Draft
Site-Specific Field Sampling Plan Addendum III for the Remedial Investigation (Horizontal Extent-Surface Soil and Groundwater) at Ranges Near Training Area T-24A Parcels 187(7), 112Q, 113Q-X, 213Q, and 214Q

Fort McClellan
Calhoun County, Alabama

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Task Order CK10
Contract No. DACA21-96-D-0018
IT Project No. 796887

October 2002

Revision 0

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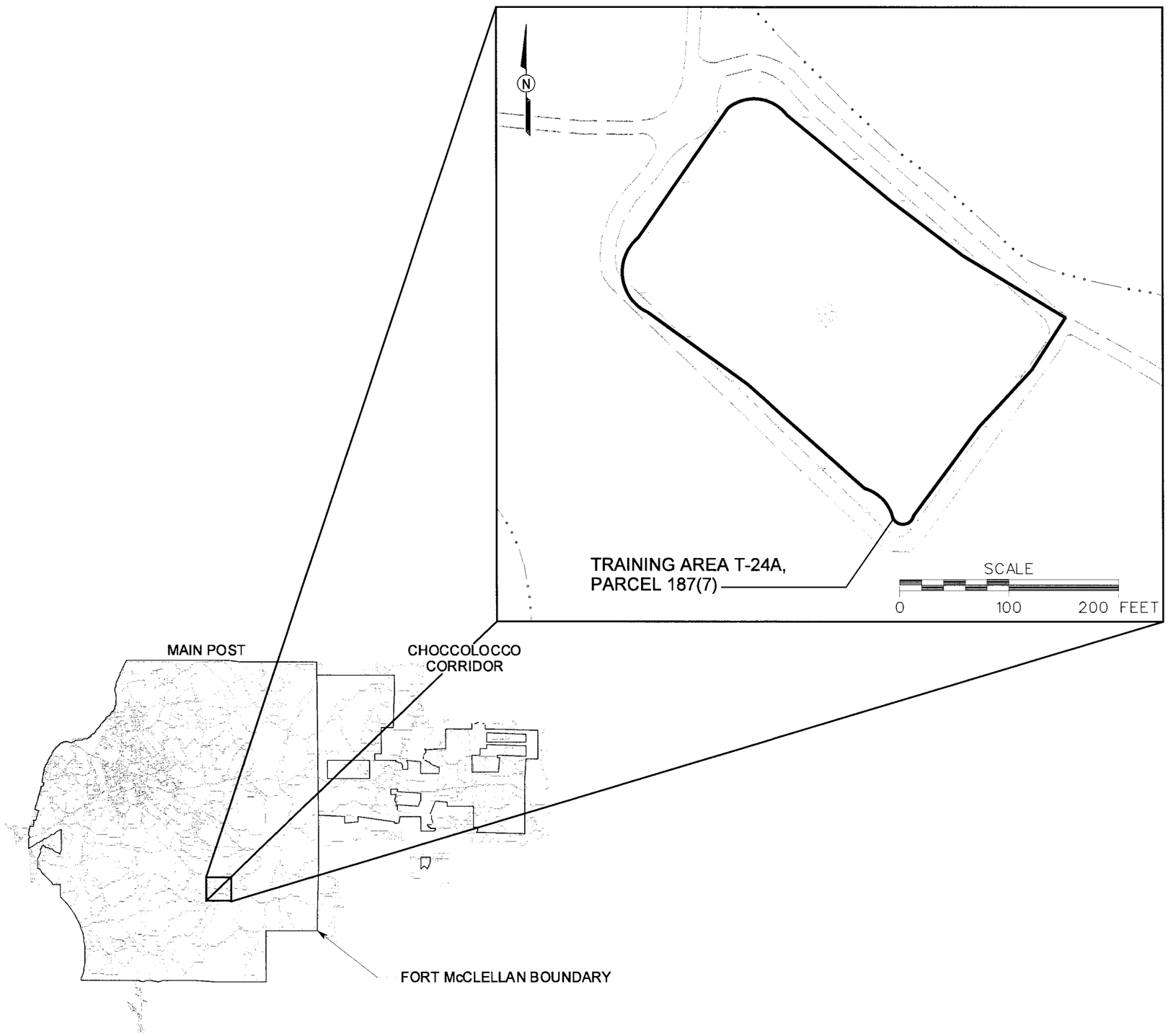
1.0 Background

The Ranges Near Training Area T-24A are located on the southeast portion of the Main Post and consist of a 1.5-acre fenced chemical munitions disposal area and four overlapping ranges (Figure 1). The following five parcels make up the Ranges Near Training Area T-24A: Former Chemical Munitions Disposal Area, Parcel 187(7); Former Machine Gun Range, Parcel 112Q; Former Demolition Area, Parcel 113Q-X; Former Bandholtz Machine Gun Qualification Range, Parcel 213Q; and Bandholtz Field Firing Range, Parcel 214Q.

Previous investigations conducted at the Ranges Near Training Area T-24A included, soil sampling, groundwater sampling, and a geophysical survey. A remedial investigation (RI) was conducted by Science Applications International Corporation (SAIC) in 1994 and 1995 (SAIC, 2000). The results of the RI indicated that one well (FTA-108-T24A-G01) (Figure 2) had a detection of benzene. A site investigation (SI) at overlapping Range 24A Fog Oil Drum Storage (Parcel 88[6]) and Range 24A Multipurpose Range (Parcel 108[7]) was conducted by IT Corporation (IT) in 1998 and 1999. Fourteen residuum monitoring wells were installed and sampled during this investigation. In addition, four pre-existing monitoring wells were resampled. The results of this SI verified the presence of benzene in monitoring well FTA-108-T-24A-G01. The analytical results, lithological logs and well completion forms from this SI are included in Appendices A and B of the supplemental remedial investigation (SRI) work plan (IT, 2000b).

IT continued the RI at the Ranges Near Training Area T-24A in 2000. To date, 57 surface soil samples have been collected and 23 monitoring wells have been installed and sampled outside of the fenced area. Surface soil samples collected from previous investigations conducted by IT were selected to investigate suspected firing lines, impact areas and target mounds located in the area. As shown on Figure 3, the results indicate the presence of four metals exceeding background and human health site-specific screening levels (SSSL): antimony (six locations), chromium (one location), copper (one location), and lead (four locations). Based on the results of the investigations, further investigation of the Ranges Near Training Area T-24A is necessary to define the extent of metal contamination in surface soils.

The results of groundwater sampling during the RI have verified the presence of benzene in FTA-108-T24A-G01 and have indicated that carbon tetrachloride is present in bedrock wells installed deeper than FTA-108-T24A-G01. As shown in Figure 2, groundwater sample results from previous investigations conducted by IT indicate the presence of benzene in three bedrock monitoring wells (R24A-187-MW12, R24A-187-MW22 and FTA-108-T24A-G01) and carbon tetrachloride in three



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- FENCE

FIGURE 1
SITE LOCATION MAP
RANGES NEAR TRAINING
AREA T-24A
PARCELS 187(7), 112Q, 113Q-X, 213Q
AND 214Q

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

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E 680,600

N 1,159,400

N 1,157,500

SUSPECTED IMPACT AREA FOR PARCEL 214Q

DUMP

APPROXIMATE FIRING RANGE LOCATION FOR PARCEL 214Q

APPROXIMATE FIRING RANGE LOCATION FOR PARCEL 112Q

APPROXIMATE FIRING RANGE LOCATION FOR PARCEL 213Q

POTENTIAL FORMER TRAINING PITS, (SAIC, 1999)

FLOW DIRECTION

R24A-187-MW17
R24A-187-SW/SD02
R24A-187-SW/SD03
R24A-187-MW16
FTA-108-SW/SD03
R24A-187-UXO
R24A-187-MW08
R24A-187-MW02
R24A-187-MW10
R24A-187-MW04
R24A-187-MW20
FTA-108-GP04
R24A-187-MW09
R24A-187-MW03
FTA-108-SW/SD01
FTA-88-SW/SD01
R24A-187-MW05
R24A-187-MW11
R24A-187-SW/SD07
R24A-187-MW01
R24A-187-MW07
FTA-108-GP05
R24A-187-MW13
R24A-187-MW21
FTA-88-GP04
FTA-88-GP02
FTA-88-SW/SD02
FTA-88-GP01
R24A-187-MW22
FTA-108-T24A-G01
R24A-187-MW12
R24A-187-MW06
FTA-88-GP03
FTA-108-GP10
R24A-187-MW18
FTA-108-GP09
R24A-187-MW14
FTA-108-T24A-G02
R24A-187-SW/SD06
R24A-187-SW/SD05
R24A-187-MW19
FTA-108-T24A-G03
R24A-187-MW15
R24A-187-MW23
FTA-108-GP01
FTA-108-GP02
FTA-108-GP06
FTA-108-GP03
FTA-108-GP08
R24A-187-SW/SD04
FTA-108-GP07
R24A-187-SW/SD01
FTA-108-SW/SD02

Sample Identification		SSSL	FTA-108-T24A-G01			
Sample Number			SAIC01	SAIC03	FT3014	JG3023
Sample Date			23-Sep-94	01-Feb-95	11-Nov-99	23-Jan-01
Benzene	mg/L	0.0014	0.10	0.20	0.28	0.22
Pentachlorophenol	mg/L	0.00027	0.002	-	-	-

Sample Identification		SSSL	R24A-187-MW12
Sample Number			JG3014
Sample Date			20-Feb-01
Benzene	mg/L	0.0014	0.2

Sample Identification		SSSL	R24A-187-MW22
Sample Number			JG3047
Sample Date			27-Sep-01
1,2-Dichloroethane	mg/L	0.00045	0.037
Benzene	mg/L	0.0014	1.9
Carbon tetrachloride	mg/L	0.00041	0.78
Chloroform	mg/L	0.0012	0.17 J

Sample Identification		SSSL	R24A-187-SW/SD05
Sample Number			JG2005
Sample Date			09-Jan-01
4-Methylphenol	mg/L	0.077	0.1

Sample Identification		SSSL	R24A-187-MW21
Sample Number			JG3045
Sample Date			14-Sep-01
Carbon tetrachloride	mg/L	0.00041	0.072
Chloroform	mg/L	0.0012	0.013

Sample Identification		SSSL	FTA-88-GP01	
Sample Number			FR3001	JG3036
Sample Date			09-Nov-99	08-Jan-01
1,2,4-Trimethylbenzene	mg/L	0.00063	0.0072	-
4-Amino-2,6-dinitrotoluene	mg/L	0.000094	-	0.00078

Sample Identification		SSSL	FTA-108-GP02	
Sample Number			FT3004	JG3027
Sample Date			10-Nov-99	05-Jan-01
4-Methylphenol	mg/L	0.077	0.036	-

