2.0 Study Area Investigation

This chapter summarizes site characterization activities conducted by IT during SI and RI field activities at Parcel 94(7), including geophysical survey, environmental sampling and analysis, groundwater monitoring well installation, seep survey, and slug testing activities. Field activities for the SI were initiated in October 1998 and were completed in February 1999. SI field activities included a geophysical survey, installation of three monitoring wells, and the sampling and analysis of soil, groundwater, and surface water/sediment samples (IT, 1998a).

Based on the results of the SI analytical data, an RI was deemed necessary. IT conducted the RI in two phases over a period of time from November 2000 to July 2001. Phase I field activities, which began in November 2000 and were completed in May 2001, consisted of the installation of 12 monitoring wells and the sampling and analysis of surface soil, groundwater, and surface water/sediment samples (IT, 2000a). Phase II field activities, which were performed in June and July 2001, included the installation of four monitoring wells and the sampling and analysis of surface soil and groundwater samples (IT, 2001a). This report documents the results of the initial SI and Phases I and II of the RI.

2.1 Geophysical Survey

A geophysical survey utilizing magnetic and electromagnetic methods was conducted at the Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7), to locate possible USTs associated with former gas stations at the site. The area surveyed was approximately 216,700 square feet (5 acres), as shown on Figure 2-1. A detailed discussion of the geophysical investigation, including theory of operation of the instruments, field procedures, data processing, and interpreted results of the investigation, is presented as Appendix A.

An initial survey grid was established at the site to encompass the suspected UST locations. A detailed, hand-sketched site map was drawn in the field. The map included any surface cultural features within the survey area, or near its perimeter, that could potentially affect the geophysical data (e.g., surface metal debris, fence, and monitoring wells). Preliminary color contour maps of the data were analyzed and compared with the site sketch to differentiate between anomalies caused by surface and subsurface source materials. The results of the geophysical survey are summarized in Chapter 4.0.

E 671,900

E 673,900

N 1,168,500

N 1,167,500

COOSA DRIVE

CANE CREEK

ST. CLAIR ROAD

CEMETERY

BLACMAN ROAD

WILHELM LANE

LANGLEY AVENUE

INGRAM CREEK

HEAT STREET

NIELSEN ST.

WOODS

775

800

825

850

BURIED PIPE

BUILDING SUMP HOUSE

FORMER BUILDING FOUNDATION

SCALE

0 200 400 FEET

LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- GEOPHYSICAL SURVEY AREA
- CULVERT WITH HEADWALL
- SURFACE DRAINAGE / CREEK
- MANMADE SURFACE DRAINAGE FEATURE
- FENCE
- UTILITY POLE

FIGURE 2-1
EXTENT OF GEOPHYSICAL SURVEY AREA
FORMER CHEMICAL LAUNDRY AND MOTOR POOL AREA 1500
PARCEL 94(7)

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

IT CORPORATION
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ENGR. CHCK. BY: S. MORAN		PROJ. MGR.: J. YACOUB	PROJ. NO.: 796887
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2.2 Environmental Sampling

The environmental sampling performed during the SI and RI at Parcel 94(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 2-1. Sampling locations are shown on Figure 2-2. Samples were submitted for laboratory analysis of site-related parameters listed in Section 2.4.

2.2.1 Surface and Depositional Soil Sampling

Sixteen surface soil samples and four depositional soil samples were collected at Parcel 94(7), as shown on Figure 2-2. Soil sampling locations and rationale are presented in Table 2-1. Sample designations and analytical parameters are listed in Table 2-2. Soil sampling locations were determined in the field by the on-site geologist based on the geophysical survey results, sampling rationale, presence of surface structures, and site topography.

Sample Collection. Surface and depositional soil samples were collected from the upper 1 foot of soil using either a direct-push technology (DPT) sampling system or a stainless-steel hand auger following the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000b). Surface soil samples were collected by first removing surface debris (e.g., rocks or vegetation) from the immediate sample area. At some locations, asphalt or concrete pavement was penetrated prior to sample collection. 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, 2000b). Samples for volatile organic compound (VOC) analysis were collected directly from the sampler using three EnCore® samplers. The remaining portion of the soil was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 2-2 using methods outlined in Section 2.4.

2.2.2 Subsurface Soil Sampling

Subsurface soil samples were collected from 15 soil borings at Parcel 94(7), as shown on Figure 2-2. One subsurface soil sample was collected from each soil boring. Subsurface soil sampling locations and rationale are presented in Table 2-1. Sample designations, depths, and analytical parameters are listed in Table 2-2. Soil boring sampling locations were determined in the field by the on-site geologist based on the geophysical survey results, sampling rationale, presence of

Table 2-1

Sampling Locations and Rationale
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sampling Location Rationale
FTA-94-DEP01	Depositional Soil	Surface runoff from the northern end of the site is deposited downslope before entering Cane Creek. Sample collected to confirm or deny the presence of contamination in deposited soil.
FTA-94-DEP02	Depositional Soil	Surface runoff from the north-central part of the site is deposited downslope before entering Ingram Creek and Cane Creek. Sample collected to confirm or deny the presence of contamination in deposited soil.
FTA-94-DEP03	Depositional Soil	Surface runoff from the central portion of the site is deposited downslope before entering Ingram Creek. Sample collected to confirm or deny the presence of contamination in deposited soil.
FTA-94-DEP04	Depositional Soil	Surface runoff from the southern portion of the site is deposited downslope before entering Ingram Creek. Sample collected to confirm or deny the presence of contamination in deposited soil.
FTA-94-GP01	Surface Soil Subsurface Soil	Samples were collected downslope of the former USTs at Building 1494 and from the northwestern corner of the Former Chemical Laundry and motor pool area to determine if contaminants were released during the operation of the former gas station and/or from vehicle maintenance activities.
FTA-94-GP02	Surface Soil Subsurface Soil Groundwater	Samples were collected downslope and downgradient of the former USTs at Building 1494 from the northern portion of the former chemical laundry and motor pool area to determine if contaminants were released into site media during the operation of the former gas station and/or from vehicle maintenance activities.
FTA-94-GP03	Subsurface Soil	Sample was collected in the immediate vicinity of the possible UST location at Building 1494 [Parcel 133(7)]. Source area sample was collected to confirm or deny the presence of contamination in subsurface soil.
FTA-94-GP04	Subsurface Soil	Sample was collected in the immediate vicinity of the possible UST location at Building 1494 [Parcel 133(7)]. Source area sample was collected to confirm or deny the presence of contamination in subsurface soil.
FTA-94-GP05	Surface Soil Subsurface Soil Groundwater	Samples were collected from the southern portion of the former chemical laundry and motor pool facility to determine if contaminants were released into site media during vehicle maintenance and/or chemical impregnation activities.
FTA-94-GP06	Subsurface Soil	Sample was collected in the immediate vicinity of the possible UST location at Building 1594A [Parcel 134(7)]. Source area sample was collected to confirm or deny the presence of contamination in subsurface soil.
FTA-94-GP07	Subsurface Soil	Sample was collected in the immediate vicinity of the possible UST location at Building 1594A [Parcel 134(7)]. Source area sample was collected to confirm or deny the presence of contamination in subsurface soil.
FTA-94-GP08	Surface Soil Subsurface Soil	Samples were collected from the location of the former chemical laundry and motor pool facility to determine if contaminants were released into soil during vehicle maintenance and chemical impregnation activities.
FTA-94-GP09	Subsurface Soil	Sample was collected in the immediate vicinity of the possible UST location at Building 1594 [Parcel 132(7)]. Source area sample was collected to confirm or deny the presence of contamination in subsurface soil.
FTA-94-GP10	Subsurface Soil	Sample was collected in the immediate vicinity of the possible UST location at Building 1594 [Parcel 132(7)]. Source area sample was collected to confirm or deny the presence of contamination in subsurface soil.
FTA-94-GP11	Surface Soil Subsurface Soil Groundwater	Samples were collected from central portion of the former motor pool area to determine if contaminants were released into site media during vehicle maintenance and/or chemical impregnation activities.

