA], 1961). The typical soil description is 1 to 3 feet of well-drained cherty silt loam to cherty, silty clay loam developed from deeply weathered cherty dolomitic limestone (USDA, 1961).

Bedrock at the site is mapped as the undifferentiated Cambrian/Ordovician Knox group (Osborne et al., 1997). In the vicinity of Calhoun County, the Knox Group consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weather to a chert residuum (Osborne and Szabo, 1984). Based on the boring logs from the two monitoring wells installed at the site, residuum at the site is predominantly clay with some sand, little silt, and chert, quartzite, and weathered dolomite gravel. HSA refusal was encountered on gray dolomite at depths ranging from 89 to 100 feet bgs.

4.2 Site Hydrology

4.2.1 Surface Hydrology

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

The eastern edge of Parcel 208(7) is bounded by a northwest-flowing tributary of Cane Creek. This tributary is the only surface water feature located at the site. Surface water runoff at the site drains to the northeast towards the tributary of Cane Creek.

4.2.2 Hydrogeology

Static groundwater levels were measured in the monitoring wells at Parcel 208(7) on January 7, 2002. Groundwater elevations are summarized in Table 3-4. Based on the groundwater elevations and the site topography, groundwater flow at the site is most likely to the northeast towards the tributary of Cane Creek.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at Parcel 208(7) indicate that metals, VOCs, SVOCs, and explosives were detected in the various site media. CWM breakdown products were not detected in any of the samples collected. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, the analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

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

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

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

Table 5-1

Surface Soil Analytical Results
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Sample Location						RNG-208-MW01						RNG-208-MW02					
Sample Number						RP0001						RP0005					
Sample Date						3-Mar-00						2-Mar-00					
Sample Depth (Feet)						0- 2						0- 2					
Parameter	Units	UBR[a]	BKG[b]	SSSL[c]	ESV[c]	Result	Qual	>UBR	>BKG	>SSSL	>ESV	Result	Qual	>UBR	>BKG	>SSSL	>ESV
METALS																	
Aluminum	mg/kg	3.99E+04	1.63E+04	7.80E+03	5.00E+01	8.40E+03				YES	YES	6.43E+03					YES
Arsenic	mg/kg	4.90E+01	1.37E+01	4.26E-01	1.00E+01	1.82E+01	J		YES	YES	YES	4.70E+00	J			YES	
Barium	mg/kg	2.88E+02	1.24E+02	5.47E+02	1.65E+02	8.67E+01						1.06E+02					
Beryllium	mg/kg	8.70E-01	8.00E-01	9.60E+00	1.10E+00	7.80E-01						4.50E-01	B				
Calcium	mg/kg	1.79E+04	1.72E+03	NA	NA	1.30E+02	J					6.16E+02	J				
Chromium	mg/kg	1.34E+02	3.70E+01	2.32E+01	4.00E-01	1.13E+01					YES	8.30E+00					YES
Cobalt	mg/kg	7.10E+01	1.52E+01	4.68E+02	2.00E+01	1.17E+01						5.20E+00	J				
Copper	mg/kg	2.40E+01	1.27E+01	3.13E+02	4.00E+01	1.19E+01						3.70E+00					
Iron	mg/kg	5.63E+04	3.42E+04	2.34E+03	2.00E+02	1.84E+04				YES	YES	7.78E+03				YES	YES
Lead	mg/kg	8.30E+01	4.01E+01	4.00E+02	5.00E+01	1.04E+01						1.41E+01					
Magnesium	mg/kg	9.60E+03	1.03E+03	NA	4.40E+05	2.16E+02	J					2.13E+02	J				
Manganese	mg/kg	6.85E+03	1.58E+03	3.63E+02	1.00E+02	5.05E+02				YES	YES	1.24E+03				YES	YES
Mercury	mg/kg	3.20E-01	8.00E-02	2.33E+00	1.00E-01	3.90E-02	J					6.80E-02					
Nickel	mg/kg	2.20E+01	1.03E+01	1.54E+02	3.00E+01	1.45E+01			YES			3.20E+00	J				
Potassium	mg/kg	6.01E+03	8.00E+02	NA	NA	7.40E+01	J					1.05E+02	J				
Thallium	mg/kg	3.40E+01	3.43E+00	5.08E-01	1.00E+00	5.50E-01	J			YES		5.90E-01	J			YES	
Vanadium	mg/kg	1.58E+02	5.88E+01	5.31E+01	2.00E+00	2.07E+01					YES	1.42E+01					YES
Zinc	mg/kg	2.09E+02	4.06E+01	2.34E+03	5.00E+01	3.35E+01	J					1.62E+01	J				
VOLATILE ORGANIC COMPOUNDS																	
Acetone	mg/kg	NA	NA	7.76E+02	2.50E+00	5.40E-02	J					9.20E-03	B				
Methylene chloride	mg/kg	NA	NA	8.41E+01	2.00E+00	4.00E-03	B					4.60E-03	B				
SEMIVOLATILE ORGANIC COMPOUNDS																	
bis(2-Ethylhexyl)phthalate	mg/kg	NA	NA	4.52E+01	9.30E-01	9.40E-02	B					9.70E-02	B				
EXPLOSIVES																	
2,4-Dinitrotoluene	mg/kg	NA	NA	9.27E-01	1.28E+00	8.20E-01						ND					
2,6-Dinitrotoluene	mg/kg	NA	NA	9.27E-01	3.28E-02	4.80E-01					YES	ND					
2-Nitrotoluene	mg/kg	NA	NA	7.77E+01	NA	5.00E+00	J					ND					
3-Nitrotoluene	mg/kg	NA	NA	7.77E+01	NA	5.70E-01						ND					
p-Nitrotoluene	mg/kg	NA	NA	7.77E+01	NA	5.80E+00	J					ND					

