

**Final
Site-Specific Field Sampling Plan,
Site-Specific Safety and Health Plan, and
Site-Specific Unexploded Ordnance Safety Plan Attachments
Range 23A, Multipurpose Range,
Parcel 109(7)/152Q-X**

**Fort McClellan
Calhoun County, Alabama**

**Task Order CK05
Contract No. DACA21-96-D-0018
IT Project No. 774645**

October 2001

Revision 0

**Final
Site-Specific Field Sampling Plan,
Site-Specific Safety and Health Plan, and
Site-Specific Unexploded Ordnance Safety Plan Attachments
Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X**

**Fort McClellan
Calhoun County, Alabama**

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List of Acronyms

See Attachment 1 for the list of Abbreviations and Acronyms.

Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK05, IT Corporation (IT) will conduct site investigation activities at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X, at Fort McClellan, Calhoun County, Alabama, to determine the presence or absence of potential site-specific chemicals (PSSC) at these sites. The purpose of this site-specific field sampling plan (SFSP) is to provide technical guidance for sampling activities at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X.

Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X is located on the north-central portion of Pelham Range and occupies approximately 41 acres. Training is believed to have begun in 1987 and continued into 1999. This range is located north of the two large established impact areas on Pelham Range. The site was historically used by the Chemical School at Fort McClellan for Flame Field Expedient (FFE) training and was known as the Flame Operations Range. There are no records of projectiles fired at this range (ESE, 1998). Features at this site included a metal building, vehicle parking area, fuel tanker parking area, observation bleachers, fuel mixing area, and the detonation field.

The detonation field is divided into the following areas:

- Hasty Mine Field training area
- Directional training area
- Non-directional training area
- Former Wall of Flame training area
- Nuke-simulator training area
- Electric training area
- Non-electric training area
- Modernized Demolition Initiators (MDI) training area.

Smoke, demolitions, and FFE training activities involved the mixing of either raw gasoline and M4 thickener, or MOGAS (gasoline) and fog oil to formulate FFE. The materials used to formulate FFE reportedly leaked at this range. Fuel containers were usually 55-gallon drums. Earthen ditches were used for the detonation of FFE in the wall of flame and nuke-simulator training areas. Any spillage was reportedly cleaned up.

Based on the comments from the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) and the Alabama Department of Environmental Management (ADEM) to

the CH2M Hill 2000 *Draft Range 23A Site Investigation Report*, it was concluded that neither the direction of groundwater flow was established nor an evaluation of groundwater conditions was completed in the site investigation by CH2M Hill. Furthermore, explosive analyses were completed outside of the recommended holding times, and an additional sample collection was recommended to verify the sample results. Based on the CHPPM's and ADEM's comments, the Base Realignment and Closure Cleanup Team requested IT to complete the site investigation at Range 23A. IT will install 4 monitoring wells, collect 11 surface soil samples, 11 subsurface soil samples, 4 groundwater samples, 6 surface water samples, and 6 sediment samples at these sites to determine the presence or absence of potential site-specific chemicals (PSSC) at Range 23A and complete the SI.

Potential contaminant sources at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X are Flame Field Expedient mixture materials, explosives and metals. Chemical analyses of the samples collected during the field program will include volatile organic compounds, semivolatile organic compounds, nitroaromatic/nitramine explosives, and metals. In addition, sediment samples will be analyzed for total organic carbon and grain size. Results from these analyses will be compared with site-specific screening levels presented in the IT July 2000 *Final Human Health and Ecological Screening Values and PAH Background Summary Report* and regulatory agency guidelines.

Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X falls within Pelham Range, which is an active range. Therefore, unexploded ordnance (UXO) surface sweeps and downhole surveys of soil borings will be required to support field activities. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purpose of UXO avoidance.

This site-specific field sampling plan attachment to the installation-wide sampling and analysis plan (SAP) for Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X will be used in conjunction with the site-specific safety and health plan, the site-specific UXO safety plan, the installation-wide work plan, and the SAP. The SAP includes the installation-wide safety and health plan, waste management plan, ordnance and explosives management plan, and quality assurance plan. Site-specific hazard analyses are included in the site-specific safety and health plan and the site-specific UXO safety plan.

1.0 Project Description

1.1 Introduction

The U.S. Army is conducting studies of the environmental impact of suspected contaminants at Fort McClellan (FTMC) in Calhoun County, Alabama, under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE has contracted IT Corporation (IT) to provide environmental services for the site investigation (SI) of Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X, under Task Order CK05, Contract Number DACA21-96-D-0018.

Based on the comments from the U.S. Army Center for Health Promotion and Preventive Medicine and the Alabama Department of Environmental Management to the CH2M Hill 2000 *Draft Range 23A Site Investigation Report*, it was concluded that neither the direction of groundwater flow was established nor an evaluation of groundwater conditions was completed in the site investigation by CH2M Hill. Furthermore, explosive analyses were completed outside of the recommended holding times, and an additional sample collection was recommended to verify the sample results. Based on the CHPPM's and ADEM's comments, the Base Realignment and Closure Cleanup Team requested IT to complete the site investigation at Range 23A.

This site-specific field sampling plan (SFSP) attachment to the installation-wide sampling and analysis plan (SAP) (IT, 2000a) for FTMC has been prepared to provide technical guidance for sample collection and analysis at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X. This SFSP will be used in conjunction with the site-specific safety and health plan (SSHP) and the site-specific unexploded ordnance (UXO) safety plan developed for Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X and the installation-wide work plan (WP) (IT, 1998) and the SAP. The SAP includes the installation-wide safety and health plan (SHP), waste management plan, ordnance and explosives management plan, and quality assurance plan (QAP). Site-specific hazard analyses are included in the SSHP and the site-specific UXO safety plan.