Table 2-1

Sampling Locations and Rationale
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
Fort McClellan, Calhoun County, Alabama

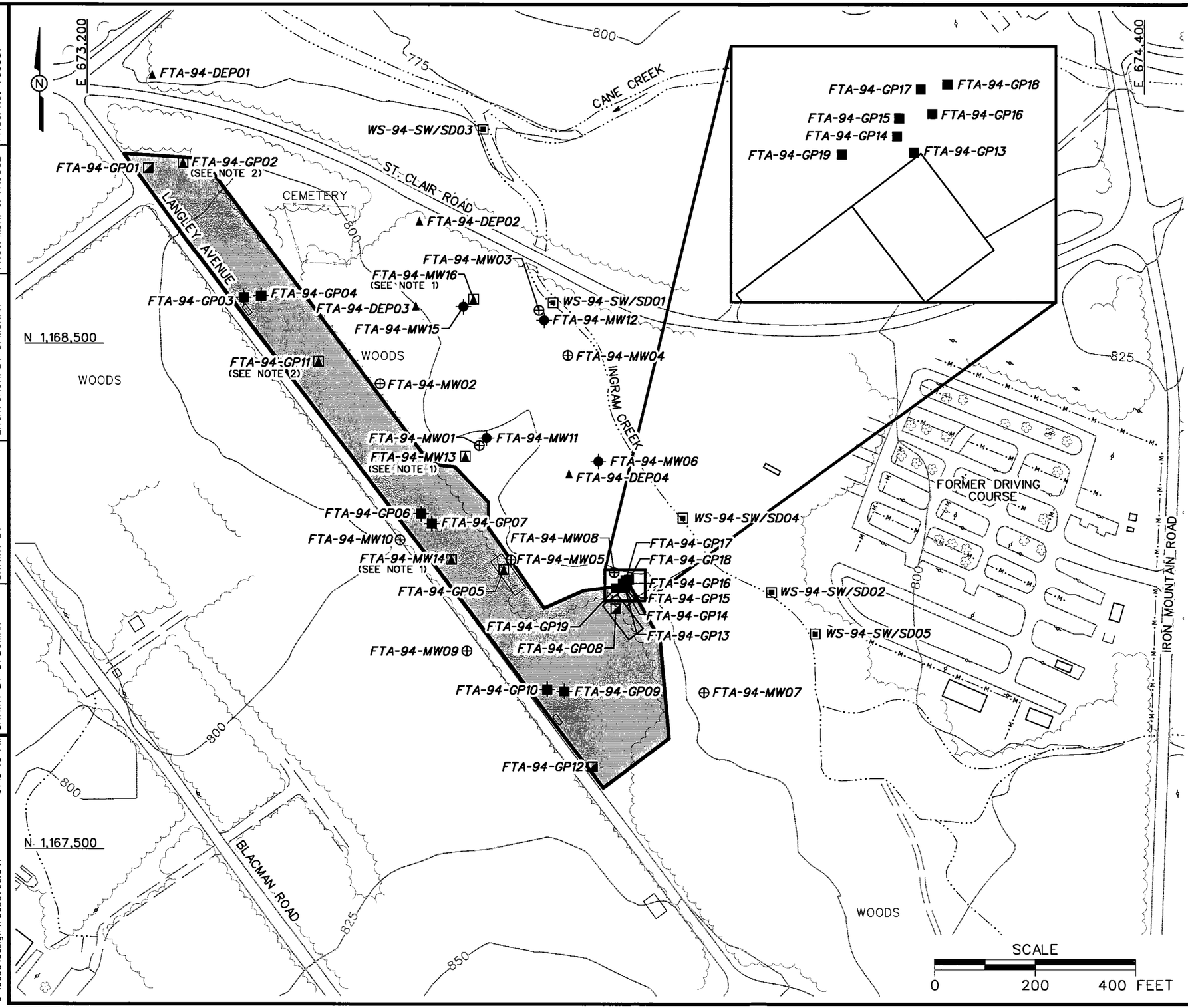
Sample Location	Sample Media	Sampling Location Rationale
FTA-94-GP12	Surface Soil Subsurface Soil	Samples were collected from the southwest area of the former chemical laundry and motor pool facility to determine if contaminants were released into soil during vehicle maintenance and chemical impregnation activities.
FTA-94-GP13	Surface Soil	A surface soil sample was collected along a buried pipeline located northeast of sample location FTA-94-GP08 to determine if the pipeline was a source of contamination in surface soil.
FTA-94-GP14	Surface Soil	A surface soil sample was collected along a buried pipeline located northeast of sample location FTA-94-GP08 to determine if the pipeline was a source of contamination in surface soil.
FTA-94-GP15	Surface Soil	A surface soil sample was collected along a buried pipeline located northeast of sample location FTA-94-GP08 to determine if the pipeline is a source of contamination in surface soil.
FTA-94-GP16	Surface Soil	A surface soil sample was collected along a buried pipeline located northeast of sample location FTA-94-GP08 to determine if the pipeline is a source of contamination in surface soil.
FTA-94-GP17	Surface Soil	A surface soil sample was collected along a buried pipeline located northeast of sample location FTA-94-GP08 to determine if the pipeline is a source of contamination in surface soil.
FTA-94-GP18	Surface Soil	A surface soil sample was collected along a buried pipeline located northeast of sample location FTA-94-GP08 to determine if the pipeline is a source of contamination in surface soil.
FTA-94-GP19	Surface Soil	A surface soil sample was collected underneath the concrete building sump house located next to the former building foundation to determine if the sump house was a source of contamination.
FTA-94-MW01	Groundwater	Groundwater samples were collected from existing background well MW-BK-G11 located in the east-central portion of the former motor pool building and downgradient of USTs at Building 1594A to assess potential migration of contaminants from the source areas. This well was resampled during RI activities.
FTA-94-MW02	Groundwater	A permanent residuum groundwater monitoring well was installed approximately 200 feet northwest of existing well FTA-94-MW01. Groundwater was collected and analyzed to determine the horizontal extent of chlorinated VOCs in groundwater northwest of FTA-94-MW01.
FTA-94-MW03	Groundwater	A permanent residuum groundwater well was installed approximately 300 feet north-northeast of existing well FTA-94-MW01. Groundwater was collected and analyzed to determine the horizontal extent of chlorinated VOCs in groundwater hydraulically downgradient of FTA-94-MW01.
FTA-94-MW04	Groundwater	A permanent residuum groundwater well was installed approximately 300 feet northeast of existing well FTA-94-MW01. Groundwater was collected and analyzed to determine the horizontal extent of chlorinated VOCs in groundwater hydraulically downgradient of FTA-94-MW01.
FTA-94-MW05	Groundwater	A permanent residuum groundwater monitoring well was installed approximately 250 feet southeast of existing well FTA-94-MW01 to replace temporary well FTA-94-GP05. Groundwater was collected and analyzed to verify the presence of chlorinated VOCs in groundwater.
FTA-94-MW06	Groundwater	A permanent bedrock groundwater well was installed approximately 255 feet east of existing well FTA-94-MW01. Groundwater was analyzed to determine the horizontal extent of chlorinated VOCs in groundwater downgradient of FTA-94-MW01 and FTA-94-GP05.
FTA-94-MW07	Groundwater	A permanent residuum groundwater monitoring well was installed approximately 600 feet southeast of existing well FTA-94-MW01. Groundwater was collected and analyzed to determine the horizontal extent of chlorinated VOCs in groundwater southeast of the parcel.
FTA-94-MW08	Groundwater	A permanent residuum groundwater well was installed approximately 75 feet downgradient of FTA-94-GP08. Groundwater was analyzed to determine if chlorinated VOCs are present in groundwater. Temporary monitoring well FTA-94-GP08 was not installed during the SI because groundwater had not been encountered during direct-push activities.