Table 5-1

Surface Soil Analytical Results
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Sample Location						RNG-208-SB01					
Sample Number						RP0007					
Sample Date						3-Mar-00					
Sample Depth (Feet)						0- 2					
Parameter	Units	UBR[a]	BKG[b]	SSSL[c]	ESV[c]	Result	Qual	>UBR	>BKG	>SSSL	>ESV
METALS											
Aluminum	mg/kg	3.99E+04	1.63E+04	7.80E+03	5.00E+01	7.94E+03				YES	YES
Arsenic	mg/kg	4.90E+01	1.37E+01	4.26E-01	1.00E+01	5.30E+00	J			YES	
Barium	mg/kg	2.88E+02	1.24E+02	5.47E+02	1.65E+02	5.75E+01					
Beryllium	mg/kg	8.70E-01	8.00E-01	9.60E+00	1.10E+00	4.70E-01	B				
Calcium	mg/kg	1.79E+04	1.72E+03	NA	NA	9.03E+01	J				
Chromium	mg/kg	1.34E+02	3.70E+01	2.32E+01	4.00E-01	7.30E+00					YES
Cobalt	mg/kg	7.10E+01	1.52E+01	4.68E+02	2.00E+01	6.20E+00					
Copper	mg/kg	2.40E+01	1.27E+01	3.13E+02	4.00E+01	3.50E+00					
Iron	mg/kg	5.63E+04	3.42E+04	2.34E+03	2.00E+02	7.48E+03				YES	YES
Lead	mg/kg	8.30E+01	4.01E+01	4.00E+02	5.00E+01	1.16E+01					
Magnesium	mg/kg	9.60E+03	1.03E+03	NA	4.40E+05	2.17E+02	J				
Manganese	mg/kg	6.85E+03	1.58E+03	3.63E+02	1.00E+02	7.99E+02				YES	YES
Mercury	mg/kg	3.20E-01	8.00E-02	2.33E+00	1.00E-01	2.40E-02	B				
Nickel	mg/kg	2.20E+01	1.03E+01	1.54E+02	3.00E+01	3.70E+00	J				
Potassium	mg/kg	6.01E+03	8.00E+02	NA	NA	8.18E+01	J				
Thallium	mg/kg	3.40E+01	3.43E+00	5.08E-01	1.00E+00	5.70E-01	J			YES	
Vanadium	mg/kg	1.58E+02	5.88E+01	5.31E+01	2.00E+00	1.45E+01					YES
Zinc	mg/kg	2.09E+02	4.06E+01	2.34E+03	5.00E+01	8.90E+00	J				
VOLATILE ORGANIC COMPOUNDS											
Acetone	mg/kg	NA	NA	7.76E+02	2.50E+00	2.10E-02	J				
Methylene chloride	mg/kg	NA	NA	8.41E+01	2.00E+00	3.50E-03	B				
SEMIVOLATILE ORGANIC COMPOUNDS											
bis(2-Ethylhexyl)phthalate	mg/kg	NA	NA	4.52E+01	9.30E-01	8.90E-02	B				
EXPLOSIVES											
2,4-Dinitrotoluene	mg/kg	NA	NA	9.27E-01	1.28E+00	ND					
2,6-Dinitrotoluene	mg/kg	NA	NA	9.27E-01	3.28E-02	ND					
2-Nitrotoluene	mg/kg	NA	NA	7.77E+01	NA	6.40E+00	J				
3-Nitrotoluene	mg/kg	NA	NA	7.77E+01	NA	5.50E-01					
p-Nitrotoluene	mg/kg	NA	NA	7.77E+01	NA	4.10E+00	J				

Table 5-1

Surface Soil Analytical Results
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] UBR - Upper background range as given in Science Applications International Corporation (SAIC), 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

[b] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998. For SVOCs, concentration listed is the background screening value for soils adjacent to asphalt as given in IT Corporation (IT), 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

[c] Residential human health site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT, 2000.

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

J - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-2

Subsurface Soil Analytical Results
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Sample Location:					RNG-208-MW01					RNG-208-MW02					RNG-208-SB01				
Sample Number:					RP0004					RP0006					RP0008				
Sample Date:					3-Mar-00					2-Mar-00					3-Mar-00				
Sample Depth (Feet):					4 - 7					8 - 12					10 - 12				
Parameter	**Units**	**UBR[a]**	**BKG[b]**	**SSSL[c]**	**Result**	**Qual**	**>UBR**	**>BKG**	**>SSSL**	**Result**	**Qual**	**>UBR**	**>BKG**	**>SSSL**	**Result**	**Qual**	**>UBR**	**>BKG**	**>SSSL**
METALS																			
Aluminum	mg/kg	2.46E+04	1.36E+04	7.80E+03	5.59E+03					2.96E+03					3.31E+03				
Antimony	mg/kg	9.90E-01	1.31E+00	3.11E+00	9.10E-01	J				ND					6.00E-01	J			
Arsenic	mg/kg	3.80E+01	1.83E+01	4.26E-01	3.81E+01	J	YES	YES	YES	3.22E+01	J		YES	YES	5.08E+01	J	YES	YES	YES
Barium	mg/kg	4.50E+03	2.34E+02	5.47E+02	4.10E+00	J				3.00E+00	J				4.50E+00	J			
Beryllium	mg/kg	2.00E+00	8.60E-01	9.60E+00	4.00E-01	B				1.30E-01	B				4.00E-01	B			
Chromium	mg/kg	5.50E+01	3.83E+01	2.32E+01	2.99E+01				YES	3.05E+01				YES	6.70E+00				
Cobalt	mg/kg	9.60E+01	1.75E+01	4.68E+02	6.60E+00					1.30E+00	J				3.00E+00	J			
Copper	mg/kg	6.10E+01	1.94E+01	3.13E+02	1.96E+01			YES		1.39E+01					2.95E+01			YES	
Iron	mg/kg	4.80E+04	4.48E+04	2.34E+03	3.60E+04				YES	1.45E+04				YES	2.14E+04				YES
Lead	mg/kg	5.00E+02	3.85E+01	4.00E+02	6.40E+00					5.20E+00					1.78E+01				
Magnesium	mg/kg	5.94E+03	7.66E+02	NA	7.48E+01	J				5.37E+01	J				1.11E+02	J			
Manganese	mg/kg	1.90E+04	1.36E+03	3.63E+02	6.99E+01					2.63E+01					1.07E+02				
Mercury	mg/kg	1.20E-01	7.00E-02	2.33E+00	1.70E-02	J				3.10E-02	J				3.20E-02	B			
Nickel	mg/kg	3.80E+01	1.29E+01	1.54E+02	1.45E+01			YES		7.60E+00					1.68E+01			YES	
Potassium	mg/kg	6.15E+03	7.11E+02	NA	9.86E+01	J				1.26E+02	J				2.71E+02	J			
Thallium	mg/kg	2.40E+01	1.40E+00	5.08E-01	ND					ND					5.60E-01	J			YES
Vanadium	mg/kg	9.90E+01	6.49E+01	5.31E+01	6.27E+01				YES	2.51E+01					2.71E+01				
Zinc	mg/kg	8.90E+01	3.49E+01	2.34E+03	4.53E+01	J		YES		1.73E+01	J				5.22E+01	J		YES	
VOLATILE ORGANIC COMPOUNDS																			
Acetone	mg/kg	NA	NA	7.76E+02	1.30E-02	J				ND					ND				
Methylene chloride	mg/kg	NA	NA	8.41E+01	2.40E-03	B				4.80E-03	B				3.40E-03	B			
SEMIVOLATILE ORGANIC COMPOUNDS																			
bis(2-Ethylhexyl)phthalate	mg/kg	NA	NA	4.52E+01	7.80E-02	B				7.30E-02	B				9.60E-02	B			
EXPLOSIVES																			
2,4-Dinitrotoluene	mg/kg	NA	NA	9.27E-01	ND					ND					9.40E-01				YES
2,6-Dinitrotoluene	mg/kg	NA	NA	9.27E-01	ND					ND					6.50E-01				
2-Nitrotoluene	mg/kg	NA	NA	7.77E+01	1.30E+01	J				ND					1.70E+01	J			
3-Nitrotoluene	mg/kg	NA	NA	7.77E+01	1.20E+00					ND					1.70E+00				
p-Nitrotoluene	mg/kg	NA	NA	7.77E+01	7.80E+00	J				ND					1.50E+01	J			