Sample Identification		SSSL	FTA-108-T24A-G03			
Sample Number			SAIC01	UC00385	FT3018	JG3025
Sample Date			23-Oct-94	01-Feb-95	17-Nov-99	19-Jan-01
Pentachlorophenol	mg/L	0.00027	0.0013	-	-	-

Sample Identification		SSSL	FTA-108-GP06	
Sample Number			FT3008	JG3031
Sample Date			12-Nov-99	12-Jan-01
4-Methylphenol	mg/L	0.077	0.022	-
Di-n-octylphthalate	mg/L	0.00032	0.0018 J	-

LEGEND:

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 25 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- BRIDGE
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- TRENCHES
- MOUNDS
- DEPRESSIONS
- BEDROCK MONITORING WELL LOCATION
- RESIDUUM MONITORING WELL LOCATION
- GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- GROUNDWATER SAMPLE LOCATION
- J — RESULT IS GREATER THAN STATED METHOD DETECTION LIMIT BUT LESS THAN OR EQUAL TO SPECIFIED REPORTING LIMIT
- — NOT DETECTED
- SSSLs — SITE SPECIFIC SCREENING LEVELS
- mg/L — MILLIGRAMS PER LITER

NOTE:

1. COMMON LAB CONTAMINANTS ACETONE, METHYLENE CHLORIDE, BIS(2-ETHYLHEXYL) PHTHALATE NOT INCLUDED.

SCALE
0 100 200 FEET

FIGURE 2
GROUNDWATER AND SURFACE WATER SAMPLES ORGANIC DETECTIONS EXCEEDING HUMAN HEALTH SSSLs RANGES NEAR TRAINING AREA T-24A PARCELS 187(7), 112Q, 113Q-X, 213Q AND 214Q

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SUSPECTED IMPACT AREA FOR PARCEL 214Q

DUMP

APPROXIMATE FIRING RANGE LOCATION FOR PARCEL 214Q

APPROXIMATE FIRING RANGE LOCATION FOR PARCEL 112Q

APPROXIMATE FIRING RANGE LOCATION FOR PARCEL 213Q

POTENTIAL FORMER TRAINING PITS, (SAIC, 1999)

FLOW DIRECTION

R24A-187-MW17
R24A-187-MW16
R24A-187-MW08
R24A-187-MW02
R24A-187-MW09
R24A-187-MW03
R24A-187-MW01
R24A-187-MW07
R24A-187-MW05
R24A-187-MW11
R24A-187-MW21
FTA-108-GP05
R24A-187-MW13
R24A-187-MW22
FTA-108-T24A-G01
R24A-187-MW12
R24A-187-MW06
R24A-187-MW14
FTA-108-T24A-G02
FTA-108-T24A-G03
R24A-187-MW15
R24A-187-MW23
R24A-187-MW19
R24A-187-MW04
R24A-187-MW10
R24A-187-MW20
FTA-108-GP10
R24A-187-MW18
R24A-187-GP01
R24A-187-GP02
FTA-108-GP04
R24A-187-GP19
R24A-187-GP20
R24A-187-GP18
FTA-88-GP04
FTA-88-GP02
FTA-88-GP01
FTA-88-GP03
R24A-187-GP11
R24A-187-GP12
R24A-187-GP13
R24A-187-GP14
R24A-187-GP15
R24A-187-GP16
R24A-187-GP17
FTA-108-GP01
FTA-108-GP02
FTA-108-GP03
FTA-108-GP06
FTA-108-BK-G06
R24A-187-GP28
R24A-187-GP27
R24A-187-GP21
R24A-187-GP29
R24A-187-GP03
R24A-187-GP30
FTA-108-GP09
R24A-187-GP04
R24A-187-GP05
R24A-187-GP10
R24A-187-GP24
R24A-187-GP25
R24A-187-GP06
R24A-187-GP23
FTA-108-GP08
R24A-187-GP22
R24A-187-GP26
FTA-108-GP07
R24A-187-GP07
R24A-187-GP08
R24A-187-GP09

Sample Identification		SSSL	BKG	UBR	R24A-187-GP19
Sample Number					JG0040
Sample Depth (feet)					0 - 1
Sample Date					12-Jan-01
Antimony	mg/kg	3.1	1.99	2.6	5.1 J

Sample Identification		SSSL	BKG	UBR	R24A-187-MW01
Sample Number					JG0001
Sample Depth (feet)					0 - 1
Sample Date					23-Oct-94
Antimony	mg/kg	3.1	1.99	2.6	4.04 J

Sample Identification		SSSL	BKG	UBR	R24A-187-GP27
Sample Number					JG0049
Sample Depth (feet)					0 - 1
Sample Date					20-Jul-01
Antimony	mg/kg	3.1	1.99	2.6	6.85 J
Copper	mg/kg	312.5	12.71	24	343 J
Lead	mg/kg	400	40.05	83	5310

Sample Identification		SSSL	BKG	UBR	R24A-187-GP29
Sample Number					JG0051
Sample Depth (feet)					0 - 1
Sample Date					20-Jul-01
Lead	mg/kg	400	40.05	83	569

Sample Identification		SSSL	BKG	UBR	R24A-187-GP03
Sample Number					JG0021
Sample Depth (feet)					0 - 1
Sample Date					11-Jan-01
Antimony	mg/kg	3.1	1.99	2.6	4.93 J

Sample Identification		SSSL	BKG	UBR	R24A-187-GP04
Sample Number					JG0022
Sample Depth (feet)					0 - 1
Sample Date					11-Jan-01
Lead	mg/kg	400	40.05	83	3880

Sample Identification		SSSL	BKG	UBR	R24A-187-GP12
Sample Number					JG0033
Sample Depth (feet)					0 - 1
Sample Date					11-Jan-01
Antimony	mg/kg	3.1	1.99	2.6	4.27 J

Sample Identification		SSSL	BKG	UBR	FTA-88-GP01
Sample Number					FR0001
Sample Depth (feet)					0 - 1
Sample Date					30-Oct-98
Chromium	mg/kg	23.2	37.04	134	109

Sample Identification		SSSL	BKG	UBR	R24A-187-GP09
Sample Number					JG0028
Sample Depth (feet)					0 - 1
Sample Date					11-Jan-01
Antimony	mg/kg	3.1	1.99	2.6	4.91 J

Sample Identification		SSSL	BKG	UBR	R24A-187-GP07
Sample Number					JG0026
Sample Depth (feet)					0 - 1
Sample Date					11-Jan-01
Lead	mg/kg	400	40.05	83	426

LEGEND:

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 25 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- BRIDGE
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- TRENCHES
- MOUNDS
- DEPRESSIONS
- BEDROCK MONITORING WELL LOCATION
- RESIDUUM MONITORING WELL LOCATION
- GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- GROUNDWATER SAMPLE LOCATION
- J — RESULT IS GREATER THAN STATED METHOD DETECTION LIMIT BUT LESS THAN OR EQUAL TO SPECIFIED REPORTING LIMIT
- SSSLs — SITE SPECIFIC SCREENING LEVELS
- BKG — BACKGROUND
- UBR — UPPER BACKGROUND RANGE
- mg/kg — MILLIGRAMS PER KILOGRAM

FIGURE 3
SURFACE SOIL SAMPLES EXCEEDING BACKGROUND AND HUMAN HEALTH SSSLs RANGES NEAR TRAINING AREA T-24A PARCELS 187(7), 112Q, 113Q-X, 213Q AND 214Q

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SCALE
0 100 200 FEET

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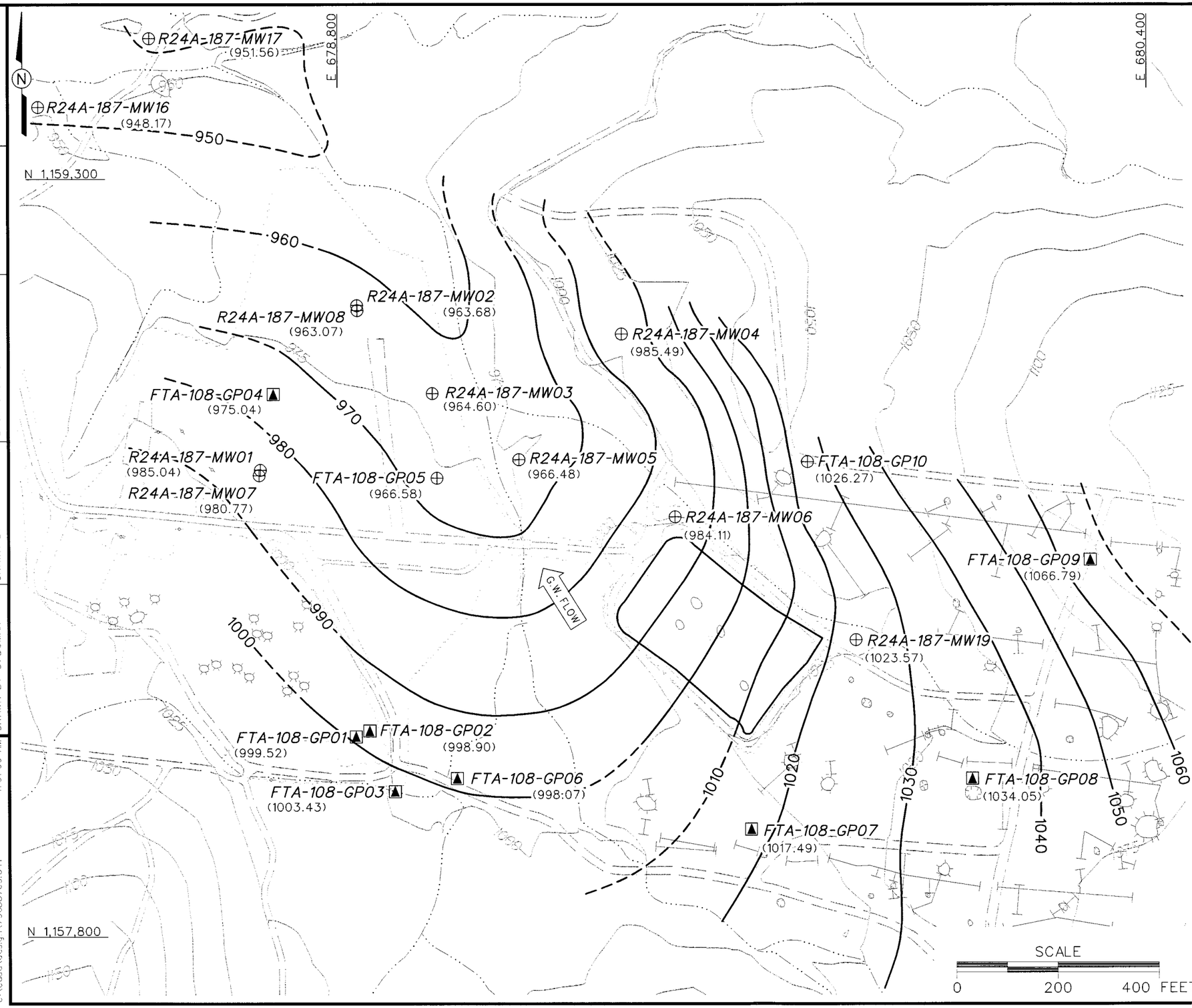
bedrock monitoring wells (R24A-187-MW12, R24A-187-MW22 and R24A-187-MW21) located hydraulically downgradient (northwest) of the fenced area at Training Area T-24A. The groundwater potentiometric surface maps for residuum and bedrock wells are shown on Figures 4 and 5, respectively. The lithologic logs and well completion logs are included in Appendix A. Because the extent of the volatile organic compounds (VOC) benzene and carbon tetrachloride in groundwater has not been established, further investigation of the Ranges Near Training Area T-24A is necessary to define the extent of contamination in groundwater.