Table 2-1

Sampling Locations and Rationale
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sampling Location Rationale
FTA-94-MW09	Groundwater	A permanent residuum groundwater monitoring well was installed approximately 380 feet south of existing well FTA-94-MW01 southwest of the parcel boundary. Groundwater was collected and analyzed to verify the presence of chlorinated VOCs in groundwater.
FTA-94-MW10	Groundwater	A permanent residuum groundwater monitoring well was installed approximately 230 feet southwest and hydraulically upgradient of existing well FTA-94-MW01. Groundwater was collected and analyzed to verify the presence of chlorinated VOCs in groundwater.
FTA-94-MW11	Groundwater	A permanent bedrock groundwater monitoring well was installed adjacent to existing well location FTA-94-MW01. Groundwater samples were collected and analyzed to determine the vertical extent of chlorinated VOCs in groundwater.
FTA-94-MW12	Groundwater	A permanent residuum groundwater monitoring well was installed adjacent to FTA-94-MW03 if groundwater contamination is present in the residuum. Groundwater was collected and analyzed to determine the vertical extent of chlorinated VOCs in groundwater.
FTA-94-MW13	Surface Soil Subsurface Soil Groundwater	Bedrock monitoring well was installed adjacent to FTA-94-MW01 (residuum) and FTA-94-MW11 (bedrock). The well location assisted in defining the vertical extent of groundwater contamination. Surface and subsurface soil samples were collected for analysis to aid in determining a source area. Two rounds of groundwater samples were collected from this well.
FTA-94-MW14	Surface Soil Subsurface Soil Groundwater	Bedrock monitoring was installed approximately midway between residuum monitoring wells FTA-94-MW05 and FTA-94-MW10 to aid in defining the upgradient extent of horizontal and vertical groundwater contamination. Surface and subsurface soil samples were collected for analysis to aid in determining a source area.
FTA-94-MW15	Groundwater	Bedrock monitoring was installed adjacent to FTA-94-MW16. The well location assisted in defining the downgradient extent of horizontal and vertical groundwater contamination.
FTA-94-MW16	Surface Soil Subsurface Soil Groundwater	Bedrock monitoring well was installed adjacent to FTA-94-MW15. The well location assisted in defining the downgradient extent of horizontal and vertical groundwater contamination. Surface and subsurface soil samples were collected for analysis to aid in determining a source area.
WS-94-SW/SD01	Surface Water Sediment	Potential groundwater flow from the northern portion of the site toward Ingram Creek could influence sediment and surface water within the creek. Samples collected to confirm or deny the presence of contamination in site media.
WS-94-SW/SD02	Surface Water Sediment	Potential groundwater flow from the southern portion of the site toward Ingram Creek could influence sediment and surface water within the creek. Samples collected to confirm or deny the presence of contamination in site media.
WS-94-SW/SD03	Surface Water Sediment	A surface water/sediment sample was collected at the confluence of Ingram Creek and Cane Creek. Samples were analyzed to determine if chlorinated VOCs are present.
WS-94-SW/SD04	Surface Water Sediment	A surface water/sediment sample was collected approximately 380 feet east-southeast of FTA-94-MW01, approximately midway between existing sample points WS-94-SW/SD01 and WS-94-SW/SD02 along Ingram Creek. Samples were analyzed to determine if chlorinated VOCs are present.
WS-94-SW/SD05	Surface Water Sediment	A surface water/sediment sample was collected approximately 500 feet east of FTA-94-12, and south of sample point WS-94-SW/SD02 along Ingram Creek. Samples were analyzed to determine if chlorinated VOCs are present.

GP - Geoprobe/direct-push.
MW - Monitoring well.
SW/SD - Surface water/sediment.
TCE - Trichloroethene.
UST - Underground storage tank.
WS - Watershed.



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 25 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- CULVERT WITH HEADWALL
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- SURFACE WATER/SEDIMENT SAMPLE LOCATION
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- SUBSURFACE SOIL SAMPLE LOCATION
- GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- DEPOSITIONAL SOIL SAMPLE LOCATION
- RESIDUUM MONITORING WELL / GROUNDWATER SAMPLE LOCATION
- BEDROCK MONITORING WELL / GROUNDWATER SAMPLE LOCATION

SCALE
0 200 400 FEET

NOTES:

1. BEDROCK MONITORING WELL.
2. RESIDUUM MONITORING WELL.

FIGURE 2-2
SAMPLE LOCATION MAP
FORMER CHEMICAL LAUNDRY
AND MOTOR POOL AREA 1500
PARCEL 94(7)