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] UBR - Upper background range as given in Science Applications International Corporation (SAIC), 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

[b] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998.

[c] Residential human health site-specific screening level (SSSL) as given in IT Corporation (2000), *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 - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-3

Groundwater Analytical Results
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Sample Location: / Sample Number: / Sample Date:					RNG-208-MW01 RP3001 21-Jun-00					RNG-208-MW02 RP3004 21-Jun-00				
Parameter	**Units**	**UBR[a]**	**BKG[b]**	**SSSL[c]**	**Result**	**Qual**	**>UBR**	**>BKG**	**>SSSL**	**Result**	**Qual**	**>UBR**	**>BKG**	**>SSSL**
METALS														
Aluminum	mg/L	9.60E+00	2.34E+00	1.56E+00	2.32E-01	J				7.87E-01	J			
Arsenic	mg/L	2.24E-01	1.78E-02	4.40E-05	ND					2.60E-03	J			YES
Barium	mg/L	4.01E-01	1.27E-01	1.10E-01	1.59E-02	J				1.17E-02	J			
Calcium	mg/L	4.52E+02	5.65E+01	NA	2.88E+01					2.59E+01				
Chromium	mg/L	NA	NA	4.69E-03	2.80E-03	J				2.80E-03	J			
Cobalt	mg/L	2.50E-02	2.34E-02	9.39E-02	2.40E-03	J				3.20E-03	J			
Iron	mg/L	2.58E+01	7.04E+00	4.69E-01	1.76E-01					9.30E-01				YES
Magnesium	mg/L	1.49E+02	2.13E+01	NA	1.56E+01					1.50E+01				
Manganese	mg/L	5.82E+00	5.81E-01	7.35E-02	7.63E-02				YES	3.42E-01				YES
Nickel	mg/L	NA	NA	3.13E-02	2.60E-03	J				4.90E-03	J			
Potassium	mg/L	6.85E+01	7.20E+00	NA	9.64E-01	J				5.25E-01	J			
Sodium	mg/L	6.47E+01	1.48E+01	NA	5.01E+00					1.42E+00	J			
Vanadium	mg/L	1.10E-02	1.70E-02	1.10E-02	ND					2.30E-03	B			
Zinc	mg/L	1.16E+00	2.20E-01	4.69E-01	3.50E-03	B				5.50E-03	B			
VOLATILE ORGANIC COMPOUNDS														
Chloromethane	mg/L	NA	NA	3.93E-03	ND					1.70E-04	B			
SEMIVOLATILE ORGANIC COMPOUNDS														
bis(2-Ethylhexyl)phthalate	mg/L	NA	NA	4.31E-03	ND					6.40E-02				YES

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] UBR - Upper background range as given in Science Applications International Corporation (SAIC), 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

[b] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998.

[c] Residential human health site-specific screening level (SSSL) as given in IT Corporation (2000), *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 - Compound was positively identified; reported value is an estimated concentration.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-4

Surface Water Analytical Results
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Sample Location:						RNG-208-SW/SD01					
Sample Site:						RP2001					
Sample Date:						8-Mar-00					
Parameter	**Units**	**UBR[a]**	**BKG[b]**	**SSSL[c]**	**ESV[c]**	**Result**	**Qual**	**>UBR**	**>BKG**	**>SSSL**	**>ESV**
METALS											
Aluminum	mg/L	4.78E+01	5.26E+00	1.53E+01	8.70E-02	2.25E-01	B				YES
Barium	mg/L	2.00E-01	7.54E-02	1.10E+00	3.90E-03	1.96E-02	J				YES
Calcium	mg/L	6.41E+01	2.52E+01	NA	1.16E+02	1.11E+01					
Iron	mg/L	2.32E+02	1.96E+01	4.70E+00	1.00E+00	4.92E-01					
Magnesium	mg/L	2.44E+01	1.10E+01	NA	8.20E+01	5.79E+00					
Manganese	mg/L	6.06E+00	5.65E-01	6.40E-01	8.00E-02	8.29E-02					YES
Potassium	mg/L	7.12E+00	2.56E+00	NA	5.30E+01	5.08E-01	J				
Sodium	mg/L	1.52E+01	3.44E+00	NA	6.80E+02	6.97E-01	J				
Zinc	mg/L	1.82E-01	4.04E-02	4.65E+00	5.89E-02	4.50E-03	J				

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] UBR - Upper background range as given in Science Applications International Corporation (SAIC), 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

[b] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998.