The geophysical survey was conducted in 2001 inside the Former Chemical Munitions Disposal Area, Parcel 187(7), (the fenced area at Training Area T-24A) by Parsons Engineering Science, Inc. as part of a chemical warfare material (CWM) engineering/evaluation cost analysis (Parsons, 2002). Numerous geophysical anomalies were observed and evaluated. Twenty-one CWM items were encountered during investigative trenching of the anomalies; however, they did not contain chemical warfare agents, nor were they explosively configured. Items recovered during the investigation included 155 millimeter (mm) projectiles, 105mm projectiles, a 4.2-inch mortar, partial drums, practice bombs, burnt residue, and auto scrap. Eight soil samples were collected during the trenching and analyzed for chemical warfare agents (sarin [GB], distilled mustard [HD], 1,4-thioxane, and 1,4-dithiane). There were no concentrations of GB, HD, 1,4-thioxane, and 1,4-dithiane detected above the reporting limits. As a result of this CWM investigation, the U.S. Army Corps of Engineers (USACE)-Huntsville Center issued a release of Training Area T-24A for hazardous, toxic, and radiological waste investigations.



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 25 FOOT)
- 950 GROUNDWATER ELEVATION CONTOURS (DASHED WHERE INFERRED)
- (951.56) GROUNDWATER ELEVATION (FT MSL) (OCTOBER 2001)
- G.W. FLOW GROUNDWATER FLOW DIRECTION
- TREES / TREELINE
- PARCEL BOUNDARY
- BRIDGE
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- TRENCHES
- MOUNDS
- DEPRESSIONS
- ⊕ RESIDUUM MONITORING WELL LOCATION
- ▲ GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION

FIGURE 4
RESIDUUM POTENTIOMETRIC MAP RANGES NEAR TRAINING AREA T-24A PARCELS 187(7), 112Q, 113Q-X, 213Q AND 214Q

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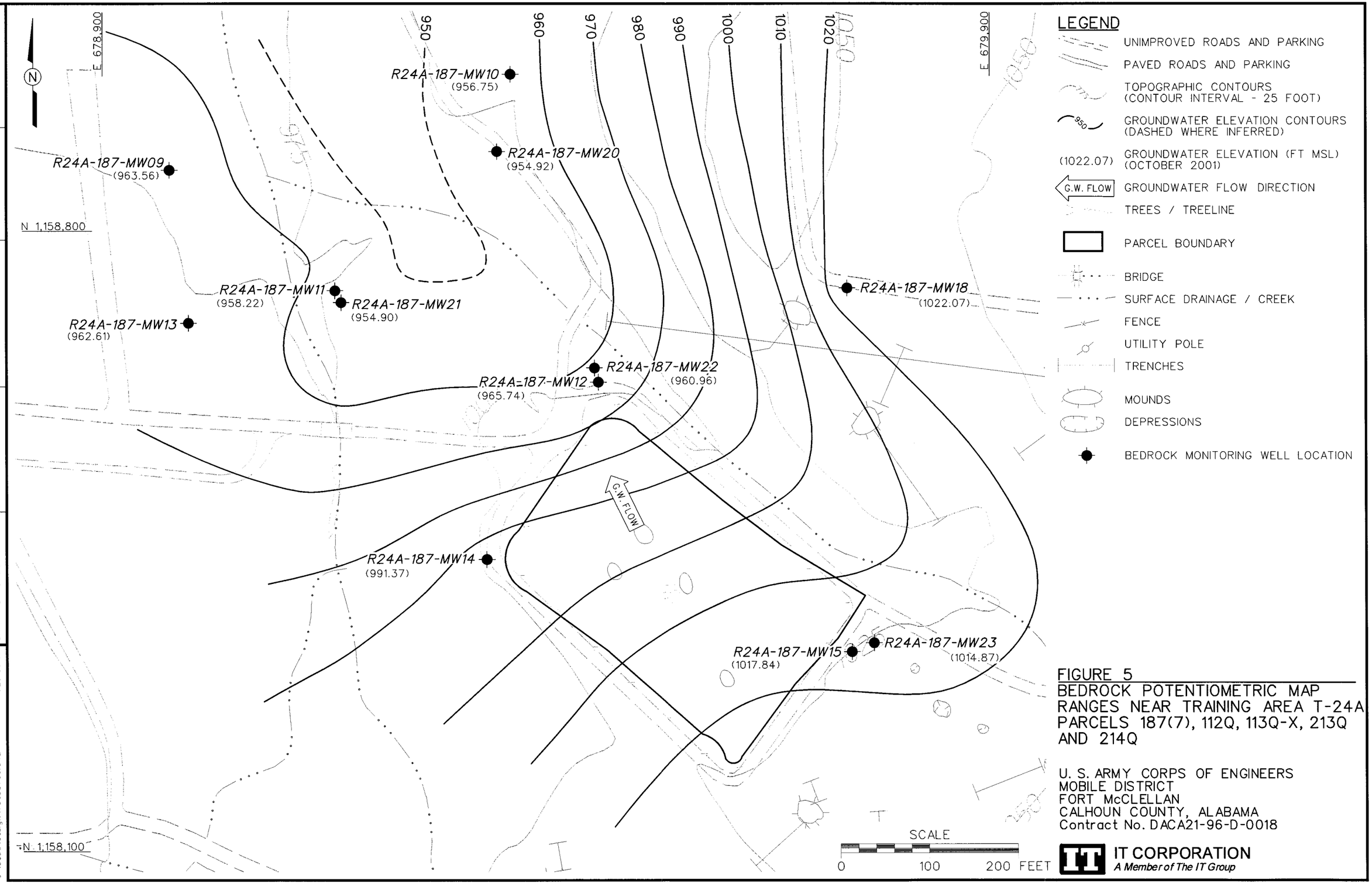

FIGURE 5
BEDROCK POTENTIOMETRIC MAP
RANGES NEAR TRAINING AREA T-24A
PARCELS 187(7), 112Q, 113Q-X, 213Q
AND 214Q

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2.0 Proposed Field Activities

As presented at the February 2002 meeting of the Baseline Realignment and Closure Cleanup Team, IT proposes to conduct further investigations at the Ranges Near Training Area T-24A to define the vertical and horizontal extent of contaminants in surface soil and groundwater. The proposed investigations include:

- Collection of surface soil samples from 31 locations
- Collection of subsurface soil samples from 6 locations.
- Screening of surface soil samples using x-ray fluorescence (XRF) at 35 locations within the range safety fans at the Ranges Near Training Area T-24A. Collection of confirmation soil samples from 4 of these locations to be analyzed for lead.
- Installation of 8 groundwater monitoring wells (7 bedrock and 1 residuum).

The proposed sample locations and monitoring well locations are shown on Figure 6. The proposed XRF surface soil screening locations are shown on Figure 7. Table 1 presents the sampling rationales and the anticipated completion depths for the soil borings and monitoring wells. Tables 2, 3 and 4 present the soil sample, groundwater sample, and XRF confirmation sample analytical parameters, respectively. The sample data will provide information on soil and groundwater quality and will be used to define the vertical and horizontal extent of surface soil and groundwater contamination at the Ranges Near Training Area T-24A.

The presence of unexploded ordnance (UXO) is possible at the Ranges Near Training Area T-24A; therefore, IT will conduct UXO avoidance activities as outlined in Appendix E of the installation-wide sampling and analysis plan (SAP) (IT, 2002a) and as presented in the revised site-specific UXO safety plan attachment (IT, 2002b) prior to initiating intrusive field activities at the Ranges Near Training Area T-24A.

2.1 Surface Soil Samples

Surface soil samples will be collected from suspected firing lines, impact areas, and target mounds at 31 locations shown on Figure 6. Surface soil samples will be collected from the uppermost 1 foot of soil using a stainless-steel hand auger as specified in Sections 5.1.1.2 and 6.1.1.1 of the SAP. Collected soil samples will be screened using a photoionization detector (PID) in accordance with Section 6.8.3 of the SAP. Surface soil samples will be screened for information purposes only and not to select samples for analysis. Sample containers, sample

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S. MORAN
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D. BOMAR