IT will install 4 monitoring wells, collect 11 surface soil samples, 11 subsurface soil samples, 4 groundwater samples, 6 surface water samples, and 6 sediment samples at these sites to determine the presence or absence of potential site-specific chemicals (PSSC) at Range 23A and complete the SI. Chemical analyses of the samples collected during the field program will include volatile organic compounds, semivolatile organic compounds, nitroaromatic/nitramine explosives, and metals. In addition, sediment samples will be analyzed for total organic carbon and grain size. Results from these analyses will be compared with site-specific screening levels

presented in the IT July 2000 *Final Human Health and Ecological Screening Values and PAH Background Summary Report* and regulatory agency guidelines.

1.2 Site Description

Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X is located on the north-central portion of Pelham Range and occupies approximately 41 acres (Figure 1-1) (ESE, 1998). Training is believed to have begun in 1987 and continued into 1999. This range is located north of the two large established impact areas on Pelham Range. The site was historically used by the Chemical School at Fort McClellan for Flame Field Expedient (FFE) training and was known as the Flame Operations Range. There are no records of projectiles fired at this range (ESE, 1998). Features at this site included a metal building, vehicle parking area, fuel tanker parking area, observation bleachers, fuel mixing area, and the detonation field.

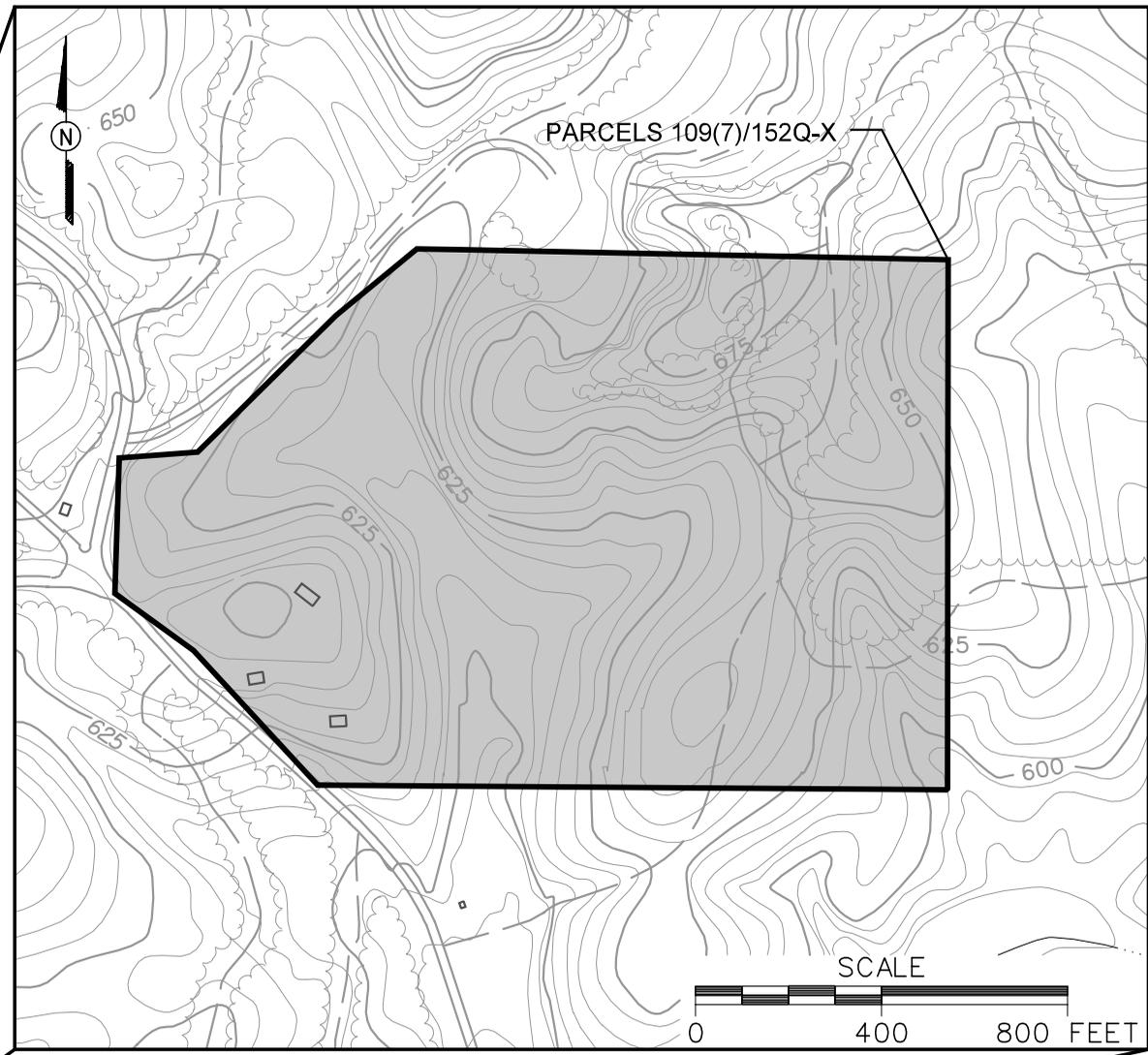
Smoke, demolitions, and FFE training activities involved the mixing of either raw gasoline and M4 thickener, or MOGAS (gasoline) and fog oil to formulate FFE. The materials used to formulate FFE reportedly leaked at this range. Fuel containers were usually 55-gallon drums. Earthen ditches were used for FFE detonation in the wall of flame and nuke-simulator training areas. Any spillage was reportedly cleaned up (ESE, 1998)

The detonation field is divided into the following areas (CH2M Hill, 2000) (Figure 1-2):

- Hasty Mine Field training area
- Directional training area
- Non-directional training area
- Former Wall of Flame training area
- Nuke-simulator training area
- Electric training area
- Non-electric training area
- Modernized Demolition Initiators (MDI) training area.