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

IT CORPORATION
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Table 2-2

Soil Sample Designations and Analytical Parameters
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Parameters
			Field Duplicates	Field Splits	MS/MSD	
FTA-94-DEP01	FTA-94-DEP01-DEP-EM0021-REG	0-1				Metals, VOCs, SVOCs, and PCBs
FTA-94-DEP02	FTA-94-DEP02-DEP-EM0022-REG	0-1				Metals, VOCs, SVOCs, and PCBs
FTA-94-DEP03	FTA-94-DEP03-DEP-EM0023-REG	0-1				Metals, VOCs, SVOCs, and PCBs
FTA-94-DEP04	FTA-94-DEP04-DEP-EM0024-REG	0-1				Metals, VOCs, SVOCs, and PCBs
FTA-94-GP01	FTA-94-GP01-SS-EM0001-REG	0-1				Metals, VOCs, SVOCs, and PCBs
	FTA-94-GP01-DS-EM0002-REG	5-8				
FTA-94-GP02	FTA-94-GP02-SS-EM0003-REG	0-1				Metals, VOCs, SVOCs, and PCBs
	FTA-94-GP02-DS-EM0004-REG	1-5				
FTA-94-GP03	FTA-94-GP03-DS-EM0007-REG	0-4	FTA-94-GP03-DS-EM0005-FD	FTA-94-GP03-DS-EM0006-FS		Metals, VOCs, SVOCs, and PCBs
FTA-94-GP04	FTA-94-GP04-DS-EM0008-REG	8-12				Metals, VOCs, SVOCs, and PCBs
FTA-94-GP05	FTA-94-GP05-SS-EM0009-REG	0-1				Metals, VOCs, SVOCs, and PCBs
	FTA-94-GP05-DS-EM0010-REG	24-28				
FTA-94-GP06	FTA-94-GP06-DS-EM0011-REG	8-11				Metals, VOCs, SVOCs, and PCBs
FTA-94-GP07	FTA-94-GP07-DS-EM0012-REG	1-4				Metals, VOCs, SVOCs, and PCBs
FTA-94-GP08	FTA-94-GP08-SS-EM0013-REG	0-1				Metals, VOCs, SVOCs, and PCBs
	FTA-94-GP08-DS-EM0014-REG	7-9				
FTA-94-GP09	FTA-94-GP09-DS-EM0015-REG	8-12				Metals, VOCs, SVOCs, and PCBs
FTA-94-GP10	FTA-94-GP10-DS-EM0016-REG	8-12				Metals, VOCs, SVOCs, and PCBs
FTA-94-GP11	FTA-94-GP11-SS-EM0017-REG	0-1				Metals, VOCs, SVOCs, and PCBs
	FTA-94-GP11-DS-EM0018-REG	4-8			FTA-94-GP11-DS-EM0018-MS/MSD	
FTA-94-GP12	FTA-94-GP12-SS-EM0019-REG	0-1				Metals, VOCs, SVOCs, and PCBs
	FTA-94-GP12-DS-EM0020-REG	8-10				
FTA-94-GP13	FTA-94-GP13-SS-EMM0001-REG	0-1				VOCs
FTA-94-GP14	FTA-94-GP14-SS-EMM0002-REG	0-1				VOCs
FTA-94-GP15	FTA-94-GP15-SS-EMM0003-REG	0-1				VOCs

Table 2-2

Soil Sample Designations and Analytical Parameters
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Parameters
			Field Duplicates	Field Splits	MS/MSD	
FTA-94-GP16	FTA-94-GP16-SS-EMM0004-REG	0-1				VOCs
FTA-94-GP17	FTA-94-GP17-SS-EMM0005-REG	0-1	FTA-94-GP17-SS-EMM0006-FD	FTA-94-GP17-SS-EMM0007-FS		VOCs
FTA-94-GP18	FTA-94-GP18-SS-EMM0008-REG	0-1			FTA-94-GP18-SS-EMM0008-MS/MSD	VOCs
FTA-94-GP19	FTA-94-GP19-SS-EMM0009-REG	0-1				VOCs
FTA-94-MW13	FTA-94-MW13-SS-EMM0010-REG	0-1			FTA-94-MW13-SS-EMM0010-MS/MSD	Metals, VOCs, SVOCs, and PCBs
	FTA-94-MW13-DS-EMM0011-REG	11-12				
FTA-94-MW14	FTA-94-MW14-SS-EMM0012-REG	0-1				Metals, VOCs, SVOCs, and PCBs
	FTA-94-MW14-DS-EMM0013-REG	11-12				
FTA-94-MW16	FTA-94-MW16-SS-EMM0014-REG	0-1	FTA-94-MW16-SS-EMM0015-FD			Metals, VOCs, SVOCs, and PCBs
	FTA-94-MW16-DS-EMM0016-REG	11-12				

DEP - Depositional soil.
DS - Deep soil.
FD - Field duplicate.
FS - Field split.
GP - Geoprobe/direct-push.
MS/MSD - Matrix spike/matrix spike duplicate.
MW - Monitoring well.
PCB - Polychlorinated biphenyl.
QA/QC - Quality assurance/quality control.
REG - Regular field sample.
SS - Surface soil.
SVOC - Semivolatile organic compound.
VOC - Volatile organic compound.

surface structures, and site topography. IT contracted TEG, Inc., a DPT subcontractor, to assist in subsurface soil sample collection.

Sample Collection. Subsurface soil samples were collected from soil borings at depths greater than 1 foot bgs in the unsaturated zone. The soil borings were advanced and soil samples collected using the DPT sampling procedures specified in Section 4.9.1.1 of the SAP (IT, 2000b). Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 2-2 using methods outlined in Section 2.4.

Subsurface soil samples were collected continuously to 12 feet bgs or until DPT sampler refusal was encountered. Samples were field-screened using a PID in accordance with Section 4.7.1.1 of the SAP (IT, 2000b) to measure for volatile organic vapors. The soil sample displaying the highest reading was selected and sent to the laboratory for analysis; however, at those locations where PID readings were not greater than background, the deepest soil sample interval above the saturated zone was submitted for analysis. Samples for VOC analysis were collected directly from the sampler with three EnCore samplers. The remaining portion of the soil was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The samples were analyzed for the parameters listed in Table 2-2 using methods outlined in Section 2.4. The on-site geologist constructed a detailed boring log for each soil boring (Appendix C).

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

2.2.3 Monitoring Well Installation

A total of 18 monitoring wells were installed at Parcel 94(7) to collect groundwater samples for laboratory analysis. The well locations are shown on Figure 2-2. Table 2-3 summarizes construction details of the monitoring wells installed at the site. The well construction logs are included in Appendix C.

2.2.3.1 Temporary Monitoring Well

One temporary well (FTA-94-GP05) was installed in the residuum groundwater zone at the Former Chemical Laundry and Motor Pool Area, Parcel 94(7), to collect groundwater samples for laboratory analysis. The well was installed by advancing a 2-inch outside diameter DPT

Table 2-3

Monitoring Well Construction Summary
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
Fort McClellan, Calhoun County, Alabama