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E 680,600

N=1,159,600

N 1,157,700

R24A-187-GP69
R24A-187-GP70
SUSPECTED IMPACT AREA FOR PARCEL 214Q
R24A-187-MW17
R24A-187-GP97
R24A-187-MW47
R24A-187-GP67
R24A-187-SW/SD02
R24A-187-SW/SD03
R24A-187-GP71
R24A-187-MW16
DUMP
FTA-108-SW/SD03
R24A-187-GP01
R24A-187-GP72
APPROXIMATE FIRING RANGE LOCATION FOR PARCEL 214Q
R24A-187-GP73
R24A-187-MW08
R24A-187-MW02
R24A-187-GP02
R24A-187-MW44
R24A-187-MW10
R24A-187-MW04
FLOW DIRECTION
R24A-187-MW20
R24A-187-MW45
R24A-187-GP19
FTA-108-GP04
R24A-187-MW09
R24A-187-MW03
R24A-187-GP20
FTA-108-SW/SD01
R24A-187-MW43
FLOW DIRECTION
FTA-88-SW/SD01
R24A-187-MW05
R24A-187-MW11
R24A-187-MW21
R24A-187-SW/SD07
FTA-108-GP10
R24A-187-MW18
R24A-187-GP18
R24A-187-MW01
R24A-187-MW07
FTA-88-GP04
FTA-108-GP05
R24A-187-MW13
R24A-187-MW46
R24A-187-MW22
R24A-187-MW12
FTA-108-T24A-G01
R24A-187-MW06
R24A-187-GP21
R24A-187-GP85
R24A-187-GP84
R24A-187-GP28
R24A-187-GP80
R24A-187-GP03
R24A-187-GP77
R24A-187-GP50
R24A-187-GP29
R24A-187-GP83
R24A-187-GP27
R24A-187-GP82
R24A-187-GP79
R24A-187-GP78
R24A-187-GP81
APPROXIMATE FIRING RANGE LOCATION FOR PARCEL 112Q
FTA-88-GP02
FTA-88-SW/SD02
FTA-88-GP01
FTA-108-GP09
FTA-88-GP03
R24A-187-GP11
R24A-187-GP12
R24A-187-GP13
R24A-187-MW42
R24A-187-MW14
FTA-108-T24A-G02
R24A-187-SW/SD06
R24A-187-SW/SD05
R24A-187-GP04
R24A-187-GP86
R24A-187-GP87
R24A-187-GP88
R24A-187-GP89
R24A-187-MW19
R24A-187-GP74
R24A-187-GP75
R24A-187-GP76
FTA-108-T24A-G03
R24A-187-MW23
R24A-187-MW15
R24A-187-GP05
R24A-187-GP14
POTENTIAL FORMER TRAINING PITS, (SAIC, 1999)
R24A-187-GP10
R24A-187-GP25
R24A-187-GP24
R24A-187-GP06
R24A-187-GP15
FTA-108-GP01
FTA-108-GP02
R24A-187-MW41
R24A-187-MW40
R24A-187-GP23
FTA-108-GP08
R24A-187-GP16
FTA-108-GP06
FTA-108-GP03
R24A-187-GP22
R24A-187-GP17
R24A-187-SW/SD04
R24A-187-GP26
FTA-108-GP07
R24A-187-GP09
R24A-187-GP90
R24A-187-GP93
R24A-187-GP91
R24A-187-GP92
APPROXIMATE FIRING RANGE LOCATION FOR PARCEL 213Q
R24A-187-SW/SD01
R24A-187-GP94
R24A-187-GP07
R24A-187-GP08
R24A-187-GP95
R24A-187-GP96
FTA-108-BK-G06
FLOW DIRECTION

LEGEND:

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- BRIDGE
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- TRENCHES
- MOUNDS
- DEPRESSIONS
- BEDROCK MONITORING WELL LOCATION
- RESIDUUM MONITORING WELL LOCATION
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- GROUNDWATER SAMPLE LOCATION
- SURFACE WATER/SEDIMENT SAMPLE LOCATION
- PROPOSED SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- PROPOSED SURFACE SOIL SAMPLE LOCATION
- PROPOSED BEDROCK MONITORING WELL LOCATION
- PROPOSED RESIDUUM MONITORING WELL LOCATION

SCALE
0 100 200 FEET

FIGURE 6
PROPOSED SAMPLE LOCATION MAP RANGES NEAR TRAINING AREA T-24A PARCELS 187(7), 112Q, 113Q-X, 213Q AND 214Q

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

02/23/04 01:47:19 PM
jwaters
796887es.533
24 x 36

Figure 7

Proposed XRF Locations in Range Fans Ranges Near Training Area T-24A, Parcels 187(7), 112Q, 113Q-X, 213Q and 214Q

670000 675000 680000 685000 690000

1160000 1155000 1150000

Parcel 214Q

Parcel 112Q

Parcel 213Q

R24X01 R24X02 R24X03 R24X04 R24X05 R24X06 R24X07 R24X08 R24X09 R24X10 R24X11 R24X12 R24X13 R24X14 R24X15 R24X16 R24X17 R24X18 R24X19 R24X20 R24X21 R24X22 R24X23 R24X24 R24X25 R24X26 R24X27 R24X28 R24X29 R24X30 R24X31 R24X32 R24X33 R24X34 R24X35

Legend

- Planned XRF Location
- Former XRF Location
- Roads
- 25' Contours
- 100' Contours
- Flow Direction
- Creeks
- Intermittent/ Surface Drainage
- Safety Fan
- Woods
- Cleared/Developed

U. S. Army Corps of Engineers
Mobile District

N

0 1500 3000

State Plane feet, NAD83

X:\FTMC\GISWorkarea\Peter\Projects\Randy\randy_maps_save2.apr\New Fig 2 Planned XRF Range 24A area

U.S. Army Corps of Engineers
Mobile District
Fort McClellan
Calhoun County
Contract No. DACA21-96-D-0018

IT CORPORATION

Table 1

Soil Sample and Monitoring Well Locations and Rationale
RI, Horizontal Extent,
Ranges Near Training Area T-24A,
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
R24A-187-GP58	Surface soil and subsurface soil	Surface soil sample will be collected on north side of dump located near Parcel 214Q. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP59	Surface soil	Surface soil sample will be collected in the suspected impact area of parcel 214Q, on a terrace along the hillside. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP60	Surface and subsurface soil	Surface and subsurface soil samples will be collected in the suspected impact area of parcel 214Q, on a terrace along the hillside. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP61	Surface soil	Surface soil sample will be collected in the suspected impact area of parcel 214Q, on a terrace along the hillside. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP62	Surface soil	Surface soil sample will be collected on a mound, suspected to be an impact area, of Parcel 214Q. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP63	Surface soil	Surface soil sample will be collected in the western portion of the suspected firing line of Parcel 214Q. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP64	Surface soil	Surface soil sample will be collected in the eastern portion of the suspected firing line of Parcel 214Q. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP65	Surface soil	Surface soil sample will be collected on the mound within suspected impact area of Parcel 112Q. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP66	Surface and subsurface soil	Surface and subsurface soil samples will be collected on the mound within suspected impact area of Parcel 112Q. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP67	Surface soil	Surface soil sample will be collected on the mound within suspected impact area of Parcel 112Q. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP68	Surface soil	Surface soil sample will be collected approximately 20 feet northwest of sample location R24A-187-GP27. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP27 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP69	Surface soil	Surface soil sample will be collected approximately 30 feet southwest of sample location R24A-187-GP27. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP27 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP70	Surface soil	Surface and subsurface soil sample will be collected approximately 10 feet southeast of sample location R24A-187-GP27. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP27 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.

Table 1

Soil Sample and Monitoring Well Locations and Rationale
RI, Horizontal Extent,
Ranges Near Training Area T-24A,
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
R24A-187-GP71	Surface and subsurface soil	Surface soil sample will be collected approximately 30 feet north of sample location R24A-187-GP29. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP29 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP72	Surface soil	Surface soil sample will be collected approximately 30 feet southwest of sample location R24A-187-GP29. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP29 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP73	Surface soil	Surface soil sample will be collected approximately 30 feet southeast of sample location R24A-187-GP29. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP29 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP74	Surface soil	Surface soil sample will be collected approximately 30 feet south of sample location R24A-187-GP03. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP03 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP75	Surface soil	Surface soil sample will be collected approximately 30 feet northeast of sample location R24A-187-GP03. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP03 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP76	Surface soil	Surface soil sample will be collected approximately 30 feet northwest of sample location R24A-187-GP03. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP03 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP77	Surface soil	Surface soil sample will be collected approximately 20 feet north of sample location R24A-187-GP04. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP04 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP78	Surface and subsurface soil	Surface and subsurface soil samples will be collected approximately 20 feet west of sample location R24A-187-GP04. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP04 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP79	Surface soil	Surface soil sample will be collected approximately 20 feet east of sample location R24A-187-GP04. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP04 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP80	Surface soil	Surface soil sample will be collected approximately 20 feet south of sample location R24A-187-GP04. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP04 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP81	Surface soil	Surface soil sample will be collected approximately 20 feet north of sample location R24A-187-GP09. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP09 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP82	Surface soil	Surface soil sample will be collected approximately 20 feet east of sample location R24A-187-GP09. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP09 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP83	Surface soil	Surface soil sample will be collected approximately 20 feet south of sample location R24A-187-GP09. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP09 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP84	Surface soil	Surface soil sample will be collected approximately 20 feet west of sample location R24A-187-GP09. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP09 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.

Table 1

Soil Sample and Monitoring Well Locations and Rationale
RI, Horizontal Extent,
Ranges Near Training Area T-24A,
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
R24A-187-GP85	Surface soil	Surface soil sample will be collected approximately 20 feet north of sample location R24A-187-GP07. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP07 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP86	Surface and subsurface soil	Surface and subsurface soil sample will be collected approximately 30 feet southwest of sample location R24A-187-GP07. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP07 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP87	Surface soil	Surface soil sample will be collected approximately 20 feet south of sample location R24A-187-GP07. Sample data will indicate extent of lead in surface soils noted in R24A-187-GP07 and if contaminated media exist at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-GP88	Surface soil	Surface soil sample will be collected on northwest side of dump located near Parcel 214Q. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
R24A-187-MW24	Groundwater	Permanent bedrock monitoring well to be placed at southeast corner of fenced area at Training Area T-24A. Groundwater sample data will further delineate the vertical and horizontal extent of benzene and carbon tetrachloride contamination. The monitoring well location will be used to establish a local groundwater flow direction, site-specific geology, and provide information on groundwater quality in the bedrock. R24A-187 MW24 will be sampled by split spoon sampler and hollow stem auger drill rig to the top of bedrock and then continuously cored to a total anticipated depth of 275 feet bgs after installing 10-inch outer casing 5 feet into bedrock, this target depth may be modified based on actual field conditions. Discrete groundwater sampling will be performed from the bottom of the casing to the total anticipated depth. Geophysical logging, comprised of acoustic televiewer, temperature, resistivity and caliper logging will be carried out from the bottom of the casing to the total anticipated depth. Natural gamma logging will be completed from ground surface to the total anticipated depth. The well construction will consist of 4-inch ID Schedule 80 PVC with 15 feet of screen.
R24A-187-MW25	Groundwater	Permanent bedrock monitoring well to be placed approximately 225 feet south of southwest corner of fenced area at Training Area T-24A. Groundwater sample data will further delineate the horizontal extent of benzene and carbon tetrachloride contamination. The monitoring well location will be used to establish a local groundwater flow direction, site-specific geology, and provide information on groundwater quality in the bedrock. R24A-187-MW25 will be sampled by split spoon sampler and hollow stem auger drill rig to the top of bedrock and then continuously cored to a total anticipated depth of 245 feet bgs after installing 10-inch outer casing 5 feet into bedrock, this target depth may be modified based on actual field conditions. Discrete groundwater sampling will be performed from the bottom of the casing to the total anticipated depth. The well construction will consist of 4-inch ID Schedule 80 PVC with 15 feet of screen.
R24A-187-MW26	Groundwater	Permanent bedrock monitoring well to be placed adjacent to existing wells R24A-187-MW14 and FTA-108-T24A-G02 at southeast corner of fenced area at Training Area T-24A. Groundwater sample data will further delineate the horizontal extent of benzene and carbon tetrachloride contamination. The monitoring well location will be used to establish a local groundwater flow direction, site-specific geology, and provide information on groundwater quality in the bedrock. 10-inch outer casing will be installed at R24A-187-MW26 to an approximate depth of 110 feet bgs before the borehole is continuously cored to a total anticipated depth of 250 feet bgs, this target depth may be modified based on actual field conditions. Discrete groundwater sampling will be performed from the bottom of the casing to the total anticipated depth. The well construction will consist of 4-inch ID Schedule 80 PVC with 15 feet of screen.
R24A-187-MW27	Groundwater	Permanent bedrock monitoring well to be placed approximately equidistant between R24A-187-MW03, -MW13, and -MW11, northeast of the fenced area at Training Area T-24A. Groundwater sample data will further delineate the vertical and horizontal extent of benzene and carbon tetrachloride contamination. The monitoring well location will be used to establish a local groundwater flow direction, site-specific geology, and provide information on groundwater quality in the bedrock. R24A-187-MW27 will be sampled by split spoon sampler and hollow stem auger drill rig to the top of bedrock and then continuously cored to a total anticipated depth of 220 feet bgs after installing 10-inch outer casing 5 feet into bedrock, this target depth may be modified based on actual field conditions. Discrete groundwater sampling will be performed from the bottom of the casing to the total anticipated depth. Geophysical logging, comprised of acoustic televiewer, temperature, resistivity and caliper logging will be carried out from the bottom of the casing to the total anticipated depth. Natural gamma logging will be completed from ground surface to the total anticipated depth. The well construction will consist of 4-inch ID Schedule 80 PVC with 15 feet of screen.