[c] Recreational site user site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), *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 - Compound was positively identified; reported value is an estimated concentration.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-5

Sediment Analytical Results
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Sample Location:						RNG-208-SW/SD01					
Sample Number:						RP1001					
Sample Date:						8-Mar-00					
Sample Depth (Feet):						0- .5					
Parameter	**Units**	**UBR[a]**	**BKG[b]**	**SSSL[c]**	**ESV[c]**	**Result**	**Qual**	**>UBR**	**>BKG**	**>SSSL**	**>ESV**
METALS											
Aluminum	mg/kg	1.74E+04	8.59E+03	1.15E+06	NA	8.00E+03					
Arsenic	mg/kg	2.00E+01	1.13E+01	5.58E+01	7.24E+00	1.71E+01			YES		YES
Barium	mg/kg	2.72E+02	9.89E+01	8.36E+04	NA	5.64E+01					
Beryllium	mg/kg	1.20E+00	9.70E-01	1.50E+02	NA	5.80E-01	B				
Calcium	mg/kg	2.81E+03	1.11E+03	NA	NA	9.26E+02	J				
Chromium	mg/kg	6.30E+01	3.12E+01	2.79E+03	5.23E+01	1.05E+01	J				
Cobalt	mg/kg	2.20E+01	1.10E+01	6.72E+04	5.00E+01	8.70E+00					
Copper	mg/kg	5.90E+01	1.71E+01	4.74E+04	1.87E+01	1.17E+01	J				
Iron	mg/kg	5.75E+04	3.53E+04	3.59E+05	NA	1.65E+04					
Lead	mg/kg	1.10E+02	3.78E+01	4.00E+02	3.02E+01	1.97E+01					
Magnesium	mg/kg	3.27E+03	9.06E+02	NA	NA	4.52E+02	J				
Manganese	mg/kg	2.05E+03	7.12E+02	4.38E+04	NA	4.74E+02					
Mercury	mg/kg	2.80E-01	1.10E-01	2.99E+02	1.30E-01	5.70E-02					
Nickel	mg/kg	3.30E+01	1.30E+01	1.76E+04	1.59E+01	1.00E+01					
Potassium	mg/kg	4.81E+03	1.01E+03	NA	NA	1.69E+02	J				
Thallium	mg/kg	2.20E-01	1.30E-01	7.78E+01	NA	9.00E-01	B	YES	YES		
Vanadium	mg/kg	6.70E+01	4.09E+01	4.83E+03	NA	2.67E+01					
Zinc	mg/kg	1.11E+02	5.27E+01	3.44E+05	1.24E+02	3.87E+01	J				
VOLATILE ORGANIC COMPOUNDS											
Acetone	mg/kg	NA	NA	1.03E+05	4.53E-01	2.50E-02	B				
Methylene chloride	mg/kg	NA	NA	9.84E+03	1.26E+00	4.60E-03	B				
Trichlorofluoromethane	mg/kg	NA	NA	3.06E+05	3.07E-03	2.60E-03	J				
SEMIVOLATILE ORGANIC COMPOUNDS											
bis(2-Ethylhexyl)phthalate	mg/kg	NA	NA	5.41E+03	1.82E-01	3.60E-01	B				YES
TOTAL ORGANIC CARBON											
Total Organic Carbon	mg/kg	NA	NA	NA	NA	1.63E+04					

Table 5-5

Sediment Analytical Results
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] UBR - Upper background range as given in Science Applications International Corporation (SAIC), 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

[b] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998.

[c] Recreational site user site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), *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 - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

5.1 Surface Soil Analytical Results

Three surface soil samples were collected for chemical analysis at Parcel 208(7). Surface soil samples were collected from the upper 1-foot of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and metals background screening values as presented in Table 5-1.

Metals. Eighteen metals were detected in surface soil samples collected at the site. Five metals (aluminum, arsenic, iron, manganese, and thallium) were detected at concentrations exceeding SSSLs. Of these metals, only arsenic (18.2 mg/kg) at RNG-208-MW01 also exceeded its background concentration (13.73 mg/kg); however, the detected concentration was flagged with a "J" data qualifier, signifying that the concentration was estimated. The arsenic concentration was within the range of background values determined by SAIC (1998) (Appendix H).

The concentrations of six metals (aluminum, arsenic, chromium, iron, manganese, and vanadium) exceeded ESVs. Only arsenic (at RNG-208-MW01) exceeded its respective background value; however, the result was flagged with a "J" data qualifier, indicating that the concentration was estimated. The arsenic concentration was within the range of background values determined by SAIC (1998) (Appendix H).

Volatile Organic Compounds. Two VOCs (acetone and methylene chloride) were detected in surface soil samples collected at the site. The VOCs were flagged with either a "J" or "B" data qualifier, signifying that the reported concentration was estimated or the compound was detected in an associated laboratory or field blank sample. The detected VOC concentrations were below SSSLs and ESVs.

Semivolatile Organic Compounds. Bis(2-ethylhexyl)phthalate was detected in each of the surface soil samples collected at the site; however, the results were flagged with a "B" data qualifier, signifying that the compound was detected in an associated laboratory or field blank sample. The bis(2-ethylhexyl)phthalate results were below the SSSL and ESV.

Explosives. A total of five explosive compounds (2,4-dinitrotoluene, 2,6-dinitrotoluene, 2-nitrotoluene, 3-nitrotoluene, and p-nitrotoluene) were detected in two surface soil samples (RNG-208-SB01 and RNG-208-MW01) collected at the site. Explosives concentrations were below SSSLs. The concentration of 2,6-dinitrotoluene (0.48 mg/kg) exceeded its ESV (0.0328 mg/kg) at RNG-208-MW01.

5.2 Subsurface Soil Analytical Results

Three subsurface soil samples were collected for chemical analysis at the site. Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-2.

Metals. Eighteen metals were detected in subsurface soil samples collected at the site. The concentrations of five metals (arsenic, chromium, iron, thallium, and vanadium) exceeded SSSLs. Of these metals, only the arsenic results (at all three locations) also exceeded their respective background value (SAIC, 1998) (Appendix H). Two of the arsenic results (38.1 and 50.8 mg/kg) also exceeded the upper background range (38 mg/kg) determined by SAIC (1998) (Appendix H); however, the results were flagged with a "J" data qualifier, signifying that the concentrations were estimated.

Volatile Organic Compounds. Two VOCs (acetone and methylene chloride) were detected in subsurface soil samples collected at the site. Acetone (0.0130 mg/kg) was detected in RNG-208-MW01; however, the concentration was flagged with a "J" data qualifier, signifying that the results were estimated. Methylene chloride was detected in all three subsurface soil samples; however, all results were flagged with a "B" data qualifier, signifying that the compound was also detected in an associated laboratory or field blank sample. The VOC results were below SSSLs.

Semivolatile Organic Compounds. Bis(2-ethylhexyl)phthalate was the only SVOC detected in each of the subsurface soil samples collected at the site. The results were flagged with a "B" data qualifier, signifying that the concentrations were detected in an associated laboratory or field blank sample. The bis(2-ethylhexyl)phthalate concentrations were below the SSSL.