Well Location	Well Type [a]	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
FTA-94-GP02 [b]	Residuum	1168857.42	672494.45	792.92	795.49	29	NA	15	13.75 - 28.75	2" ID Sch. 40 PVC
FTA-94-GP05	Temporary	1168051.03	673128.97	806.99	808.77	28	NA	5	23 - 28	1" ID Sch. 40 PVC
FTA-94-GP11 [b]	Residuum	1168463.37	672762.39	814.10	816.10	39	NA	15	23.75 - 38.75	2" ID Sch. 40 PVC
FTA-94-MW02	Residuum	1168419.42	672884.35	810.70	812.75	55	1	15	39 - 54	2" ID Sch. 40 PVC
FTA-94-MW03	Residuum	1168564.57	673200.15	784.57	786.49	21	NA	15	6 - 21	2" ID Sch. 40 PVC
FTA-94-MW04	Residuum	1168475.74	673257.53	785.55	787.60	20	NA	15	5 - 20	2" ID Sch. 40 PVC
FTA-94-MW05	Residuum	1168068.27	673141.15	806.68	808.70	36	2	15	19 - 34	2" ID Sch. 40 PVC
FTA-94-MW06	Bedrock	1168265.17	673318.48	787.84	789.78	25.8	NA	15	5.5 - 20.5	4" ID Sch. 80 PVC
FTA-94-MW07	Residuum	1167807.94	673527.78	797.16	799.10	18	NA	15	3 - 18	2" ID Sch. 40 PVC
FTA-94-MW08	Residuum	1168045.72	673349.50	809.10	811.09	24.5	NA	15	9.5 - 24.5	2" ID Sch. 40 PVC
FTA-94-MW09	Residuum	1167889.92	673055.72	810.70	813.25	30	NA	15	14.5 - 29.5	2" ID Sch. 40 PVC
FTA-94-MW10	Residuum	1168109.95	672924.08	806.69	806.59	39	NA	15	23.5 - 38.5	2" ID Sch. 40 PVC
FTA-94-MW11	Bedrock	1168303.58	673090.77	804.82	806.79	68.3	1	10	57.2 - 67.2	4" ID Sch. 80 PVC
FTA-94-MW12	Bedrock	1168556.63	673203.52	785.13	787.16	91.3	NA	10	81.1 - 91.1	2" ID Sch. 40 PVC
FTA-94-MW13	Bedrock	1168275.09	673052.85	805.89	808.06	126	NA	10	116 - 126	4" ID Sch. 80 PVC
FTA-94-MW14	Bedrock	1168071.00	673025.20	807.44	807.20	75	NA	10	65 - 75	4" ID Sch. 80 PVC
FTA-94-MW15	Bedrock	1168571.48	673049.12	793.14	795.19	45	NA	10	35 - 45	4" ID Sch. 80 PVC
FTA-94-MW16	Bedrock	1168583.05	673064.25	790.99	793.00	91.4	NA	10	81.4 - 91.4	4" ID Sch. 80 PVC

[a] Temporary well installed using direct-push technology (DPT). Residuum wells installed using hollow-stem auger. Bedrock wells installed using air rotary.

[b] FTA-94-GP02 and FTA-94-GP11 were installed using hollow-stem auger after attempts using DPT failed to produce groundwater.

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).

1" ID Sch. 40 PVC - 1-inch inside diameter, Schedule 40, polyvinyl choride.
2" ID Sch. 40 PVC - 2-inch inside diameter, Schedule 40, polyvinyl chloride.
4" ID Sch. 80 PVC - 4-inch inside diameter, Schedule 80, polyvinyl chloride.
amsl - Above mean sea level.
bgs - Below ground surface.
ft - Feet.
NA - Not applicable.

sampler to 12 feet bgs or until refusal was encountered. The DPT sampler was removed from the borehole and a 5-foot length of 1-inch ID, 0.010-inch factory-slotted Schedule 40 polyvinyl chloride (PVC) screen with a 1-inch PVC end cap was placed at the bottom of the borehole and attached to 1-inch ID, flush-threaded Schedule 40 PVC riser. A sand pack consisting of number 1 filter sand (environmentally safe, clean fine sand, sieve size 20 to 40) was tremied in the annular space of the borehole around the screen from the bottom of the borehole to approximately 1 foot above the top of the screen. A seal was created from the top of the filter sand to the ground surface by placing bentonite chips in the annular space and hydrating with potable water.

2.2.3.2 Residuum Monitoring Wells

IT contracted Miller Drilling, Inc. to install the temporary and permanent residuum monitoring wells using a hollow-stem auger drill rig. The wells were installed following procedures outlined in Section 4.7 and Appendix C of the SAP (IT, 2000b). The borehole at each well location was advanced with a 6.25-inch ID hollow-stem auger from ground surface to the first water-bearing zone in the residuum. A 2-foot-long, 2-inch ID carbon steel split-spoon sampler was driven at 5-foot intervals to collect residuum for observing and describing lithology. Where split-spoon refusal was encountered, the auger was advanced until the first water-bearing zone was encountered. The on-site geologist logging the auger boreholes continued the lithological log for each borehole from the depth of split-spoon sampler refusal to the bottom of the auger borehole by logging the auger drill cuttings. The drill cuttings were logged to determine lithologic changes and the approximate depth of groundwater encountered during drilling. This information was used to determine the optimal placement of the monitoring well screen interval and to provide site-specific geologic and hydrogeologic information. The lithological log for each borehole is included in Appendix C.

Upon reaching the target depth in each borehole, a 15-foot length of 2-inch ID, 0.010-inch continuous slot, Schedule 40 PVC screen with a PVC end cap (or 1- to 2-foot 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 sand pack consisting of number 1 filter sand (environmentally safe, clean fine sand, sieve size 20 to 40) was tremied around the well screen to approximately 2 feet above the top of the well screen as the augers were removed. The well was surged using a solid PVC surge block for approximately 10 minutes, or until no more settling of the sand pack 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, 2000b). 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.

2.2.3.3 Bedrock Monitoring Wells

Seven bedrock monitoring wells were installed at the site using a combination of hollow-stem auger, air rotary, and PQ wireline rock coring techniques. The bedrock monitoring well locations are shown on Figure 2-2.

The borings at well locations FTA-94-MW06 and FTA-94-MW15 were advanced with a 6 1/4-inch ID hollow-stem auger from ground surface to hollow-stem auger refusal. 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. At these locations, groundwater was not encountered prior to reaching competent bedrock; therefore, an air-rotary drill was used to advance the borehole to the desired depth. During air-rotary drilling, a 6 1/4-inch ID tri-cone roller bit was used to advance the borehole from the depth of hollow-stem auger refusal to the first water bearing zone in the bedrock. A 7 7/8-inch air percussion bit was then used to ream the borehole to approximately 8 inches in diameter. The on-site geologist logging the boreholes continued the lithological log for each borehole from the depth of hollow-stem auger refusal to the bottom of the borehole by logging the air rotary drill cuttings.

Bedrock monitoring wells FTA-94-MW11 and FTA-94-MW12 were drilled using a 12-inch ID tri-cone rotary bit coupled with a 7.875-inch air percussion bit from ground surface to approximately 5 feet into competent bedrock. An 8-inch ID carbon steel International Pipe Standard outer casing was installed into the borehole from ground surface to approximately 5 feet into bedrock. A minimum of 2-inches annular space was maintained between the outer casing and borehole wall. The 8-inch carbon steel outer casing was grouted in place using a tremie pipe suspended in the annulus outside the casing. Bentonite-cement grout was mixed using approximately 6.5 to 7 gallons of water and 5 pounds of bentonite per 94-pound bag of Type I or II Portland cement. The grout was allowed to cure for a minimum of 48 hours before drilling continued. A PQ wireline core barrel was then used to collect core samples continuously from the bottom of the outer casing to the total depth of the borehole. However, at FTA-94-

MW12, voids were encountered at approximately 37 feet bgs, restricting the use of the PQ wireline core barrel. Therefore, a 7 7/8-inch tri-cone roller bit was used from the bottom of the surface casing to the total depth of the void, at which depth a second 6-inch casing was grouted in place. The remainder of the borehole was advanced using a 5 5/8-inch tri-cone roller bit to approximately 20 feet into bedrock. After reaching the target depth, an air percussion bit was used to ream the borehole to the total depth of the boring.