Table 1

Soil Sample and Monitoring Well Locations and Rationale
RI, Horizontal Extent,
Ranges Near Training Area T-24A,
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
R24A-187-MW28	Groundwater	Permanent bedrock monitoring well to be placed approximately 225 feet west of R24A-187-MW10, northwest of fenced area at Training Area T-24A. Groundwater sample data will further delineate the vertical and horizontal extent of benzene and carbon tetrachloride contamination. The monitoring well location will be used to establish a local groundwater flow direction, site-specific geology, and provide information on groundwater quality in the bedrock. R24A-187-MW28 will be sampled by split spoon sampler and hollow stem auger drill rig to the top of bedrock and then continuously cored to a total anticipated depth of 225 feet bgs after installing 10-inch outer casing 5 feet into bedrock, this target depth may be modified based on actual field conditions. Discrete groundwater sampling will be performed from the bottom of the casing to the total anticipated depth. Geophysical logging, comprised of acoustic televiewer, temperature, resistivity and caliper logging will be carried out from the bottom of the casing to the total anticipated depth. Natural gamma logging will be completed from ground surface to the total anticipated depth. The well construction will consist of 4-inch ID Schedule 80 PVC with 15 feet of screen.
R24A-187-MW29	Groundwater	Permanent bedrock monitoring well to be placed adjacent to R24A-187-MW20 north of fenced area at Training Area T-24A. Groundwater sample data will further delineate the vertical and horizontal extent of benzene and carbon tetrachloride contamination. The monitoring well location will be used to establish a local groundwater flow direction, site-specific geology, and provide information on groundwater quality in the bedrock. 10-inch outer casing will be installed at R24A-187-MW29 to an approximate depth of 160 feet bgs before the borehole is continuously cored to a total anticipated depth of 230 feet bgs, this target depth may be modified based on actual field conditions. Discrete groundwater sampling will be performed from the bottom of the casing to the total anticipated depth. The well construction will consist of 4-inch ID Schedule 80 PVC with 15 feet of screen.
R24A-187-MW30	Groundwater	Permanent bedrock monitoring well to be placed adjacent to R24A-187-MW22 at northwest corner of fenced area at Training Area T-24A. Groundwater sample data will further delineate the vertical extent of benzene and carbon tetrachloride contamination. The monitoring well location will be used to establish a local groundwater flow direction, site-specific geology, and provide information on groundwater quality in the bedrock. 10-inch outer casing will be installed at R24A-187-MW30 to an approximate depth of 235 feet bgs before the borehole is continuously cored to a total anticipated depth of 350 feet bgs, this target depth may be modified based on actual field conditions. Discrete groundwater sampling will be performed from the bottom of the casing to the total anticipated depth. Geophysical logging, comprised of acoustic televiewer, temperature, resistivity and caliper logging will be carried out from the bottom of the casing to the total anticipated depth. Natural gamma logging will be completed from ground surface to the total anticipated depth. The well construction will consist of 4-inch ID Schedule 80 PVC with 15 feet of screen.
R24A-187-MW31	Groundwater	Permanent residuum monitoring well to be placed at northwest side of the dump located within the range fan of parcel 214Q. Groundwater sample data will aid in determining if there any impacts to groundwater from the presence of the dump. The monitoring well location will be used to establish a local groundwater flow direction, site-specific geology, and provide information on groundwater quality in the residuum. R24A-187-MW31 will be sampled by split spoon sampler and hollow stem auger drill rig to the top of bedrock, or 15 feet into groundwater. The well construction will consist of 2-inch ID Schedule 40 PVC with 15 feet of screen and approximately 30 feet bgs.

bgs - below ground surface
RI - Remedial Investigation

Table 2

Surface and Subsurface Soil Sample Designations and Analytical Parameters
RI, Horizontal Extent,
Ranges Near Training Area T-24A,
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Suite
			Field Duplicates	MS/MSD	
R24A-187-GP58	R24A-187-GP58-SS-SC0001-REG	0-1		R24A-187-GP58-SS-SC0001-MS/MSD	TAL Metals
	R24A-187-GP58-DC-SC0002-REG	a			
R24A-187-GP59	R24A-187-GP59-SS-SC0003-REG	0-1			TAL Metals
R24A-187-GP60	R24A-187-GP60-SS-SC0004-REG	0-1	R24A-187-GP60-SS-SC0005-FD		TAL Metals
	R24A-187-GP60-DS-SC0006-REG	a			
R24A-187-GP61	R24A-187-GP61-SS-SC0007-REG	0-1			TAL Metals
R24A-187-GP62	R24A-187-GP62-SS-SC0008-REG	0-1			TAL Metals
R24A-187-GP63	R24A-187-GP63-SS-SC0009-REG	0-1			TCL VOCs, TCL SVOCs, TAL Metals, Nitroexplosives, CWM Breakdown Products, Cl & Op Pesticides, and Op Herbicides.
R24A-187-GP64	R24A-187-GP64-SS-SC00010-REG	0-1			TAL Metals
R24A-187-GP65	R24A-187-GP65-SS-SC0011-REG	0-1			TAL Metals
R24A-187-GP66	R24A-187-GP66-SS-SC0012-REG	0-1			TAL Metals
	R24A-187-GP66-DS-SC0013-REG	a	R24A-187-GP66-DS-SC0014-FD		
R24A-187-GP67	R24A-187-GP67-SS-SC0015-REG	0-1			TAL Metals
R24A-187-GP68	R24A-187-GP68-SS-SC0016-REG	0-1			TAL Metals
R24A-187-GP69	R24A-187-GP69-SS-SC0017-REG	0-1			TAL Metals

Table 2

Surface and Subsurface Soil Sample Designations and Analytical Parameters
RI, Horizontal Extent,
Ranges Near Training Area T-24A,
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Suite
			Field Duplicates	MS/MSD	
R24A-187-GP70	R24A-187-GP70-SS-SC0018-REG	0-1			TAL Metals
R24A-187-GP71	R24A-187-GP71-SS-SC0019-REG	0-1			TCI VOCs, TCI SVOCs, TAL Metals, Nitroexplosives, CWM Breakdown Products, CI & Op Pesticides, and Op Herbicides.
	R24A-187-GP71-DS-SC0020-REG	a			
R24A-187-GP72	R24A-187-GP72-SS-SC0021-REG	0-1			TAL Metals
R24A-187-GP73	R24A-187-GP73-SS-SC0022-REG	0-1		R24A-187-GP73-SS-SC0022-MS/MSD	TAL Metals
R24A-187-GP74	R24A-187-GP74-SS-SC0023-REG	0-1			TAL Metals
R24A-187-GP75	R24A-187-GP75-SS-SC0024-REG	0-1	R24A-187-GP75-SS-SC0025-FD		TAL Metals
R24A-187-GP76	R24A-187-GP76-SS-SC0026-REG	0-1			TAL Metals
R24A-187-GP77	R24A-187-GP77-SS-SC0027-REG	0-1			TAL Metals
R24A-187-GP78	R24A-187-GP78-SS-SC0028-REG	0-1			TAL Metals
	R24A-187-GP78-DS-SC0029-REG	a			
R24A-187-GP79	R24A-187-GP79-SS-SC0030-REG	0-1			TAL Metals
R24A-187-GP80	R24A-187-GP80-SS-SC0031-REG	0-1			TAL Metals
R24A-187-GP81	R24A-187-GP81-SS-SC0032-REG	0-1			TAL Metals

Table 2

Surface and Subsurface Soil Sample Designations and Analytical Parameters
RI, Horizontal Extent,
Ranges Near Training Area T-24A,
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Suite
			Field Duplicates	MS/MSD	
R24A-187-GP82	R24A-187-GP82-SS-SC0033-REG	0-1			TAL Metals
R24A-187-GP83	R24A-187-GP83-SS-SC0034-REG	0-1			TAL Metals
R24A-187-GP84	R24A-187-GP84-SS-SC0035-REG	0-1			TAL Metals
R24A-187-GP85	R24A-187-GP85-SS-SC0036-REG	0-1	R24A-187-GP85-SS-SC0037-FD		TAL Metals
R24A-187-GP86	R24A-187-GP86-SS-SC0038-REG R24A-187-GP86-DS-SC0039-REG	0-1 a			TAL Metals
R24A-187-GP87	R24A-187-GP87-SS-SC0040-REG	0-1			TCl VOCs, TCl SVOCs, TAL Metals, Nitroexplosives, CWM Breakdown Products, Cl & Op Pesticides, and Op Herbicides.
R24A-187-GP88	R24A-187-GP88-SS-SC0041-REG	0-1			TAL Metals

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

Cl and Op - Chlorinated and Organophosphorous
CWM - Chemical Warfare Material
Explosives - Nitroaromatic and Nitramine.
FD - Field duplicate.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
RI - Remedial Investigation
SVOCs - Semivolatile organic compounds.
TAL - Target analyte list.
TCL - Target compound list.
VOCs - Volatile organic compounds.