The hasty mine field training area exercises consist of detonating approximately 50 small plastic containers of FFE simultaneously; this action occurred approximately 40 times per year (CH2M Hill, 2000). The small explosives included a fuel mixture typically placed in common plastic household containers that hold 2 or more liters. The fuel mixture for the training consisted of approximately 50 gallons of raw gasoline combined with M4 thickener. M4 thickener was mixed at a rate of about 3 ounces per gallon of gasoline. After the detonation, the resulting fire was allowed to burn out and cool. After the fire cooled, the area was policed by the trainees and

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 PROJ. NO.: 774645
 INITIATOR: J. BROWN
 PROJ. MGR.: J. YACOUB
 DRAFT. CHCK. BY:
 ENGR. CHCK. BY: J. JENKINS
 DATE LAST REV.:
 DRAWN BY:
 STARTING DATE: 08/15/01
 DRAWN BY: D. BOMAR
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LEGEND

-  UNIMPROVED ROADS AND PARKING
-  PAVED ROADS AND PARKING
-  BUILDING
-  TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
-  TREES / TREELINE
-  PARCEL BOUNDARY
-  SURFACE DRAINAGE / CREEK

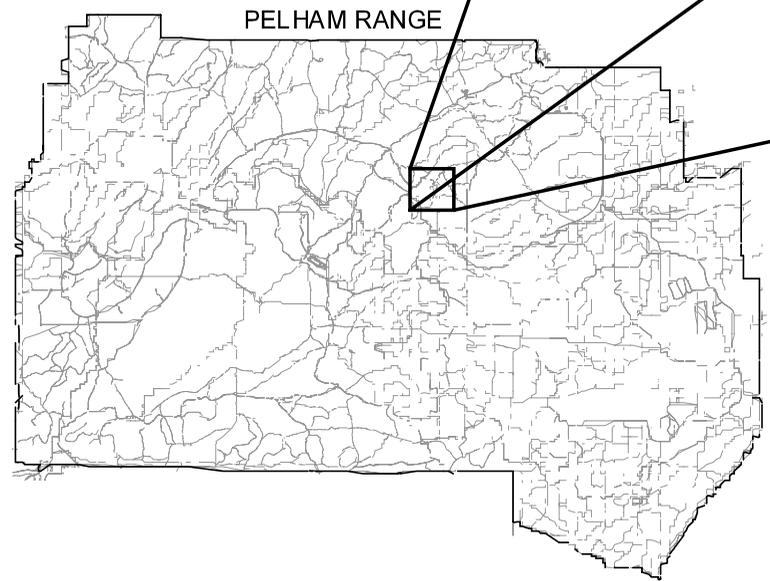
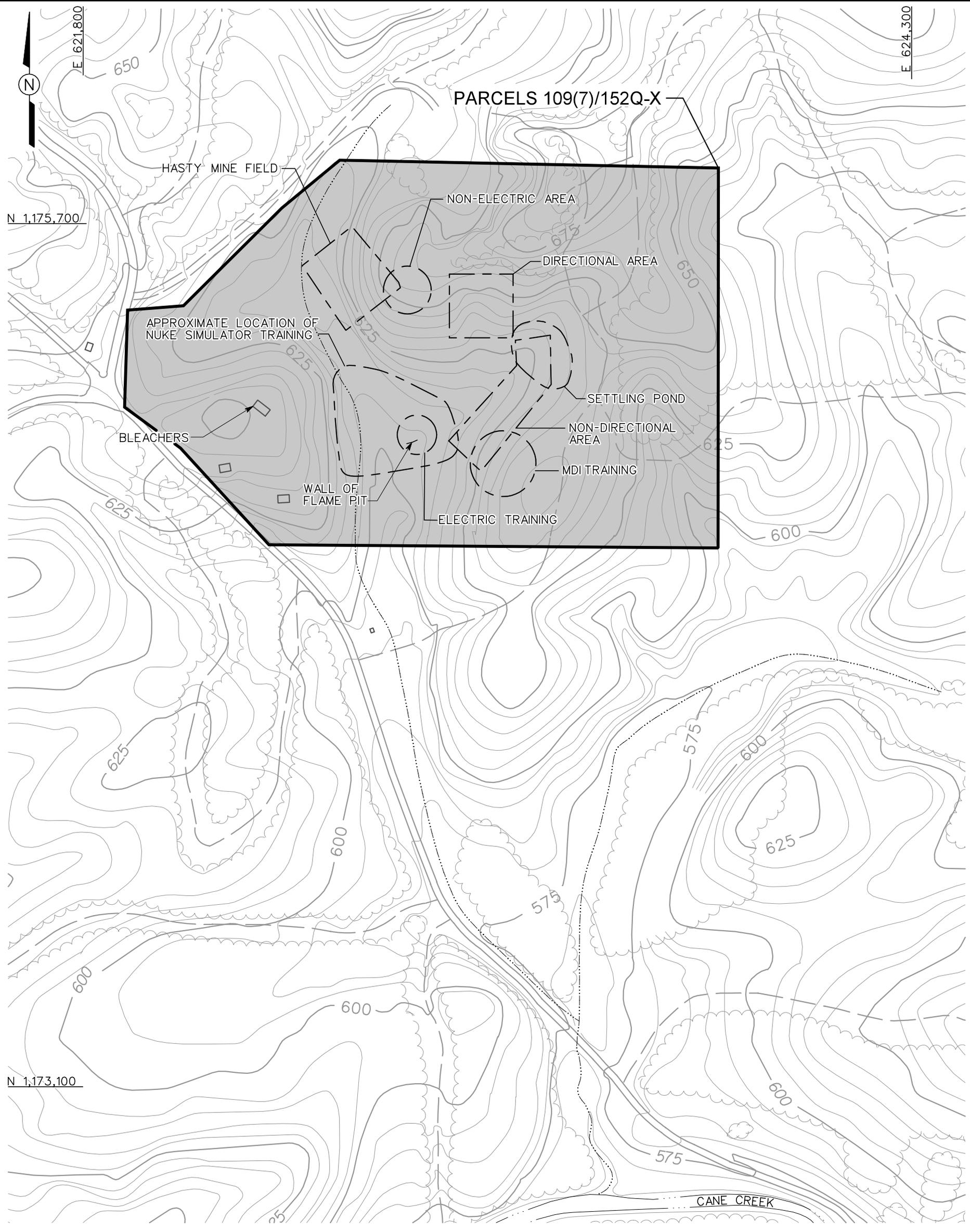