IT contracted Miller Drilling, Inc. to install three of the permanent bedrock monitoring wells (FTA-94-MW13, FTA-94-MW14, and FTA-94-MW16) using ODEX® rotary drilling techniques. An air rotary rig with a 7 5/8-inch eccentric rotary bit was used to advance the borehole from ground surface to approximately 5 feet into competent bedrock. An 8-inch ID carbon steel International Pipe Standard outer casing was installed simultaneously into the borehole in 10- to 20-foot sections. At these locations, a minimum 2-inch annulus between the outer casing and the borehole wall was not maintained because of ODEX drilling. The outer casing was welded together, forming a solid steel casing from ground surface to approximately 5 feet into bedrock. The 8-inch carbon steel outer casing was grouted in place using a tremie pipe and bentonite-cement grout as described in the previous section. After the outer casing was set in place, a PQ wireline core barrel was used to collect core samples continuously from the bottom of the outer casing to the total depth of the borehole. After completion of core sample collection, a 7 7/8-inch air percussion bit was used to ream the hole to the total depth of the boring.

Upon reaching the target depth in each borehole, a 10- or 15-foot-length of 4-inch ID, 0.010-inch continuous slot, Schedule 80 PVC screen with a 3-inch PVC end cap (or 1-foot PVC sump) was placed through the auger to the bottom of the borehole. The screen and end cap (or sump) were attached to 4-inch ID, flush-threaded Schedule 80 PVC riser. At well location FTA-94-MW12, a 10-foot length of 2-inch ID, 0.010-inch continuous slot, Schedule 40 PVC screen with a 3-inch PVC end cap was installed in the borehole. A filter pack consisting of number 1 filter sand (environmentally safe, clean fine sand, sieve size 20 to 40) and number 0 filter sand (sieve size 30 to 60) was tremied around the well screen to approximately 5 feet above the top of the well screen as the augers were removed. The well was surged using a solid PVC surge block for approximately 10 minutes, or until no more settling of the sand pack occurred inside the borehole. A bentonite seal, consisting of approximately 5 feet of bentonite pellets, was placed immediately on top of the filter pack and hydrated with potable water. In wells where 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, 2000b). Bentonite-cement grout was tremied into the remaining annular space of the well from the top of the bentonite seal to approximately ground surface. A locking protective steel casing was placed over the PVC well riser, and a concrete pad was constructed around the well.

2.2.3.4 Well Development

The 2-inch and 4-inch wells installed by IT 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, 2000b). 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 (NTU), or for a maximum of 8 hours for 2-inch wells or 12 hours for 4-inch wells. The well development logs are included in Appendix D.

2.2.4 Water Level Measurements

The depth to groundwater was measured in the wells at the site on August 21 and November 21, 2001, following procedures outlined in Section 4.18 of the SAP (IT, 2000b). Depth to groundwater was measured with an electronic water-level meter. The meter probe and cable were cleaned after use at each well following decontamination methodology presented in Section 4.10 of the SAP (IT, 2000b). Measurements were referenced to the top of the well casing, as summarized in Table 2-4.

2.2.5 Groundwater Sampling

A total of 21 groundwater samples were collected from the 18 monitoring wells installed during the SI/RI and from the pre-existing SAIC background well. For the purpose of the RI, the pre-existing background well (MW-BK-G11) was re-designated FTA-94-MW01. All monitoring wells were sampled once, except wells FTA-94-MW01 and FTA-94-MW13, which were each sampled on two separate occasions. The well/groundwater sample locations are shown on Figure 2-2. The groundwater sampling locations and rationale are listed in Table 2-1. The groundwater sample designations and analytical parameters are listed in Table 2-5.

Sample Collection. Groundwater sampling was performed following procedures outlined in Section 4.9.1.4 of the SAP (IT, 2000b). Groundwater was sampled after purging a minimum of three well volumes and after field parameters (i.e., temperature, pH, dissolved oxygen, specific

Table 2-4

Groundwater Elevations
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(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)
FTA-94-MW01	21-Aug-01	26.68	807.29	805.13	780.61
	21-Nov-01	26.75			780.54
FTA-94-MW02	21-Aug-01	31.76	812.75	810.70	780.99
	21-Nov-01	31.85			780.90
FTA-94-MW03	21-Aug-01	5.99	786.49	784.57	780.50
	21-Nov-01	5.95			780.54
FTA-94-MW04	21-Aug-01	6.52	787.60	785.55	781.08
	21-Nov-01	6.22			781.38
FTA-94-MW05	21-Aug-01	29.75	808.70	806.68	778.95
	21-Nov-01	25.78			782.92
FTA-94-MW06	21-Aug-01	7.08	789.78	787.84	782.70
	21-Nov-01	6.97			782.81
FTA-94-MW07	21-Aug-01	14.91	799.10	797.16	784.19
	21-Nov-01	15.04			784.06
FTA-94-MW08	21-Aug-01	26.15	811.09	809.10	784.94
	21-Nov-01	26.16			784.93
FTA-94-MW09	21-Aug-01	28.98	813.25	810.70	784.27
	21-Nov-01	29.14			784.11
FTA-94-MW10	21-Aug-01	24.01	806.59	806.69	782.58
	21-Nov-01	24.68			781.91
FTA-94-MW11	21-Aug-01	26.12	806.79	804.82	780.67
	21-Nov-01	26.19			780.60
FTA-94-MW12	21-Aug-01	6.95	787.16	785.13	780.21
	21-Nov-01	7.01			780.15
FTA-94-MW13	21-Aug-01	27.43	808.06	805.89	780.63
	21-Nov-01	27.55			780.51
FTA-94-MW14	21-Aug-01	30.10	807.20	807.44	777.10
	21-Nov-01	25.10			782.10
FTA-94-MW15	21-Aug-01	29.17	795.19	793.14	766.02
	21-Nov-01	14.79			780.40
FTA-94-MW16	21-Aug-01	12.53	793.00	790.99	780.47
	21-Nov-01	13.30			779.70