Table 3

Groundwater Sample Designations and Analytical Parameters
RI, Horizontal Extent,
Ranges Near training Area T-24A,
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	QA/QC Samples		Analytical Suite
			Field Duplicates	MS/MSD	
R24A-187-MW24	R24A-187-MW24-GW-SC3001-REG	Groundwater		R24A-187-MW24-GW-SC3001-MS/MSD	TCL VOCs, TCL SVOCs, TAL Metals, Nitroexplosives, Cl & Op Pesticides, and Op Herbicides.
R24A-187-MW25	R24A-187-MW25-GW-SC3002-REG	Groundwater			TCL VOCs, TCL SVOCs, TAL Metals, Nitroexplosives, Cl & Op Pesticides, and Op Herbicides.
R24A-187-MW26	R24A-187-MW26-GW-SC3003-REG	Groundwater	R24A-187-MW26-GW-SC3004-FD		TCL VOCs, TCL SVOCs, TAL Metals, Nitroexplosives, CWM Breakdown Products, Cl & Op Pesticides, and Op Herbicides.
R24A-187-MW27	R24A-187-MW27-GW-SC3005-REG	Groundwater			TCL VOCs, TCL SVOCs, TAL Metals, Nitroexplosives, Cl & Op Pesticides, and Op Herbicides.
R24A-187-MW28	R24A-187-MW28-GW-SC3006-REG	Groundwater			TCL VOCs, TCL SVOCs, TAL Metals, Nitroexplosives, Cl & Op Pesticides, and Op Herbicides.
R24A-187-MW29	R24A-187-MW29-GW-SC3007-REG	Groundwater			TCL VOCs, TCL SVOCs, TAL Metals, Nitroexplosives, Cl & Op Pesticides, and Op Herbicides.
R24A-187-MW30	R24A-187-MW30-GW-SC3008-REG	Groundwater			TCL VOCs, TCL SVOCs, TAL Metals, Nitroexplosives, Cl & Op Pesticides, and Op Herbicides.
R24A-187-MW31	R24A-187-MW31-GW-SC3009-REG	Groundwater			TCL VOCs, TCL SVOCs, TAL Metals, Nitroexplosives, CWM Breakdown Products, Cl & Op Pesticides, and Op Herbicides.

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

Cl and Op - Chlorinated and Organophosphorous
CWM - Chemical Warfare Material.
Explosives - Nitroaromatic and Nitramine.
FD - Field duplicate.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
RI - remedial Investigation.
SVOCs - Semivolatile organic compounds.
TAL - Target analyte list.
TCL - Target compound list.
VOCs - Volatile organic compounds.

Table 4

XRF Confirmation Surface Soil Sample Designations and QA/QC Sample Quantities
RI, Horizontal Extent,
Ranges Near Training Area T-24A,
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	QA/QC Samples		Analytical Suite
			Field Duplicates	MS/MSD	
R24X##	R24X##-SS-REG	0-1	R24X##-SS-FD		Lead
R24X##	R24X##-SS-REG	0-1		R24X##-SS-MS/MSD	Lead
R24X##	R24X##-SS-REG	0-1			Lead
R24X##	R24X##-SS-REG	0-1			Lead

- unique location identifier.
FD - Field duplicate.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
RI - Remedial Investigation.

volumes, preservatives, and holding times for the analyses required in this site-specific field sampling plan (SFSP) are discussed in Chapter 4.0 and listed in Table 4-1 of the quality assurance plan (included in the SAP). Sample documentation and chain-of-custody (COC) will be recorded as specified in Chapter 6.0 of the SAP. The samples will be analyzed for the parameters listed in Table 2 of this SFSP, using the methods listed in Table 5.

2.2 Subsurface Soil Samples

Subsurface soil samples will be collected at six locations shown on Figure 6 and included in Table 1. The samples will be collected from soil borings at a depth greater than 1 foot below ground surface (bgs) in the unsaturated zone. The soil borings will be advanced and soil samples collected using a stainless-steel hand auger as specified in Sections 5.1.1.2 and 6.1.1.1 of the SAP.

Soil samples will be collected continuously for the first four feet. A detailed lithological log will be recorded by the on-site geologist for each borehole. At least one subsurface sample from each borehole will be selected for analysis. The collected subsurface soil samples will be field-screened using a PID in accordance with Section 6.8.3 of the SAP to measure samples exhibiting elevated readings exceeding background (readings in ambient air). Typically, the subsurface soil sample showing the highest reading (above background) will be selected and sent to the laboratory for analysis. If none of the samples indicate readings exceeding background using the PID, the deepest interval from the soil boring will be collected and submitted to the laboratory for analysis. Subsurface soil samples may be selected for analysis from any depth interval if the on-site geologist suspects potential site-specific chemicals (PSSC) at the interval. Site conditions such as lithology may also determine the actual sample depth interval submitted for analysis. The depth of the boring may be extended beyond four feet bgs, and more than one subsurface soil sample will be collected, if field measurements and observations indicate a possible layer of PSSCs and/or additional sample data would provide insight to the existence of any PSSCs. Sample documentation and COC will be recorded as specified in Chapter 6.0 of the SAP. The samples will be analyzed for the parameters listed in Table 2 of this SFSP, using the methods listed in Table 5.

2.3 X-Ray Fluorescence Surface Soil Screening

XRF surface soil screening will be carried out in situ at 35 locations within the range safety fans of the Ranges Near T-24A, shown on Figure 7. The purpose of the XRF surface soil screening will be to analyze the surface soils within the range safety fans for the presence of lead.

Table 5

Analytical Samples
RI, Horizontal Extent, Ranges Near Training Area T-24A,
Fort McClellan, Alabama

Parameters	Analysis Method	Sample Matrix	TAT Needed	Field Samples			QA/QC Samples[a]				EMAX
				No. of Sample Points	No. of Events	No. of Field Samples	Field Dups (10%)	MS/MSD (5%)	Trip Blank (1/ship)	Eq. Rinse (1/wk/matrix)	Total No. Analysis
Ranges Near Training Area T-24A: 8 water matrix sample (8 groundwater samples) and 37 soil matrix samples (31 surface soil samples, 6 subsurface soil samples)											
All samples will be analyzed for the following parameters:											
TAL Metals	6010B/7000	water	normal	8	1	8	1	0	0		9
TAL Metals	6010B/7000	soil	normal	37	1	37	4	2	0		45
Approximately 10% of the soil samples and all water samples will be analyzed for the following parameters:											
TCL VOCs	8260B	water	normal	8	1	8	1	1	2		13
TCL SVOCs	8270C	water	normal	8	1	8	1	1	0		11
Chlorinated Pesticides	8081A	water	normal	8	1	8	1	1	0		11
Organophosphorus Pesticides	8141A	water	normal	8	1	8	1	1	0		11
Chlorinated Herbicides	8151A	water	normal	8	1	8	1	1	0		11
Nitroexplosives	8330	water	normal	8	1	8	1	1	0		11
CWM Breakdown Products	8270/8321	water	normal	2	1	2	1	1	0		5
TCL VOCs	8260B	soil	normal	4	1	4	1	1	0		7
TCL SVOCs	8270C	soil	normal	4	1	4	1	1	0		7
Chlorinated Pesticides	8081A	soil	normal	4	1	4	1	1	0		7
Organophosphorus Pesticides	8141A	soil	normal	4	1	4	1	1	0		7
Chlorinated Herbicides	8151A	soil	normal	4	1	4	1	1	0		5
Nitroexplosives	8330	soil	normal	4	1	4	1	1	0		7
CWM Breakdown Products	8270/8321	soil	normal	4	1	4	1	1	0		7
Ranges Near Training Area T-24A Subtotal:				123	19	16	2	0			174

[a]Field duplicate, QA split, and MS/MSD samples were calculated as a percentage of the field samples collected per site and were rounded to the nearest whole number. Trip blank samples will be collected with water matrix samples for VOC analysis only. Assumed four field samples per day to estimate trip blanks. Equipment blanks will be collected once per event whenever sampling equipment is field decontaminated and re-used. They will be repeated weekly for sampling events that last more than 1 week. Assumed 20 field samples will be collected per week to estimate number of equipment blanks.

MS/MSD - Matrix spike/matrix spike duplicate.
Explosives - Nitroaromatic and Nitramine.
QA/QC - Quality assurance/quality control.
RI - Remedial Investigation.
SVOCs - Semivolatile organic compounds.
TAL - Target analyte list.
TAT - Turn-around time
TCL - Target compound list.
VOCs - Volatile organic compounds.

Ship samples to: EMAX Laboratories, Inc.
1835 205th Street
Torrance, CA 90501
Attn: Elizabeth McIntyre
Tel: 310-618-8889
Fax: 310-618-0818

The XRF surface soil screening will be carried out in accordance with the procedures specified in Section 6.9 of the SAP. Sample documentation and COC will be recorded as specified in Chapter 6.0 of the SAP.

To perform this phase of the investigation, metals analysis will be completed on site using an energy-dispersive portable XRF instrument. Site soil surface areas will be prepared and analyzed in situ according to the methodology specified in this SFSP. Although the XRF instrument will measure and record a number of metals present at the screening location, lead has been selected as the primary indicator element of contamination from range use. XRF surface soil analysis provides screening-level data.

XRF surface soil screening measurements involve exposing the soil to a series of x-rays generated by radioactive sources stored within the instrument. Qualitative and quantitative data are generated by measuring the wavelength and frequency of the fluorescence of the metallic elements present in the soil. The fluorescence is a function of the x-ray strength and length of exposure during analysis. These data are captured and interpreted using an onboard data processor, then reported via the display screen for manual recording in terms of concentration and standard deviation. If possible, data will also be electronically downloaded from the instrument into spreadsheet-compatible files for electronic management and reporting. The manufacturer's directions for instrument calibration, operation, and maintenance shall be followed explicitly. Select samples will be measured in duplicate to assess analytical precision.

Prior to the measurement, the analyst will perform the daily instrument calibration checks. In situ measurements will be conducted by the XRF analyst placing the instrument probe in direct contact with the soil. In situ measurements will be performed on areas where the soil has been prepared. This preparation will include the following steps:

- A visual assessment to ensure the soil is not wet (if the location is wet, an alternate sample location will be selected)
- Removal of rocks, vegetative material, and bullet fragments from the surface using a trowel or spoon.
- Thorough surficial mixing to break up the compacted soil
- Hand tamping the soil into a small, compacted dome with a level surface for probe interface.

When a compacted, level surface is achieved, the probe is then placed onto the prepared surface and is checked for consistency of contact and the analysis initiated. When the measurement is complete, the analyst will record the XRF surface soil sample result manually on the XRF surface soil sample collection log. The XRF instrument logger will also record the analytical result associated with the sample location identity in its internal memory. This process will be repeated to gather data for all identified locations.