FIGURE 1-1
SITE LOCATION MAP
 RANGE 23A
 MULTIPLE PURPOSE RANGE
 PARCELS 109(7)/152Q-X

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

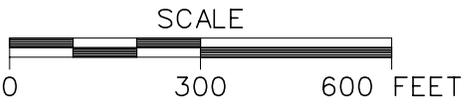


LEGEND:

-  UNIMPROVED ROADS AND PARKING
-  PAVED ROADS AND PARKING
-  BUILDING
-  TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
-  TREES / TREELINE
-  PARCEL BOUNDARY
-  SURFACE DRAINAGE / CREEK

FIGURE 1-2
SITE MAP
RANGE 23A
MULTIPLE PURPOSE RANGE
PARCELS 109(7)/152Q-X

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



the remaining plastic fragments were disposed of properly. The hasty mine field training area was eroded in several areas and sandbags had been placed in the larger gullies to minimize erosion. The large gullies were also used by the soldiers to walk from the training areas to the bleachers (CH2M Hill, 2000).

The directional training area is located just east of the hasty mine field. During the directional training exercise, one 55-gallon drum containing gasoline and M4 thickener (3 ounces of M4 per gallon) was positioned with sandbags so that the flame was directed out in a controlled manner. FFE directional training occurred approximately 40 times per year. A moderate amount of erosion exists on the hillside in this area (CH2M Hill, 2000).

The non-directional training area is located on a hillside east of the former wall of flame training site. Five to ten 55-gallon drums are filled with 400 to 500 gallons of a 1:1 mixture of MOGAS and fog oil. One drum contains M4 thickener. The drums were positioned upright, wired together, and detonated. FFE non-directional training occurred approximately 40 times per year. There is moderate erosion on the hillside in this area (CH2M Hill, 2000).

The former wall of flame training site is located south of the hasty mine field training area and the directional training area. The former wall of flame practices consisted of detonating approximately 300 gallons of a 1:1 mixture of MOGAS and fog oil in an unlined earthen ditch (CH2M Hill, 2000). The earthen ditch was approximately 2 to 3 feet wide, 2 feet deep, and 30 feet long. Early in 1996, wall of flame training was discontinued at this range. The most recently used ditch is no longer visible. It was reported that the wall of flame training also has occurred in at least one additional area at this range, but the pit location is no longer visible. FFE training occurred at this range approximately 20 times per year before this training activity was ended (CH2M Hill, 2000).

A nuke-simulator training area also was located at this range. The former nuke-simulator site was reportedly located near the intermittent stream that crosses the range west of the non-directional training area. Nuke-simulator training was similar to wall of flame training except that the earthen ditch was circular. Approximately 200 gallons of a 1:1 mixture of MOGAS and fog oil were detonated in this circular ditch during each training exercise. This training occurred only intermittently. This area of training is no longer visually evident (CH2M Hill, 2000).

There are three areas associated with explosives training which are the Non-electric, Electric, and MDI Training Areas (Figure 1-2). Explosives were used at the Electric Training Area since

August 1987 and included blasting caps (lead azide), TNT, C-4, and pentaerythritol tetranitrate (PETN). Shock tubes (combination of cyclotetramethylene tetranitramine and aluminum) were used for a few months beginning in June 1997 (CH2M Hill, 2000).

Explosives have been used at the MDI Training Area since August 1987 and included blasting caps (lead azide, C-4, and PETN), TNT, C-4, PETN, tetryl bursting charges, and thermite (magnesium oxide) trip flares. Shock tubes were used in this area since June 1997 (CH2M Hill, 2000).

Explosives were used at the Non-Electric Training Area since 1992 and included blasting caps (lead azide, lead styphenate, and PETN), TNT, C-4, and PETN. The activities conducted at the Non-Electric Training Area previously were held at the Hasty Mine Site from 1987 through 1992 (CH2M Hill, 2000).