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

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

Table 2-5

Groundwater Sample Designations and Analytical Parameters
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	QA/QC Samples			Analytical Parameters
		Field Duplicates	Field Splits	MS/MSD	
FTA-94-GP02	FTA-94-GP02-GW-EM3001-REG				Metals, VOCs, SVOCs, and PCBs
FTA-94-GP05	FTA-94-GP05-GW-EM3002-REG				Metals, VOCs, SVOCs, and PCBs
FTA-94-GP11	FTA-94-GP11-GW-EM3006-REG	FTA-94-GP11-GW-EM3003-FD	FTA-94-GP11-GW-EM3004-FS	FTA-94-GP11-GW-EM3006-MS/MSD	Metals, VOCs, SVOCs, and PCBs
FTA-94-MW01	FTA-94-MW01-GW-EM3007-REG				Metals, VOCs, SVOCs, and PCBs
	FTA-94-MW01-GW-EMM3001-REG				VOCs
FTA-94-MW02	FTA-94-MW02-GW-EMM3002-REG				VOCs
FTA-94-MW03	FTA-94-MW03-GW-EMM3003-REG	FTA-94-MW03-GW-EMM3004-FD	FTA-94-MW03-GW-EMM3005-FS		VOCs
FTA-94-MW04	FTA-94-MW04-GW-EMM3006-REG				VOCs
FTA-94-MW05	FTA-94-MW05-GW-EMM3007-REG				VOCs
FTA-94-MW06	FTA-94-MW06-GW-EMM3008-REG				VOCs
FTA-94-MW07	FTA-94-MW07-GW-EMM3009-REG				VOCs
FTA-94-MW08	FTA-94-MW08-GW-EMM3010-REG				VOCs
FTA-94-MW09	FTA-94-MW09-GW-EMM3011-REG				VOCs
FTA-94-MW10	FTA-94-MW10-GW-EMM3012-REG			FTA-94-MW10-GW-EMM3012-MS/MSD	VOCs
FTA-94-MW11	FTA-94-MW11-GW-EMM3013-REG				VOCs
FTA-94-MW12	FTA-94-MW12-GW-EMM3014-REG			FTA-94-MW12-GW-EMM3014-MS/MSD	VOCs
FTA-94-MW13	FTA-94-MW13-GW-EMM3015-REG			FTA-94-MW13-GW-EMM3015-MS/MSD	VOCs
	FTA-94-MW13-GW-EMM3015R-REG				VOCs
FTA-94-MW14	FTA-94-MW14-GW-EMM3016-REG				VOCs
FTA-94-MW15	FTA-94-MW15-GW-EMM3018-REG				VOCs
FTA-94-MW16	FTA-94-MW16-GW-EMM3019-REG	FTA-94-MW16-GW-EMM3017-FD			VOCs

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

FD - Field duplicate.
FS - Field split.
GW - Groundwater.
MS/MSD - Matrix spike/matrix spike duplicate.
MW - Monitoring well.
PCB - Polychlorinated biphenyl.
QA/QC - Quality assurance/quality control.
REG - Regular field sample.
SVOC - Semivolatile organic compound.
VOC - Volatile organic compound.

conductivity, oxidation-reduction potential, and turbidity) stabilized. Purging and sampling were performed with a peristaltic pump, a submersible pump, or a bladder pump each equipped with Teflon™ tubing. Field parameters were measured using a calibrated water-quality meter. Field parameter readings are summarized in Table 2-6. Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 2-5 using methods outlined in Section 2.4.

2.2.6 Well Abandonment

During the RI at Parcel 94(7), the DPT temporary well (FTA-94-GP05) was abandoned. Well abandonment procedures followed guidelines outlined in Appendix C of the SAP (IT, 2000b). The well was abandoned by removing the PVC riser and screen from the borehole, adding bentonite chips to ground surface, and hydrating with potable water.

2.2.7 Surface Water Sampling

Five surface water samples were collected for chemical analysis at the Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7), at the locations shown on Figure 2-2. The surface water sample locations and rationale are listed in Table 2-1. The surface water sample designations and analytical parameters are listed in Table 2-7. The sample locations were determined in the field, based on drainage pathways and actual field observations.

Sample Collection. Surface water samples were collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP (IT, 2000b). The surface water samples were 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 sample containers. Surface water samples were collected after field parameters had been measured using a calibrated water quality meter. Surface water field parameters are listed in Table 2-8. Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 2-7 using methods outlined in Section 2.4.

2.2.8 Sediment Sampling

Five sediment samples were collected at the same locations as the surface water samples, as shown on Figure 2-2. Sediment sampling locations and rationale are presented in Table 2-1. The sediment sample designations and analytical parameters are listed in Table 2-7. The actual sediment sampling locations were determined in the field, based on drainage pathways and actual field observations.

Table 2-6

Groundwater Field Parameters
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Date	Specific Conductivity (mS/cm)[a]	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)	Turbidity (NTU)	pH (SU)
FTA-94-GP02	28-Jan-99	0.640	0.58	-59	20.5	0.00	6.79
FTA-94-GP05[b]	29-Oct-98	0.454	4.16	101	20.1	20	6.39
FTA-94-GP11	1-Feb-99	0.553	1.19	-93	20.3	170	7.31
FTA-94-MW01	16-Nov-98	0.405	0.94	30	16.5	28	7.25
	1-Dec-00	0.313	3.29	NR	15.0	9.0	6.31
FTA-94-MW02	29-Nov-00	0.362	2.34	NR	16.6	19	6.13
FTA-94-MW03[c]	29-Nov-00	0.439	7.54	NR	15.1	13	6.50
FTA-94-MW04	4-Dec-00	0.340	1.98	NR	9.9	5.0	6.67
FTA-94-MW05	30-Nov-00	0.420	3.59	NR	14.9	1.0	6.98
FTA-94-MW06	30-May-01	0.433	8.64	36	17.1	2.1	7.35
FTA-94-MW07	4-Dec-00	0.540	3.45	NR	11.1	3.0	6.91
FTA-94-MW08[d]	22-Feb-01	0.960	5.49	190	17.2	180	6.46
FTA-94-MW09	4-Dec-00	0.509	7.49	NR	12.5	10	7.14
FTA-94-MW10	30-Nov-00	0.811	3.02	NR	10.8	0	6.50
FTA-94-MW11	18-Dec-00	0.559	1.04	70	13.8	19	11.43
FTA-94-MW12[d]	24-May-01	0.739	NR	NR	16.6	270	6.53
FTA-94-MW13	18-Jul-01	0.485	1.47	0	20.0	1.0	7.50
	15-Oct-01	0.678	3.94	-68	17.7	0.5	7.43
FTA-94-MW14	24-Jul-01	0.408	6.76	244	23.7	10	7.54
FTA-94-MW15	20-Jul-01	0.618	8.04	213	18.9	850	6.97
FTA-94-MW16	19-Jul-01	0.513	0.00	-138	18.1	7.2	7.30

[a] Specific conductivity values standardized to millisiemens per centimeter.

[b] Sample parameters recorded immediately upon completion of sampling.

[c] Sample collected with a bailer.

[d] Sample collected with a bailer. Well was purged dry the previous day.

°C - Degrees Celsius.
GW - Groundwater.
mg/L - Milligrams per liter.
mS/cm - Millisiemens per centimeter.
mV - Millivolts.
NR - Not recorded.
NTU - Nephelometric turbidity units.
ORP - Oxidation-reduction potential.
SU - Standard units.