During XRF calibration, the analyst will perform measurements on a blank matrix (Teflon® or quartz) and on two standard reference materials (SRM) purchased from the National Institute of Standards and Technology. SRM 2586 has a certified concentration of 432 milligrams per kilogram (mg/kg) of lead, and SRM 2711 has a certified concentration of 1,162 mg/kg. Successful calibration of the instrument will be based on a nondetect value for lead on the blank matrix sample while achieving a relative percent difference of less than 25 percent for the SRM-measured concentrations compared to their certified values for lead. Calibrations will be performed at the beginning and end of each day's analysis.

In addition to the accuracy check of the calibration, the XRF instrument will be used to periodically measure the same location in duplicate to assess analytical precision. The check will be performed once every 20 field measurements at the discretion of the XRF analyst.

Confirmation surface soil samples will be collected and submitted for laboratory analysis by EPA Method 6010B for lead. If the XRF instrument indicates locations with a high concentration of lead, the confirmation surface soil samples will be collected from these locations. The confirmation surface soil samples will be collected at a frequency of 10 percent. Therefore, of a total 35 XRF surface soil sample locations proposed, there will be four laboratory confirmation surface soil samples collected. The samples, as listed in Table 4 of this SFSP, will be analyzed in the laboratory for lead using the method presented in Table 6.

The XRF analyst will be responsible for manually recording the results of the instrument calibration and the results of each field measurement using the XRF calibration forms and the XRF surface soil sample collection form.

2.4 Bedrock Monitoring Well Installation

Seven bedrock monitoring wells will be installed using a combination of wireline coring, hollow-stem auger, air-rotary drilling techniques and/or rotary methods using an eccentric bit (ODEX ®, or equivalent). These wells are anticipated to be installed to between 220 and 350 feet bgs;

Table 6

XRF Confirmatory Surface Soil Analytical Sampling
RI, Horizontal Extent,
Ranges Near Training Area T-24A,
Fort McClellan, Calhoun County, Alabama

Parameters	Analysis Method	Sample Matrix	TAT Needed	Field Samples			QA/QC Samples[a]				EMAX
				No. of Sample Points	No. of Events	No. of Field Samples	Field Dups (10%)	MS/MSD (5%)	Trip Blank (1/ship)	Eq. Rinse (1/wk/matrix)	Total No. Analysis
Ranges Near Training Area T-24A, Range Fan Confirmatory Sampling: 4 surface soil matrix samples											
Lead	6010B	soil	normal	4	1	4	1	1	0	0	7
Ranges Near Training Area T-24A, Range Fan Confirmatory Sampling Subtotal:						4	1	1	0	0	7

[a]Field duplicate, QA split, and MS/MSD samples were calculated as a percentage of the field samples collected per site and were rounded to the nearest whole number. Trip blank samples will be collected with water matrix samples for VOC analysis only. Assumed four field samples per day to estimate trip blanks. Equipment blanks will be collected once per event whenever sampling equipment is field decontaminated and re-used. They will be repeated weekly for sampling events that last more than 1 week. Assumed 20 field samples will be collected per week to estimate number of equipment blanks.

MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
RI - Remedial Investigation.
TAT - Turn-around time

Ship samples to: EMAX Laboratories, Inc.
1835 205th Street
Torrance, CA 90501
Attn: Elizabeth McIntyre
Tel: 310-618-8889
Fax: 310-618-0818

however, actual depths may vary, based on ground elevation, lithology, and discrete groundwater sample results observed from the borehole. The purpose of installing monitoring wells is to provide groundwater sample locations to define the vertical and horizontal extent of VOCs (benzene and carbon tetrachloride) in groundwater.

R24A-187-MW24, R24A-187-MW25, R24A-187-MW27, and R24A-187-MW28. These proposed monitoring wells will first be advanced using hollow-stem auger drilling and split-spoon sampling. Soil samples for lithology will be collected starting at 5 feet bgs and at 5-foot intervals thereafter to auger refusal. Samples will be collected using a 24-inch-long, 2-inch-diameter split-spoon sampler. The soil borings will be logged in accordance with American Standard for Testing and Materials (ASTM) Method D 2488 using the Unified Soil Classification System. The soil samples will be screened in the field using a PID and flame ionization detector for potential VOCs. Soil samples will not be collected for laboratory analyses.

Upon reaching auger refusal, an air rotary rig with a 12-inch percussion bit or rotary bit will be used to ream the borehole from ground surface to 5 feet into competent bedrock. Ten-inch inside diameter (ID) temporary carbon steel International Pipe Standard outer casing will be installed into the borehole from ground surface to the bottom of the borehole. If lost circulation or borehole collapse is encountered during drilling, eccentric rotary bit drilling techniques (ODEX or equivalent) will be employed following procedures outlined in Section C.3.1.2 of Appendix C of the SAP. A rotary rig with a 10-inch eccentric rotary bit will be used to advance the borehole from ground surface to the outer casing target depth (Table 1) and simultaneously install a 10-inch ID International Pipe Standard carbon steel outer casing in 10- to 20- foot sections. At these locations, the minimum 2-inch annulus between the outer casing and the borehole wall will not be maintained. During air rotary or eccentric rotary drilling, the driller's observations shall be noted, such as amount of water used, amount of water lost, drilling rates, voids and fractures encountered. The temporary 10-inch outer casing will be welded together forming solid carbon steel casing to the target depth of the outer casing (Table 1). At these locations, the 10-inch temporary casing will be kept in place using bentonite pellets as a seal.

Continuous bedrock coring will be performed from the bottom of the outer casing to the proposed target depth (Table 1) in accordance with ASTM Method D 2113, *Standard Practice for Diamond Core Drilling for Site Investigation* (1993). Bedrock coring will be performed with a PQ size wireline triple tube core barrel with a 5-foot longitudinally split inner tube to collect core samples continuously from the bottom of the outer casing to the estimated target depth.

Bedrock cores will be described to provide a detailed lithologic log in accordance with methods outlined in USACE South Atlantic Division Manual DM 1110-1-1 (USACE, 1983). Structural features will be noted, such as folding, fracturing and brecciation, which may indicate the presence of faulting. Also any driller's observations should also be noted during drilling, such as amount of water used, amount of water lost, drilling rates, water pressure, downfeed pressure, voids and fractures encountered. Coring will be performed continuously from the bottom of the outer casing to target depths presented in Table 1.

During rock coring drilling activities, discrete groundwater samples will be collected from the bottom of the outer casing to the target depth of the borehole, utilizing a single- or double-packer system that allows 20-foot intervals to be isolated for sampling. Groundwater sample collection will begin below the temporary outer casing and continue at 20-foot intervals thereafter (e.g., 100 to 120 feet bgs, 120 to 140 feet bgs). The samples will be collected through a properly decontaminated submersible pump made of stainless steel and Teflon such as Grundfos Rediflo-2™ or equivalent, affixed with a Teflon-coated polyethylene discharge line, and an inflatable packer located above the pump (to effectively seal off upper intervals). Prior to collecting a discrete groundwater sample, five volumes of water from the isolated sampling zone will be removed. The isolated sampling zone will be allowed to recharge for a maximum time period of one hour. If there is an insufficient volume of water to sample after one hour, the borehole will be advanced 20 feet and the discrete sampling procedure will be repeated. However, the one-hour recharge period may be extended at the discretion of the IT site manager. Groundwater samples collected from the sampling zone will be screened for field parameters (pH, temperature, specific conductivity, dissolved oxygen, and oxidation-reduction potential), and a representative sample sent to an off-site laboratory for 24-hour turn-around for VOC analysis. Discrete groundwater sampling at 20-foot intervals will provide information on groundwater quality and will aid in determining the well screen placement. The discrete groundwater sampling data will be used for screening only and will not be considered definitive; the data will not be reported with data packages, nor will it be validated. Instead, only laboratory certificate of analysis deliverables will be required. Discrete groundwater sampling methodology outlined in Attachment 5, Procedure No. FTMC-GW-002 of the SAP will be followed when collecting groundwater samples in competent bedrock.

After the completion of rock coring and discrete groundwater sample collection, borehole geophysical logging will be performed at R24A-187-MW24, R24A-187-MW27 and R24A-187-MW28. No geophysical logging will be performed at R24A-187-MW25. The logging will

include acoustic televiewer, natural gamma, temperature, resistivity, and caliper logging. The purpose of the geophysical logging is to provide additional information regarding fractures and lithologic changes noted during coring. With the exception of natural gamma logging, all borehole geophysical logging will be performed only in the open portion of the borehole. Natural gamma logging will be completed in the entire borehole (open and cased portions).

After completion of the geophysical logging, an 8-inch air percussion bit will be used to ream the hole from the bottom of the surface casing to the borehole target depth. The compressor on the drill rig will be equipped with an air filter between the compressor and the drill bit.

R24A-187-MW26, R24A-187-MW29, and R24A-187-MW30. These monitoring wells are proposed at locations adjacent to existing wells. It is therefore proposed to install permanent casing at target depths (Table 1) approximately 10 feet below the screened interval of the existing wells. An air rotary rig with a 12-inch percussion or rotary bit will be used. If lost circulation or borehole collapse is encountered during drilling, eccentric rotary bit drilling (ODEX or equivalent) will be used to advance the borehole and install the outer casing following procedures outlined in Section C.3.1.2 of Appendix C of the SAP and described above. During air rotary or eccentric rotary drilling, the driller's observations shall be noted, such as amount of water used, amount of water lost, drilling rates, voids, and fractures encountered. The 10-inch carbon steel outer casing will be grouted in place using a tremie pipe suspended in the annulus outside the casing. Bentonite-cement grout will be mixed using approximately 6.5 to 7 gallons of water and 5 pounds of bentonite per 94-pound bag of Type I Portland cement. The grout will be allowed to cure for a minimum of 48 hours before bedrock coring commences. Boring logs and well construction diagrams for existing, adjacent wells are included in Attachment 2.

After the installation of the permanent casing, continuous bedrock coring and discrete groundwater sampling will be carried out as described above. Following completion of rock coring and discrete groundwater sample collection, borehole geophysical logging will be performed at R24A-187-MW30 as described above. No geophysical logging will be performed at R24A-187-MW26 or R24A-187-MW29. After completion of discrete groundwater sample collection, and geophysical logging, an 8-inch air percussion bit will be used to ream the hole from the bottom of the permanent surface casing to the borehole target depth. The compressor on the drill rig will be equipped with an air filter between the compressor and the drill bit.