A primary concern for any FFE training range was to control the potential spread of fire to nearby areas. Fire breaks were present at the site to control and contain the fires resulting from the training exercises. These fire breaks and the barren training areas were graded at least every 2 years. Occasional controlled burns also are performed on the site to keep natural fuel sources to a minimum (CH2M Hill, 2000).

According to the U.S. Department of Agriculture (1961), the soils at Range 23A is mainly classified as Clarksville cherty silt loam, 10 to 15 percent slopes (CkD). The Clarksville Series consists of well-drained strongly acidic soils that have developed in the residuum of cherty limestone. The surface soil is dark-brown to dark grayish-brown or very dark grayish-brown cherty silt loam or stony loam. Pieces of chert and limestone, 3 inches to 8 inches or more in diameter, are on the surface and in the profile (U.S. Department of Agriculture, 1961).

1.3 Scope of Work

The scope of work for activities associated with the SI at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X, includes the following tasks:

- Develop the SFSP attachment.
- Develop the SSHP attachment.
- Develop the site-specific UXO safety plan attachment.

- Conduct a surface and near-surface unexploded ordnance survey for the purpose of UXO avoidance over all areas to be included in the sampling effort.
- Provide downhole UXO support for the purpose of UXO avoidance for all intrusive drilling to determine buried downhole hazards.
- Collect 11 surface soil samples, 11 subsurface soil samples, 4 groundwater samples, 6 surface water samples, and 6 sediment samples to determine whether potential site-specific chemicals (PSSC) are present at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X, and to provide data useful for supporting any future planned corrective measures and closure activities.
- Samples will be analyzed for the parameters listed in Section 4.5.

Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X falls within Pelham Range, which is an active range. Therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at these sites. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purpose of UXO avoidance. The site-specific UXO safety plan will be used to support hazardous, toxic, and radiological waste and construction activities at the work sites should incidental ordnance, explosives and UXO be encountered and require avoidance or disposal.

At completion of the field activities and sample analyses, an SI summary report will be prepared to summarize the results of the activities, to evaluate the absence or presence of PSSCs at these sites, and to recommend further actions, if appropriate. SI sampling reports will be prepared in accordance with current U.S. Environmental Protection Agency (EPA), Region IV and the Alabama Department of Environmental Management (ADEM) guidelines.

2.0 Summary of Existing Environmental Studies

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

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas)
2. Areas where only release or disposal of petroleum products has occurred
3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response
4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken
5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken
6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented
7. Areas that are not evaluated or require additional evaluation.

For non-Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) environmental or safety issues, the parcel label includes the following components: a unique non-CERCLA issue number, the letter "Q" designating the parcel as a Community Environmental Response Facilitation Act (CERFA) Category 1 Qualified Parcel, and the code for the specific non-CERCLA issue(s) present (ESE, 1998). The non-CERCLA issue codes used are:

- | | | |
|----|---|-----------------------------------|
| A | = | Asbestos (in buildings) |
| L | = | Lead-Based Paint (in buildings) |
| P | = | Polychlorinated biphenyls |
| R | = | Radon (in buildings) |
| RD | = | Radionuclides/Radiological Issues |

X = UXO
CWM = Chemical Warfare Material.

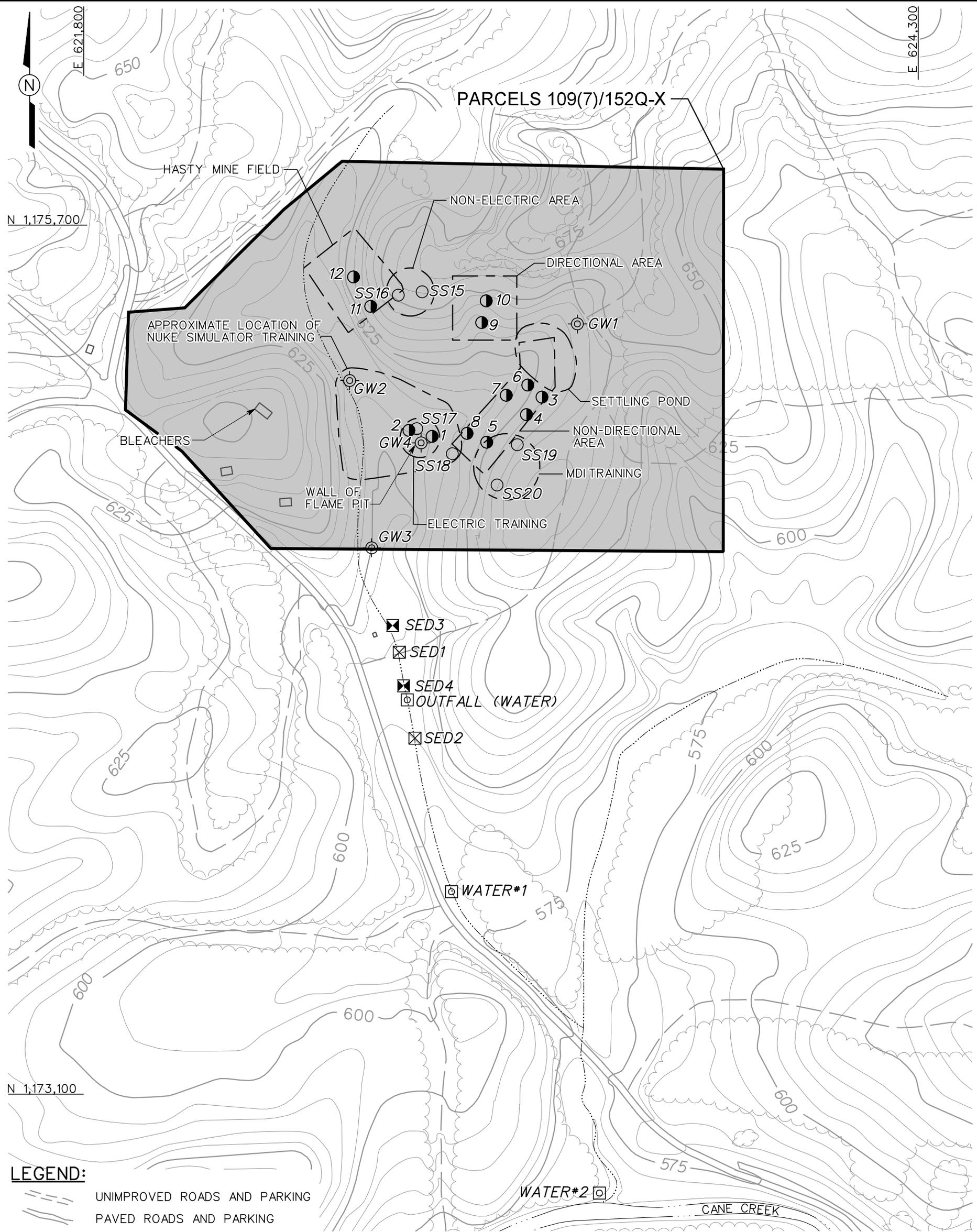
The EBS was conducted in accordance with the CERFA (CERFA-Public Law 102-426) protocols and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, ADEM, EPA Region IV, and Calhoun County, as well as a database search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

Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X was identified as a Category 7 CERFA site. CERFA sites are parcels where site-specific chemicals were stored, and possibly released onto the site or to the environment and /or were disposed of on site property. Category 7 sites are areas that lack adequate documentation and therefore require additional evaluation to determine the environmental condition of the parcel. This site was also designated as a non-CERCLA site because of the range activities and was qualified "X" for potential UXO.

In 1996, the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) conducted a preliminary site evaluation to determine if Range 23A activities have contaminated groundwater or surface water, if such activities could adversely affect public health and the environment, and to determine if subsequent investigations were warranted. CHPPM concluded the potential for surface water, groundwater, and soil contamination was high at Range 23A. A copy of CHPPM's Preliminary Site Evaluation, June 28, 1996, is contained in Appendix A of the CH2M Hill *Draft Range 23A Site Investigation Report* (CH2M Hill, 2000).

In 1997 and 1999, CH2M Hill conducted two preliminary site investigations to characterize the extent of potential contamination at Range 23A. During both investigations, a total of twelve surface soil samples, nine subsurface soil samples, four groundwater samples, three surface water samples, four sediment samples, and one storm water sample were collected for laboratory analysis. The sample locations are shown on Figure 2-1.

Soil matrix samples were reported with elevated levels of metals, volatile organic compounds (VOC), semivolatile organic compounds (SVOC), total petroleum hydrocarbon compounds (TPH) and one explosive (hexahydro-1,3,5-trinitro-1,3,5-triazine [RDX]). Water matrix samples

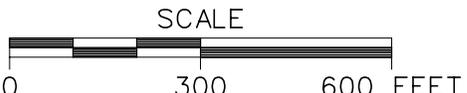


LEGEND:

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- TEMPORARY MONITORING WELL (ABANDONED)
- SEDIMENT SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION (APPROXIMATED)
- SOIL SAMPLE LOCATION
- SOIL SAMPLE LOCATION (APPROXIMATED)
- SURFACE WATER SAMPLE LOCATION (APPROXIMATED)

FIGURE 2-1
PREVIOUS SAMPLE LOCATION MAP
RANGE 23A
MULTIPLE PURPOSE RANGE
PARCELS 109(7)/152Q-X

U. S. ARMY CORPS OF ENGINEERS
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were reported with elevated levels of VOCs, metals, and one explosive (1,3-dinitrobenzene). Tables 2-1 through 2-5 contain only the detected results of the samples collected during the site investigations by CH2M Hill. All laboratory results were compared against background concentrations (*Human Health and Ecological Screening Values and PAH Background Summary Report*, July 2000) and screening values (EPA Region III and EPA Region IV risk-based concentrations) (Tables 2-1 through 2-5) (CH2M Hill, 2000). These sample analytical results and their locations were taken from the CH2M Hill *Draft Range 23A Site Investigation Report* (CH2M Hill, 2000).

Explosives detected above the detection limit include 1,3-Dinitrobenzene. Analytical data from both sampling efforts at Range 23A by CH2M Hill are included in Appendix C of the *Draft Range 23A Site Investigation Report* (CH2M Hill, 2000).

Due to poor recovery of surrogate compounds for the method blank and several samples during the first analysis, all original soil samples collected by CH2M Hill were reanalyzed for explosives. The reanalysis was completed outside of allowable holding times (CH2M Hill, 2000).