Explosives. A total of five explosives (2,4-dinitrotoluene, 2,6-dinitrotoluene, 2-nitrotoluene, 3-nitrotoluene, and p-nitrotoluene) were detected in two subsurface soil samples (RNG-208-SB01 and RNG-208-MW01) collected at the site. The 2-nitrotoluene and p-nitrotoluene results were flagged with a "J" data qualifier, signifying that the results were estimated. The detected nitroaromatic explosives were below SSSLs, except for the 2,4-dinitrotoluene result (0.94 mg/kg) at RNG-208-SB01, which slightly exceeded its SSSL (0.927 mg/kg).

5.3 Groundwater Analytical Results

Two permanent monitoring wells were sampled at the site at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-3.

Metals. Fourteen metals were detected in groundwater samples collected at the site. Three metals (arsenic, iron, and manganese) were detected at concentrations exceeding SSSLs but below their respective background concentrations.

Volatile Organic Compounds. Chloromethane was the only VOC detected in groundwater samples collected at the site. The detected concentration of chloromethane (0.00017 milligrams per liter [mg/L]) at RNG-208-MW02 was flagged with a "B" data qualifier, signifying that the compound was also detected in an associated laboratory or field blank sample. The result was below the SSSL.

Semivolatile Organic Compounds. Bis(2-ethylhexyl)phthalate (0.064 mg/L) was the only SVOC detected in the groundwater samples. The bis(2-ethylhexyl)phthalate result (0.064 mg/L) at RNG-208-MW02 exceeded its SSSL (0.0043 mg/L). The compound is a typical sample contaminant.

Explosives. Explosives were not detected in the groundwater samples collected at the site.

5.4 Surface Water Analytical Results

One surface water sample was collected for chemical analysis at Parcel 208(7) at the location shown on Figure 3-1. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background concentrations, as presented in Table 5-4.

Metals. Nine metals were detected in the surface water sample collected at the site. The metals concentrations were below SSSLs. Three metals (aluminum, barium, and manganese) were detected at concentrations exceeding their ESVs but below their respective background values.

Volatile Organic Compounds. VOCs were not detected in the surface water sample collected at the site.

Semivolatile Organic Compounds. SVOCs were not detected in the surface water sample collected at the site.

Explosives. Explosives were not detected in the surface water sample collected at the site.

5.5 Sediment Analytical Results

One sediment sample was collected for chemical and physical analyses at the site. The sediment sample was collected from the upper 0.5 foot of sediment at the location shown on Figure 3-1. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background concentrations, as presented in Table 5-5.

Metals. Eighteen metals were detected in the sediment sample collected at the site. The metals concentrations in the sediment samples were below SSSLs. The concentration of arsenic (17.1 mg/kg) exceeded its ESV (7.24 mg/kg) and background value (11.3 mg/kg). However, the arsenic result was within the range of background values determined by SAIC (1998) (Appendix H).

Volatile Organic Compounds. Three VOCs (acetone, methylene chloride, and trichlorofluoromethane) were detected in the sediment sample. The VOC results were flagged with either a "J" or "B" data qualifier, signifying that the concentrations were estimated or that the compounds were detected in an associated laboratory or field blank sample. The VOC results were below SSSLs and ESVs.

Semivolatile Organic Compounds. Bis(2-ethylhexyl)phthalate (0.36 mg/kg) was the only SVOC detected in the sediment sample. The concentration of bis(2-ethylhexyl)phthalate was below its SSSL but exceeded its ESV (0.182 mg/kg). The bis(2-ethylhexyl)phthalate result was flagged with a "B" data qualifier indicating that the compound was also detected in an associated laboratory or field blank sample. Bis(2-ethylhexyl)phthalate is a common sample contaminant.

Explosives. Explosives were not detected in the sediment sample collected at the site.

Total Organic Carbon. The sediment sample was analyzed for TOC. The TOC concentration was 16,300 mg/kg, as presented in Table 5-5 and included in Appendix F.

Grain Size. The results of the grain size analysis are included in Appendix F.

5.6 Preliminary Risk Assessment

A PRA was performed to further characterize the potential threat to human health from exposure to environmental media at the site. The PRA approach was developed at the request of EPA and ADEM to provide a fast and inexpensive estimation of risk for relatively simple sites. It was derived from the streamlined risk assessment (SRA) protocol developed for FTMC and documented in the installation-wide work plan (IT, 1998). A PRA is a simplified version of an SRA, differing primarily in that the maximum detected concentration (MDC), rather than an estimate of average, is adopted as the source-term concentration for use in the risk assessment. However, a PRA cannot be less conservative (protective) than an SRA and is generally more protective. The PRA for Parcel 208(7) is included as Appendix I. It discusses the environmental media of interest, selection of site-related chemicals, selection of chemicals of potential concern (COPC), risk characterization, and conclusions.

The foundation of the SRA (and the PRA) is the SSSL, which incorporates all the exposure and toxicological assumptions and precision of a complete baseline risk assessment. SSSLs are receptor-, medium- and chemical-specific risk-based concentrations that are used to screen media to select COPCs and to characterize the risk, i.e., compute the incremental lifetime cancer risk (ILCR) and hazard index (HI) for noncancer effects associated with exposure to the media at the site.

The SSSLs applied to a given site represent the most highly exposed receptor scenario for each of several plausible uses for the site. The on-site resident, National Guardsperson, and recreational site user receptor scenarios were evaluated for Parcel 208(7). COPCs were selected from the site-related chemicals identified in the previous sections by comparing the MDC of the site-related chemical with the appropriate SSSL. Chemicals that were identified as not being site-related were dropped from further consideration because their presence was not attributed to site activities. The COPCs selected in this manner are the chemicals in each medium that may contribute significantly to cancer risk or to the potential for noncancer effects. As noted above, the MDC was selected as the source-term concentration for use in risk characterization. ILCR and HI values were estimated for each COPC in each medium and were summed to obtain total ILCR and HI values for each receptor.

COPCs for the on-site resident were limited to arsenic (in surface and subsurface soils), 2,4-dinitrotoluene (in subsurface soils), and bis(2-ethylhexyl)phthalate (in groundwater). The PRA concluded, however, that exposure to site media poses no unacceptable human health threat in the residential reuse scenario.