At the completion of each boring, a four-inch diameter monitoring well will be installed. The well casing will consist of new 4-inch ID, Schedule 80, threaded, flush-joint, polyvinyl chloride

(PVC) pipe. Attached to the bottom of the well casing will be a section of new, threaded, flush-joint 0.010-inch continuous wrap PVC well screen, approximately 15 feet long. At the discretion of the IT site manager, an approximately 3- to 5-foot long sump composed of new, 4-inch ID, Schedule 80, threaded, flush-joint PVC pipe may be attached to the bottom of the well screen. After the casing and screen materials are lowered into the boring, a filter pack will be installed around the well screen. The filter pack will be tremied into place from the bottom of the screen or sump to approximately 5 feet above the top of the screen. The filter pack will consist of 20/40 silica sand. A fine sand layer (30/70 silica sand), approximately 5 feet thick, will be placed above the filter pack. A bentonite seal will then be placed above the fine sand layer and will be extended from the top of the fine sand to approximately five feet above the bottom of the outer casing. The remaining annular space will be grouted with a bentonite-cement mixture, using approximately 7 to 8 gallons of water and approximately 5 pounds of bentonite per 94-pound bag of Type I or Type II Portland cement. The grout will be tremied into place with a side-discharge tremie pipe from the top of the bentonite seal to ground surface. The bedrock monitoring wells will be completed and developed as specified in Appendix C of the SAP. Groundwater samples will not be collected from bedrock wells for a period of at least 14 days after well development.

Residuum Well R24A-187-MW31. One residuum monitoring well will be drilled and installed using hollow-stem auger or air rotary drilling techniques to an estimated depth of 30 feet bgs. The residuum monitoring well borehole will be drilled to the top of bedrock or to 15 feet below the water table, whichever is encountered first. Soil samples for lithologic descriptions will be collected at 5-foot intervals from ground surface to the total depth of the borehole during drilling to provide a detailed lithologic log. The samples will be collected for lithology using a 24-inch long, 2-inch or larger diameter, split-spoon sampler. The soil borings will be logged in accordance with ASTM Method D 2488 using the Unified Soil Classification System. The soil samples will be screened in the field using a PID and flame ionization detector for VOCs. Soil samples will not be collected for laboratory analysis.

The monitoring well will be installed using a hollow-stem auger drill rig (or air rotary drill rig) mounted on a truck or all-terrain vehicle. The monitoring well casing will consist of new 2-inch ID, Schedule 40, threaded, flush-joint, PVC pipe. Attached to the bottom of the well casing will be a section of new threaded, flush-joint, 0.010-inch continuous wrap PVC well screen, approximately 15 feet long. At the discretion of the IT site manager, a sump composed of new, 2-inch ID, schedule 40, threaded, flush-joint PVC may be attached to the bottom of the well screen. After the casing and screen materials are lowered into the boring, a filter pack will be installed around the well screen. In wells installed to depths of 20 feet or less, the filter pack

material will be gravity filled. In wells installed to depths of 20 feet or more, the filter pack will be tremied into place from the bottom of the well to approximately five feet above the top of the well screen. The filter pack will consist of 20/40 silica sand. A fine sand layer (30/70 silica sand), approximately five feet thick may be placed above the filter pack. A bentonite seal, approximately five feet thick, will be placed above the filter pack (or fine sand, if used). The remaining annular space will be grouted with a bentonite-cement mixture, using approximately 7 to 8 gallons of water and approximately 5 pounds of bentonite per 94-pound bag of Type I or Type II Portland cement. The grout will be tremied into place from the top of the bentonite seal to ground surface.

The monitoring well will be completed and developed as specified in Section 5.1 and Appendix C of the SAP. The exact monitoring well location will be determined in the field by the on-site geologist, based on actual field conditions. After well development, the monitoring well will be allowed to equilibrate 14 days prior to sample collection.

2.5 Groundwater Sampling

Following the completion of well installation and development activities, groundwater samples will be collected. The groundwater sample data collected from the monitoring wells will be considered definitive. The groundwater sampling rationale is provided in Table 2. The groundwater sample designations and required quality assurance/quality control (QA/QC) sample quantities are listed in Table 5. Groundwater samples will be collected in accordance with Section 4.2.4.2 of the site-specific field sampling plan for the SRI (IT, 2000), and Section 6.1.1.5 of the SAP. Low-flow groundwater sampling methodology, outlined in Attachment 5, Procedure No. FTMC-GW-001 of the SAP, may be used as deemed necessary by the IT site manager. The groundwater samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable as shown in Table 5, for the parameters listed in Table 3. Equipment decontamination procedures will follow the methodology presented in Section 6.5.1.1 of the SAP.

The monitoring well locations and elevations will be surveyed following the methodology outlined in Section 4.2.8 of the site-specific field sampling plan for the SRI (IT, 2000), and Section 4.17 of the SAP.

Investigative-derived waste (IDW) generated during well installation and groundwater sampling will be managed in accordance with the procedures outlined in Appendix D of the SAP. Drill cuttings and water will be generated during drilling as the bit and rods are advanced. The cuttings and water

shall be directly diverted into a lined, watertight, roll-off box per methodology previously established during drilling activities at FTMC.

It is proposed that liquid IDW generated during this RI be treated and disposed of on site as shown in the schematic on Figure 8. After allowing time for settling, untreated liquids (from drilling and groundwater sampling) in the first roll-off box will be siphoned from the top of the liquid and pumped through a sand filter and then through a granular activated carbon (GAC) canister into a second lined, watertight, roll-off box. The intent of the sand filter is to extract suspended drill cuttings to reduce particles going into the GAC. The GAC will remove VOCs in the water. When the second box is approximately 75 percent full of treated water, a grab sample of the treated water in the second box will be collected and analyzed for VOCs, using a quick turnaround time. Assuming the treated water has no detection of VOCs above surface water ecological screening values, it will be discharged onto the ground using a submersible pump. The treated water will be allowed to percolate into the ground and will not be allowed to flow directly into a drainage ditch or creek.

Treated water containing VOCs exceeding ecological surface water ecological screening values, sand, and GAC will be characterized and disposed of following previously established procedures.

All work conducted during the RI (horizontal extent, surface soil and groundwater) at the Ranges Near Training Area T-24A will be conducted in accordance with this SFSP, the revised UXO safety plan attachment, and the revised site-specific safety and health plan attachment (IT, 2002b).

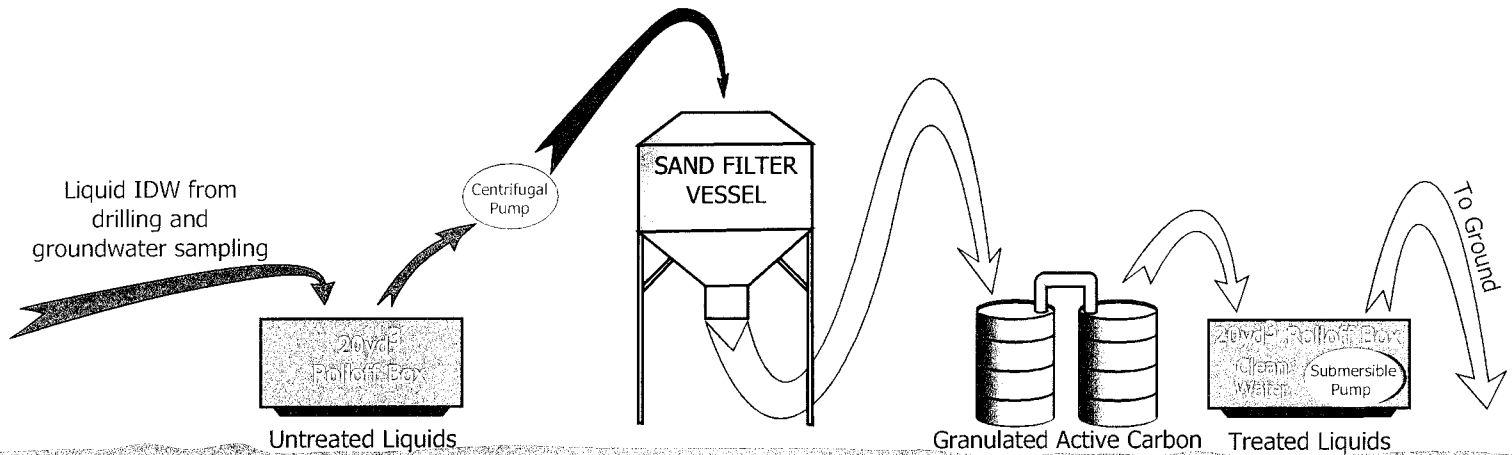

FIGURE 8

IDW Disposal Option for Drilling at Ranges Near T-24A, Parcels 187(7), 112Q, 113Q-X, 213Q, and 214Q Fort McClellan, Alabama

U.S. Army Corps
of Engineers
Mobile District

IT CORPORATION
A Member of The IT Group

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3.0 Schedule

The proposed field activities described herein will be initiated concurrently with activities described in *Draft Site-Specific Field Sampling Plan Addendum II for the Remedial Investigation (Source Area) at the Ranges Near Training Area T-24A, Parcels 187(7), 112Q, 113Q-X, 213Q, and 214Q,* (IT, 2002b) to reduce labor and mobilization costs. The project schedule for the field activities will be provided by the IT project manager to the Base Realignment and Closure Cleanup Team.

4.0 References

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ATTACHMENT 1

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
AUF	area use factor
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
BGR	Bains Gap Road
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_2	carbon dioxide
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)/constituent(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
DAAMS	depot area air monitoring system
DAF	dilution-attenuation factor
DANC	decontamination agent, nonorrosive
°C	degrees Celsius
°F	degrees Fahrenheit
DCA	dichloroethane
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DEH	Directorate of Engineering and Housing
DEP	depositional soil
DFTPP	decafluorotriphenylphosphine
DI	deionized

List of Abbreviations and Acronyms *(Continued)*

DID	data item description
DIMP	di-isopropylmethylphosphonate
DM	dry matter; adamsite
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 Dector
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
Fe^{+3}	ferric iron
Fe^{+2}	ferrous iron
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. G856 magnetometer
G-858G	Geometrics, Inc. G858G magnetic gradiometer
GAF	gastrointestinal absorption factor
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravelsand-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; gravelsand-silt mixtures
gp	poorly graded gravels; gravelsand 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; gravelsand mixtures
H&S	health and safety
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
HRC	hydrogen release compound
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

List of Abbreviations and Acronyms (Continued)

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
KeV	kilo electron volt
K_{ow}	octonal-water partition coefficient
L	lewisite; liter
L/kg/day	liters per kilogram per day
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
MeV	mega electron volt
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
MOUT	Military Operations in Urban Terrain
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
NO_3^-	nitrate
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

List of Abbreviations and Acronyms (Continued)

PCE	perchloroethene
PCP	pentachlorophenol
PDS	Personnel Decontamination Station
PEF	particulate emission factor
PEL	permissible exposure limit
PERA	preliminary ecological risk assessment
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
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
PS	chloropicrin
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; sandsilt mixtures
SM	Serratia marcescens
SMDP	Scientific Management Decision Point
s/n	signal-to-noise ratio
SO_4^{-2}	sulfate
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
UBR	upper background range
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