Table 2-1

**Detected Constituents - Surface Soil
CH2M Hill Range 23A Site Investigation Report
Fort McClellan, Calhoun County, Alabama**

Sample Identification	Lab Report #	Sample Type	VOCs		SVOCs		Explosive	Cations							General Chemistry
			Toluene (µg/kg)	Ethylbenzene (µg/kg)	bis(2-e3thylhexyl)phthalate (µg/kg)	Naphthalene (µg/kg)		Hexahydro-1,3,5-trinitro-1,3,5-triazine [RDX] (mg/kg)	Arsenic (mg/kg)	Beryllium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	
Wall of Flame Training Area															
1A	MD914	Surface Soil						4.3	0.51	8.5	6.6	22.0	6.3	63.7	342
2A	MD914	Surface Soil						3.2		8.7	6.7	19.6	6.4	55.3	2470
Non-Directional Training Area															
3A	MD914	Surface Soil						6.2		11.6	6.3	9.5	6.8	38.5	59.8
4A	MD914	Surface Soil			3200			3.1		13.4	10.5	13.8	7.9	43.4	610
5A	MD914	Surface Soil			4400					15.7	5.1	12.0	4.4	15.5	230
5ADL	MD914	Reanalyze			4600										
6A	MD914	Surface Soil								13.8	10.8	13.6	4.8	70.2	741
7A	MD914	Surface Soil								14.1	11.2	15.5	5.4	51.3	375
8A	MD914	Surface Soil			1100			3.2		15.7	7.5	9.3	5.1	19.6	245
Directional Training Area															
9A	MD713	Surface Soil	23	14		930		8.8		24.9	95.2	10.7	7.9	22.1	134
10A	MD713	Surface Soil						7.1		5.4	14.5	8.7	3.7	23.8	12.2
10AR	MD713	Reanalyze													
Hasty Mine Field Training Area															
11A	MD713	Surface Soil						7.6		7.3	8.3	15.4	7.1	23.9	449
12A	MD713	Surface Soil						4.3		5.9	6.1	10.2	5.4	29.1	193
12AR	MD713	Reanalyze													
MDI Training Area															
20A	DO127	Surface Soil					5 (estimated)								
Equipment Rinse Blank															
Rinse	MD713	Rinsate Blank													0.0415
Concentrations Detected															
Maximum			23	14	4600	930	5 (estimated)	8.8	0.51	24.9	95.2	22.0	7.9	70.2	2470
Minimum			23	14	1100	930	5 (estimated)	3.1	0.51	5.4	5.1	8.7	3.7	15.5	12
Average			23	14	3325	930	5 (estimated)	5.3	0.51	12.1	15.7	13.4	5.9	38.0	488
Background															
From IT Report		Surface Soil	NR	NR	NR	832		13.73	0.80	37.04	12.71	40.05	10.33	40.64	
Risk-based Concentration for Soils (mg/kg)															
Industrial			4.1E+8	2.0E+8	4.1E+5	4.1E+7	5.2E+1	3.8E-1	4.1E+2	6.1E+2	8.2E+4	NR	4.1E+4	6.1E+5	
Residential			1.6E+7	7.8E+6	4.6E+4	1.6E+6	5.8E+0	4.3E-1	1.6E+2	2.3E+2	3.1E+3	4.0E+2	1.6E+3	2.3E+4	
SSL with DAF=20			8.8E+3	1.5E+4	2.9E+9	1.5E+2	NR	2.6E-2	1.2E+3	4.2E+1	1.1E+4	NR	NR	1.4E+4	

Notes:
 DAF - Dilution attenuation factor.
 DL - Dilution of referenced sample.
 IT - IT Corporation.
 µg/kg - Micrograms per kilogram.
 mg/kg - Milligrams per kilogram.
 µg/L - Micrograms per liter.
 NR - No data published in reference document.
 R - Reanalysis of referenced sample.
 SSL - Site-specific screening level.
 SVOC - Semivolatile organic compound.
 TPH - Total petroleum hydrocarbon compounds.
 VOC - Volatile organic compound.

Shaded areas - not analyzed.
 Blank areas - less than method detection limit.
 Risk-based concentrations from Region III, April 2000.

Table reproduced from: CH2M Hill, 2000, *Draft Range 23A Site Investigation Report, U.S. Army, Fort McClellan, Alabama*, December.

Table 2-2

Detected Constituents - Subsurface Soil
CH2M Hill Range 23A Site Investigation Report
Fort McClellan, Calhoun County, Alabama

Sample Identification	Lab Report #	Sample Type	SVOCs		Cations						General Chemistry
			Methylene Chloride (µg/kg)	bis(2-ethylhexyl)phthalate (µg/kg)	Arsenic (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	
Wall of Flame Training Area											
1B	MD914	Subsurface Soil				12.2	6.6	11.4	8.5	298.0	7.3
1C	MD914	Subsurface Soil			4.4	14.2	5.9	10.0	27.2	35.3	3.8
2B	MD914	Subsurface Soil	31	740	5.6	17.4	6.4	10.2	9.0	74.1	200
2C	MD914	Subsurface Soil	18			15.4	7.2	12.0	7.5	52.0	69.2
Non-Directional Training Area											
4B	MD914	Subsurface Soil		950	5.8	17.1	6.7	10.4	6.8	30.5	115
4C	MD914	Subsurface Soil			3.3	12.4	7.2	6.6	6.6	26.2	112
5B	MD914	Subsurface Soil				14.9	7.6	12.8	7.7	97.9	44.6
5C	MD914	Subsurface Soil				12.5	8.1	18.0	6.9	84.9	98.4
7B	MD914	Subsurface Soil	15	1500		8.9	11.3	11.0	7.1	22.9	123
7BR	MD914	Reanalyze	16								
7C	MD914	Subsurface Soil				14.0	7.7	9.4	7.0	36.7	102
7CR	MD914	Reanalyze									
8B	MD914	Subsurface Soil				9.3	15.9	13.5	5.2	164.0	41.2
8BR	MD914	Reanalyze	14								
8C	MD914	Subsurface Soil		1200		8.5	8.6	11.9	4.6	19.8	13.5
8CR	MD914	Reanalyze	13								
Directional Training Area											
9B	MD713	Subsurface Soil			6.6	32.1	11.5	6.2	7.7	22.9	4.2
9C	MD713	Subsurface Soil			16.9	22.1	9.2	7.6	7.4	23.8	5.3
10B	MD713	Subsurface Soil			6.8	7.5	5.3	8.3	7.5	27.5	3.0
10BR	MD713	Reanalyze									
10C	MD713	Subsurface Soil			13.6	12.2	8.3	6.5	28.7	25.6	2.2
Hasty Mine Field Training Area											
11B	MD713	Subsurface Soil			12.3	8.8	6.1	16.9	6.8	19.9	54.2
11C	MD713	Subsurface Soil			18.1	13.2	12.5	13.0	10.5	39.7	136
12B	MD713	Subsurface Soil			2.8	5.8	2.7	5.8	6.2	17.3	149
12BR	MD713	Reanalyze									
Equipment Rinse Blank											
Rinse	MD713	Rinsate Blank								0.0415	
Concentrations Detected											
Maximum			31	1500	18.1	32.1	15.9	18	28.7	298.0	200.0
Minimum			13	740	2.8	5.8	2.7	5.8	4.6	17.3	2.2
Average			18	1098	8.7	13.6	8.1	10.6	9.4	58.9	67.6
Background											
From IT Report		Subsurface Soil	NR	NR	18.3	38.3	19.4	38.5	12.9	34.9	
Risk-based Concentration for Groundwater (SSL with DAF=20)											
Subsurface Soil			19	2.9E+6	2.6E-2	4.2E+1	1.1E+4	NR	NR	1.4E+4	