COPCs for the National Guardsperson were limited to arsenic (in surface and subsurface soil) and bis(2-ethylhexyl)phthalate (in groundwater). However, the PRA concluded that exposure to site media poses no unacceptable human health threat to the National Guardsperson.

COPCs for the recreational site user were limited to arsenic in subsurface soil. The PRA concluded that exposure to site media poses no unacceptable human health threat for the recreational site user.

The PRA concluded that the Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7), can be released for use by the National Guard requiring no further action. Furthermore, exposure to surface soil, subsurface soil, groundwater, surface water, and sediment is unlikely to pose any unacceptable threat to human health.

6.0 Summary, Conclusions, and Recommendations

IT, under contract to USACE, completed an SI at Parcel 208(7) at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site at concentrations that present an unacceptable risk to human health or the environment. The SI at Parcel 208(7) consisted of the sampling and analysis of three surface soil samples, three subsurface soil samples, two groundwater samples, one surface water sample, and one sediment sample. In addition, two permanent monitoring wells were installed at the site to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information.

Chemical analysis of samples collected at the site indicates that metals, VOCs, SVOCs, and explosives were detected in the environmental media sampled. CWM breakdown products were not detected in any of the samples collected. To evaluate whether the detected constituents pose an unacceptable risk to human health or the environment, the analytical results were compared to SSSLs, ESVs, and background screening values for FTMC. Additionally, a PRA was conducted to further characterize potential human health risk.

The potential threat to human receptors is expected to be minimal. Although Pelham Range is projected for continued military training reuse, the analytical data were screened against residential human health SSSLs to evaluate the site for possible unrestricted future use. Chemicals of potential concern identified in the PRA were limited to arsenic and 2,4-dinitrotoluene in subsurface soil and bis(2-ethylhexyl)phthalate in groundwater. Arsenic concentrations (38.1 and 50.8 mg/kg) exceeded the SSSL (0.426 mg/kg) and upper background range (38 mg/kg) in two subsurface soil samples. 2,4-dinitrotoluene (0.94 mg/kg) slightly exceeded its SSSL (0.927 mg/kg) in only one subsurface soil sample. Bis(2-ethylhexyl)phthalate, a common sample contaminant, exceeded its SSSL in one groundwater sample. The PRA concluded that exposure to site media does not pose an unacceptable threat to human health for either the National Guardsperson or the on-site resident.

The potential threat to ecological receptors is expected to be very low. Constituents of potential ecological concern were limited to arsenic (in one surface soil sample and in the sediment sample), and 2,6-dinitrotoluene (in one surface soil sample). The arsenic results, however, were within the range of background values indicating that the arsenic is present at naturally occurring levels. Although 2,6-dinotrotoluene (0.48 mg/kg) exceeded its ESV (0.033 mg/kg) in one surface soil sample, the compound was not detected in the remaining surface soil samples or in

the surface water/sediment samples. Given the conservatism inherent in the ESVs and its relatively low concentration in one sample, 2,6-dinitrotoluene is not expected to pose a significant threat to ecological receptors.

Based on the results of the SI, past operations at Parcel 208(7) have not adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health and the environment. Therefore, IT recommends "No Further Action" and unrestricted land reuse with regard to hazardous, toxic, and radioactive waste at the Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7).

7.0 References

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

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

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

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

IT Corporation (IT), 1999, ***Final Site-Specific Field Sampling Plan and Health Plan Attachments for the Relative Risk Screening for the Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7); the Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7); and the Former Agent Training Area, Range K, Parcel 203(7), Fort McClellan, Calhoun County, Alabama,*** November.

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

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

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

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

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

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

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

Raymond, D. E., W. E. Osborne, C. W. Copeland, and T. L. Neathery, 1988, ***Alabama Stratigraphy***, Geological Survey of Alabama, Tuscaloosa, Alabama, 97 p.

Science Applications International Corporation (SAIC), 2000, ***Final Remedial Investigation/Baseline Risk Assessment Report, Fort McClellan, Alabama***, July.

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

Thomas, W. A., and T. L. Neathery, 1982, ***Appalachian Thrust Belts in Alabama: Tectonics and Sedimentation***, Geologic Society of America 1982 Annual Meeting, New Orleans, Louisiana, Field Trip, Alabama Geological Society Guidebook 19A, 78 p.

Thomas, W. A., and J. A. Drahovzal, 1974, ***The Coosa Deformed Belt in the Alabama Appalachians***, Alabama Geological Society, 12th Annual Field Trip Guidebook 98 p.

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

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

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

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

ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	silvex
3D	3D International Environmental Group
AB	ambient blank
AbB3	Anniston gravelly clay loam, 2 to 6 percent slopes, severely eroded
AbC3	Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded
Abs	skin absorption
ABS	dermal absorption factor
AC	hydrogen cyanide
ACAD	AutoCadd
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
AdE	Anniston and Allen stony loam, 10 to 25 percent slope
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AEC	U.S. Army Environmental Center
AEL	airborne exposure limit
AET	adverse effect threshold
AF	soil-to-skin adherence factor
AHA	ammunition holding area
AL	Alabama
ALAD	-aminolevulinic acid dehydratase
amb.	Amber
amsl	above mean sea level
ANAD	Anniston Army Depot
AOC	area of concern
APEC	areas of potential ecological concern
APT	armor-piercing tracer
AR	analysis request
ARAR	applicable or relevant and appropriate requirement
AREE	area requiring environmental evaluation
ASP	Ammunition Supply Point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AT	averaging time
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	all-terrain vehicle
AWARE	Associated Water and Air Resources Engineers, Inc.
AWWSB	Anniston Water Works and Sewer Board
‘B’	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCF	blank correction factor; bioconcentration factor
BCT	BRAC Cleanup Team
BERA	baseline ecological risk assessment
BEHP	bis(2-ethylhexyl)phthalate
BFB	bromofluorobenzene
BFE	base flood elevation
BG	Bacillus globigii
bgs	below ground surface
BHC	betahexachlorocyclohexane
BHHRA	baseline human health risk assessment
BIRTC	Branch Immaterial Replacement Training Center
bkg	background
bls	below land surface
BOD	biological oxygen demand
Bp	soil-to-plant biotransfer factors
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BSAF	biota-to-sediment accumulation factors
BSC	background screening criterion
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethyl benzene, and xylenes
BTOC	below top of casing
BTV	background threshold value
BW	biological warfare; body weight
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
CAB	chemical warfare agent breakdown products
CAMU	corrective action management unit
CBR	chemical, biological and radiological
CCAL	continuing calibration
CCB	continuing calibration blank
CCV	continuing calibration verification
CD	compact disc
CDTF	Chemical Defense Training Facility
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CF	conversion factor
CFC	chlorofluorocarbon
CFDP	Center for Domestic Preparedness
CFR	Code of Federal Regulations
CG	carbonyl chloride (phosgene)
CGI	combustible gas indicator
ch	inorganic clays of high plasticity
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CK	cyanogen chloride
cl	inorganic clays of low to medium plasticity
Cl.	chlorinated
CLP	Contract Laboratory Program
cm	centimeter
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
CO	carbon monoxide
Co-60	cobalt-60
CoA	Code of Alabama
COC	chain of custody; contaminant of concern
COE	Corps of Engineers
Con	skin or eye contact
COPC	chemical(s) of potential concern
COPEC	chemical(s) of potential ecological concern
CPSS	chemicals present in site samples
CQCSM	Contract Quality Control System Manager
CRDL	contract-required detection limit
CRL	certified reporting limit
CRQL	contract-required quantitation limit
CRZ	contamination reduction zone
Cs-137	cesium-137
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
CSM	conceptual site model
CT	central tendency
ctr.	container
CWA	chemical warfare agent
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
‘D’	duplicate; dilution
D&I	detection and identification
DAF	dilution-attenuation factor
DANC	decontamination agent, non-corrosive
ºC	degrees Celsius
ºF	degrees Fahrenheit
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DEH	Directorate of Engineering and Housing
DEP	depositional soil
DFTPP	decafluorotriphenylphosphine
DI	deionized
DID	data item description
DIMP	di-isopropylmethylphosphonate
DM	dry matter
DMBA	dimethylbenz(a)anthracene
DMMP	dimethylmethylphosphonate

DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DOT	U.S. Department of Transportation
DP	direct-push
DPDO	Defense Property Disposal Office
DPT	direct-push technology
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
DWEL	drinking water equivalent level
E&E	Ecology and Environment, Inc.
EB	equipment blank
EBS	environmental baseline survey
EC_{50}	effects concentration for 50 percent of a population
ECBC	Edgewood Chemical/Biological Command
ED	exposure duration
EDD	electronic data deliverable
EF	exposure frequency
EDQL	ecological data quality level
EE/CA	engineering evaluation and cost analysis
Elev.	elevation
EM	electromagnetic
EMI	Environmental Management Inc.
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive ordnance disposal
EODT	explosive ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
EPRI	Electrical Power Research Institute
ER	equipment rinsate
ERA	ecological risk assessment
ER-L	effects range-low
ER-M	effects range-medium
ESE	Environmental Science and Engineering, Inc.
ESMP	Endangered Species Management Plan
ESN	Environmental Services Network, Inc.
ESV	ecological screening value
ET	exposure time
EU	exposure unit
Exp.	explosives
E-W	east to west
EZ	exclusion zone
FAR	Federal Acquisition Regulations
FB	field blank
FD	field duplicate
FDA	U.S. Food and Drug Administration
FedEx	Federal Express, Inc.
FEMA	Federal Emergency Management Agency
FFCA	Federal Facilities Compliance Act
FFE	field flame expedient
FFS	focused feasibility study
FI	fraction of exposure
Fil	filtered
Flt	filtered
FMDC	Fort McClellan Development Commission
FML	flexible membrane liner
FMP 1300	Former Motor Pool 1300
FOMRA	Former Ordnance Motor Repair Area
Foster Wheeler	Foster Wheeler Environmental Corporation
Frtn	fraction
FS	field split; feasibility study
FSP	field sampling plan
ft	feet
ft/ft	feet per foot
FTA	Fire Training Area
FTMC	Fort McClellan
FTRRA	FTMC Reuse & Redevelopment Authority
g	gram
g/m^3	gram per cubic meter
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
GAF	gastrointestinal absorption factor
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GCL	geosynthetic clay liner
GC/MS	gas chromatograph/mass spectrometer
GCR	geosynthetic clay liner
GFAA	graphite furnace atomic absorption
GIS	Geographic Information System
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GS	ground scar
GSA	General Services Administration; Geologic Survey of Alabama
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GST	ground stain
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
HA	hand auger
HCl	hydrochloric acid
HD	distilled mustard
HDPE	high-density polyethylene
HEAST	Health Effects Assessment Summary Tables
Herb.	herbicides
HHRA	human health risk assessment
HI	hazard index
HPLC	high performance liquid chromatography
HNO_3	nitric acid
HQ	hazard quotient
HQ_{screen}	screening-level hazard quotient
hr	hour
H&S	health and safety
HSA	hollow-stem auger
HTRW	hazardous, toxic, and radioactive waste
'I'	out of control, data rejected due to low recovery
IATA	International Air Transport Authority
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICRP	International Commission on Radiological Protection
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDM	investigative-derived media
IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic
IF	ingestion factor; inhalation factor
ILCR	incremental lifetime cancer risk
IMPA	isopropylmethyl phosphonic acid
IMR	Iron Mountain Road
in.	inch
Ing	ingestion
Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IR	ingestion rate
IRDMIS	Installation Restoration Data Management Information System
IRIS	Integrated Risk Information Service
IRP	Installation Restoration Program
IS	internal standard
ISCP	Installation Spill Contingency Plan
IT	IT Corporation
ITEMS	IT Environmental Management System™