Table 2-7

Surface Water and Sediment Sample Designations and Analytical Parameters
Former Chemical Laundary and Motor Pool Area 1500, Parcel 94(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	QA/QC Samples			Analytical Parameters
		Field Duplicates	Field Splits	MS/MSD	
WS-94-SW/SD01	WS-94-SW/SD01-SW-WS2009-REG				Metals, VOCs, SVOCs, and PCBs
	WS-94-SW/SD01-SD-WS1009-REG				Metals, VOCs, SVOCs, PCBs, TOC, Grain Size
WS-94-SW/SD02	WS-94-SW/SD02-SW-WS2010-REG				Metals, VOCs, SVOCs, and PCBs
	WS-94-SW/SD02-SD-WS1010-REG				Metals, VOCs, SVOCs, PCBs, TOC, Grain Size
WS-94-SW/SD03	WS-94-SW/SD03-SW-EMM2001-REG				VOCs
	WS-94-SW/SD03-SD-EMM1001-REG				VOCs
WS-94-SW/SD04	WS-94-SW/SD04-SW-EMM2002-REG			WS-94-SW/SD04-SW-EMM2002-MS/MSD	VOCs
	WS-94-SW/SD04-SD-EMM1002-REG			WS-94-SW/SD04-SD-EMM1002-MS/MSD	VOCs
WS-94-SW/SD05	WS-94-SW/SD05-SW-EMM2003-REG	WS-94-SW/SD05-SW-EMM2004-FD	WS-94-SW/SD05-SW-EMM2005-FS		VOCs
	WS-94-SW/SD05-SD-EMM1003-REG	WS-94-SW/SD05-SD-EMM1004-FD	WS-94-SW/SD05-SD-EMM1005-FS		VOCs

FD - Field duplicate.
FS - Field split.
MS/MSD - Matrix spike/matrix spike duplicate.
PCB - Polychlorinated biphenyl.
QA/QC - Quality assurance/quality control.
REG - Regular field sample.
SD - Sediment.
SVOC - Semivolatile organic compound.
SW - Surface water.
TOC - Total organic carbon.
VOC - Volatile organic compound.
WS - Watershed.

Table 2-8

Surface Water Field Parameters
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Date	Specific Conductivity (mS/cm)[a]	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)	Turbidity (NTU)	pH (SU)
WS-94-SW/SD01	20-Oct-98	0.383	2.7	245	19.5	2.5	6.75
WS-94-SW/SD02	20-Oct-98	0.407	6.0	250	20.3	0.0	7.00
WS-94-SW/SD03	7-Dec-00	0.432	11.73	260	8.3	2.0	7.85
WS-94-SW/SD04	7-Dec-00	0.406	11.01	205	6.7	3.0	7.50
WS-94-SW/SD05	7-Dec-00	0.405	11.07	195	7.4	2.0	7.60

[a] Specific conductivity values standardized to millisiemens per centimeter.

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

Sample Collection. Sediment samples were collected in accordance with the procedures specified in Section 4.9.1.2 of the SAP (IT, 2000b). 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 B. The sediment samples were analyzed for the parameters listed in Table 2-7 using methods outlined in Section 2.4.

2.2.9 Slug Testing

Slug tests were performed at five wells to determine hydraulic conductivity of groundwater in the residuum and bedrock at Parcel 94(7). Slug testing locations were chosen based on purge rates recorded during well development procedures. The well locations were selected to produce results representing the range of hydraulic conditions at the site. Two slug tests were carried out at each well, a rising head test and a falling head test, unless the static water level measured was below the top of the screened interval, in which case only a rising head test was carried out. A detailed description of the methods used is presented in Appendix E.

2.2.10 Seep Survey

A site walk was conducted on December 6, 2000, to determine if any seeps are present at the Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7). The area surveyed is shown on Figure F-1 in Appendix F. No seeps were identified during the survey.

2.3 Surveying of Sample Locations

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

2.4 Analytical Program

Samples collected during the SI and RI field activities were analyzed for various chemical parameters based on potential site-specific chemicals and on EPA, ADEM, FTMC, and USACE requirements. Target analyses included the following parameters:

Solid IDW was stored inside the fenced area surrounding Buildings 335 and 336 in lined roll-off bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analysis. Based on the results, drill cuttings, spent well materials, and personal protective equipment generated during the field activities 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.

2.7 Variances/Nonconformances

Five variances to the SFSPs were recorded during completion of SI/RI field activities at Parcel 94(7). The variances did not alter the intent of the investigation or the sampling rationale presented in the SFSPs. The variances are summarized in Table 2-9, and the variance reports are included in Appendix H. No nonconformances were documented during the field activities at Parcel 94(7).

2.8 Data Quality

The field sample analytical data are presented in tabular form in Appendix I. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI/RI work plans; the FTMC SAP and quality assurance plan; and standard, accepted methods and procedures. Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of Appendix B of the SAP [IT, 2000b]). 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 results of the data validation are presented in Appendix J. Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System™ database for tracking and reporting. The data presented in this report, except where qualified, meet the principle data quality objective for this investigation.

Table 2-9

Variances to the Site-Specific Field Sampling Plans
Former Chemical Laundry and Motor Pool Area 1500, Parcel 94(7)
Fort McClellan, Calhoun County, Alabama

Variance to the SFSP	Justification for Variance	Impact to Investigation
Direct-push temporary wells were not installed at three locations during the October 1998 SI because groundwater was not encountered during direct-push operations. Direct-push locations FTA-94-GP02, FTA-94-GP08, and FTA-94-GP11 were not installed as temporary wells.	Groundwater was not encountered during direct-push operations. Hollow-stem auger drilling was used to attempt to reach sufficient groundwater.	None. Groundwater was sufficiently encountered and temporary 2" monitoring wells were installed at FTA-94-GP02 and FTA-94-GP11. Sufficient groundwater was not encountered at FTA-94-GP08. No well was installed at this location during the SI. As part of the RI, however, permanent residuum monitoring well FTA-94-MW08 was installed approximately 75 feet downgradient of FTA-94-GP08.
Permanent residuum monitoring well FTA-94-MW10 was not installed at the location proposed in the September 2000 Work Plan. The well was relocated approximately 80 feet northwest of the proposed location.	Competent bedrock was encountered prior to encountering groundwater. Three attempts were made to install the residuum monitoring well in the proposed location prior to relocating the well.	None. The monitoring well was installed successfully as a residuum well.
Permanent monitoring well FTA-94-MW06 (originally planned as a residuum well) was not installed in the location proposed in the September 2000 Work Plan. The well was relocated approximately 60 feet southwest of the proposed location and installed into competent bedrock.	Hollow-stem auger refusal was encountered prior to encountering groundwater. Four attempts were made to install the monitoring well in the proposed location prior to relocating the well.	None. The monitoring well was installed successfully as a bedrock well in a location that more accurately delineated the extent of the groundwater contaminant plume.
Permanent monitoring well FTA-94-MW15 (originally planned as a residuum well) was not installed at the location proposed in the July 2001 Work Plan because groundwater was not encountered prior to hollow-stem auger refusal. The well was installed into competent bedrock using air-rotary drilling.	Hollow-stem auger refusal was encountered at 15.5 feet (prior to reaching groundwater). The well was installed using air-rotary drilling; groundwater was encountered at a depth of 39 feet and the well was installed.	None. The monitoring well was successfully installed as a bedrock well and more accurately delineated the extent of the groundwater contaminant plume.
Proposed temporary well FTA-94-GP08 was not installed.	Unable to install the well using hollow-stem augers because bedrock was encountered and groundwater was not present during drilling operations.	None. Groundwater data from the remaining wells installed at the site provided sufficient information to characterize the site.

RI - Remedial Investigation.
SI - Site Investigation.
SFSP - Site-specific field sampling plan.