'J'	estimated concentration
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
JPA	Joint Powers Authority
K	conductivity
K_{ow}	octonal-water partition coefficient
L	lewisite; liter
l	liter
LBP	lead-based paint
LC	liquid chromatography
LCS	laboratory control sample
LC_{50}	lethal concentration for 50 percent population tested
LD_{50}	lethal dose for 50 percent population tested
LEL	lower explosive limit
LOAEL	lowest-observed-advserse-effects-level
LT	less than the certified reporting limit
LUC	land-use control
LUCAP	land-use control assurance plan
LUCIP	land-use control implementation plan
max	maximum
MB	method blank
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MCPA	4-chloro-2-methylphenoxyacetic acid
MCS	media cleanup standard
MD	matrix duplicate
MDC	maximum detected concentration
MDCC	maximum detected constituent concentration
MDL	method detection limit
mg	milligrams
mg/kg	milligrams per kilogram
mg/kg/day	milligram per kilogram per day
mg/kgbw/day	milligrams per kilogram of body weight per day
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
min	minimum
MINICAMS	miniature continuous air monitoring system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MM	mounded material
MMBtu/hr	million Btu per hour
MOGAS	motor vehicle gasoline
MP	Military Police
MPA	methyl phosphonic acid
MPM	most probable munition
MQL	method quantitation limit
MR	molasses residue
MRL	method reporting limit
MS	matrix spike
mS/cm	millisiemens per centimeter
mS/m	millisiemens per meter
MSD	matrix spike duplicate
MTBE	methyl tertiary butyl ether
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
MWI&P	Monitoring Well Installation and Management Plan
Na	sodium
NA	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NAS	National Academy of Sciences
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NCRP	National Council on Radiation Protection and Measurements
ND	not detected
NE	no evidence; northeast
ne	not evaluated
NEW	net explosive weight
NFA	No Further Action
NG	National Guard
NGP	National Guardsperson
ng/L	nanograms per liter
NGVD	National Geodetic Vertical Datum
Ni	nickel
NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NLM	National Library of Medicine
NPDES	National Pollutant Discharge Elimination System
NPW	net present worth
No.	number
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effects-level
NR	not requested; not recorded; no risk
NRC	National Research Council
NRCC	National Research Council of Canada
NRHP	National Register of Historic Places
ns	nanosecond
N-S	north to south
NS	not surveyed
NSA	New South Associates, Inc.
nT	nanotesla
nT/m	nanoteslas per meter
NTU	nephelometric turbidity unit
nv	not validated
O_2	oxygen
O&G	oil and grease
O&M	operation and maintenance
OB/OD	open burning/open detonation
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OVM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector
OWS	oil/water separator
oz	ounce
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbon
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
Parsons	Parsons Engineering Science, Inc.
Pb	lead
PBMS	performance-based measurement system
PC	permeability coefficient
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
PCE	perchloroethene
PCP	pentachlorophenol
PDS	Personnel Decontamination Station
PEF	particulate emission factor
PEL	permissible exposure limit
PES	potential explosive site
Pest.	pesticides
PETN	pentarey thritol tetranitrate
PFT	portable flamethrower
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes

List of Abbreviations and Acronyms *(Continued)*

PM	project manager
POC	point of contact
POL	petroleum, oils, and lubricants
POW	prisoner of war
PP	peristaltic pump; Proposed Plan
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PR	potential risk
PRA	preliminary risk assessment
PRG	preliminary remediation goal
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAM	quality assurance manual
QAO	quality assurance officer
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental, Inc.
qty	quantity
Qual	qualifier
'R'	rejected data; resample
R&A	relevant and appropriate
RA	remedial action
RAO	removal action objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RDX	cyclonite
ReB3	Rarden silty clay loams
REG	regular field sample
REL	recommended exposure limit
RFA	request for analysis
RfC	reference concentration
RfD	reference dose
RGO	remedial goal option
RI	remedial investigation
RL	reporting limit
RME	reasonable maximum exposure
ROD	Record of Decision
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
RTC	Recruiting Training Center
RTECS	Registry of Toxic Effects of Chemical Substances
RTK	real-time kinematic
SA	exposed skin surface area
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
sc	clayey sands; sand-clay mixtures
Sch.	Schedule
SCM	site conceptual model
SD	sediment
SDG	sample delivery group
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties, Inc.
SF	cancer slope factor
SFSP	site-specific field sampling plan
SGF	standard grade fuels
SHP	installation-wide safety and health plan
SI	site investigation
SINA	Special Interest Natural Area
SL	standing liquid
SLERA	screening-level ecological risk assessment
sm	silty sands; sand-silt mixtures
SM	Serratia marcescens
SMDP	Scientific Management Decision Point
s/n	signal-to-noise ratio
SOP	standard operating procedure
SOPQAM	U.S. EPA's *Standard Operating Procedure/Quality Assurance Manual*
sp	poorly graded sands; gravelly sands
SP	submersible pump
SPCC	system performance calibration compound
SPCS	State Plane Coordinate System
SPM	sample planning module
SQRT	screening quick reference tables
Sr-90	strontium-90
SRA	streamlined human health risk assessment
SRM	standard reference material
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSL	soil screening level
SSSL	site-specific screening level
SSSSL	site-specific soil screening level
STB	supertropical bleach
STC	source-term concentration
STD	standard deviation
STEL	short-term exposure limit
STL	Severn-Trent Laboratories
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SUXOS	senior UXO supervisor
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA's *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SWMU	solid waste management unit
SWPP	storm water pollution prevention plan
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TBC	to be considered
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TERC	Total Environmental Restoration Contract
THI	target hazard index
TIC	tentatively identified compound
TLV	threshold limit value
TN	Tennessee
TNT	trinitrotoluene
TOC	top of casing; total organic carbon
TPH	total petroleum hydrocarbons
TR	target cancer risk
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TWA	time-weighted average
UCL	upper confidence limit
UCR	upper certified range
'U'	not detected above reporting limit
UF	uncertainty factor
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USACMLS	U.S. Army Chemical School

USAMPS	U.S. Army Military Police School
USATCES	U.S. Army Technical Center for Explosive Safety
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USC	United States Code
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UTL	upper tolerance level; upper tolerance limit
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO safety officer
V	vanadium
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
WAC	Women's Army Corps
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WRS	Wilcoxon rank sum
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd^3	cubic yards

SAIC – Data Qualifiers, Codes and Footnotes, 1995 Remedial Investigation

N/A – Not analyzed

ND – Not detected

Boolean Codes

LT – Less than the certified reporting limit

Flagging Codes

9 – Non-demonstrated/validated method performed for USAEC

B – Analyte found in the method blank or QC blank

C – Analysis was confirmed

D – Duplicate analysis

I – Interfaces in sample make quantitation and/or identification to be suspicious

J – Value is estimated

K – Reported results are affected by interfaces or high background

N – Tentatively identified compound (match greater than 70%)

Q – Sample interference obscured peak of interest

R – Non-target compound analyzed for but not detected (GC/MS methods)

S – Non-target compound analyzed for and detected (GC/MS methods)

T – Non-target compound analyzed for but not detected (non GC/MS methods)

U – Analysis in unconfirmed

Z – Non-target compound analyzed for and detected (non-GC/MS methods)

Qualifiers

J – The low-spike recovery is low

N – The high-spike recovery is low

R – Data is rejected