Notes:

IT - IT Corporation.

µg/kg - Micrograms per kilogram.

µg/L - Micrograms per liter.

NR - No data published in reference document.

R - Reanalysis of referenced sample.

SVOC - Semivolatile organic compound.

TPH - Total petroleum hydrocarbon compounds.

Shaded areas - not analyzed.

Blank areas - less than method detection limit.

Risk-based concentrations from Region III, April 2000.

Table reproduced from: CH2M Hill, 2000, *Draft Range 23A Site Investigation Report, U.S. Army Fort McClellan, Alabama, December*

Table 2-3

**Detected Constituents - Surface Water and Storm Water
CH2M Hill Range 23A, Site Investigation Report
Fort McClellan, Calhoun County, Alabama**

Sample Identification	Lab Report #	Sample Type	Cations				General Chemistry						
			Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Zinc (mg/L)	TSS (mg/L)	Total P (mg/L)	TKN (mg/L)	COD (mg/L)	Oil and Grease (mg/L)	Cyanide Distilled (µg/L)	pH (s.u.)
Surface Water Samples													
Water 1	MD713/MD913	Surface Water			0.0048		23.0	0.10	2.30				6.2
Water 2	MD713	Surface Water						0.03					
Outfall		Surface Water					90.0	0.09	1.20				7.2
Storm Water Samples													
970813	ME504	Storm Water	0.010	0.050	0.014	0.07	9.25	0.11	1.6	231	1.8	6.3	7.5
Equipment Rinse Blank													
Rinse	MD713	Rinsate Blank				0.415							
Concentrations Detected													
Minimum			0.010	0.050	0.014	0.070	925	0.110	2.30	231	1.8	6.3	7.5
Maximum			0.010	0.050	0.014	0.070	90	0.03	1.20	231	1.8	6.3	7.2
Average			0.010	0.050	0.014	0.070	346	0.083	1.70	231	1.8	6.3	7.0
Background													
From IT Report		Surface Water	0.0111	0.0127	0.0087	0.0404							
Freshwater Surface Water Screening Values (mg/L)													
Acute Value			0.016	0.009	0.034	0.065	NR	NR	NR	NR	NR	NR	NR
Chronic Value			0.48	0.016	0.005	0.058	NR	NR	NR	NR	NR	NR	NR
<p>Notes:</p> <p>COD - Chemical oxygen demand.</p> <p>IT - IT Corporation.</p> <p>µg/L - Micrograms per liter.</p> <p>mg/L - Milligrams per liter.</p> <p>NR - No data published in reference document.</p> <p>P - Phosphate.</p> <p>s.u. - Standard units.</p> <p>TKN - Total kjeldahl nitrogen.</p> <p>TSS - Total suspended solids.</p> <p>Shaded areas - not analyzed.</p> <p>Blank areas - less than method detection limit.</p> <p>Risk-based concentrations from Region III, April 2000.</p>													
Table reproduced from: CH2M Hill, 2000, <i>Draft Range 23A Site Investigation Report, U.S. Army Fort McClellan, Alabama, December.</i>													

Table 2-4

**Detected Constituents - Sediment
CH2M Hill Range 23A Site Investigation Report
Fort McClellan, Calhoun County, Alabama**

Sample Identification	Lab Report #	Sample Type	SVOCs	Cations							General Chemistry
				bis(2-ethylhexyl)phthalate (µg/kg)	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	
Surface Water Samples											
Sediment 1	MD713	Sediment	2000	7.8	0.69	12.3	21.3	13.1	8.3	35.4	180
Sediment 2	MD713	Sediment	1200	8.8		15.8	14.9	11.0	10.0	39.9	191
Equipment Rinse Blank											
Rinse	MD713	Rinsate Blank								0.0415	
Concentrations Detected											
Minimum			2000	8.8	0.69	15.8	21.3	13.1	10.0	39.90	191
Maximum			1200	7.8	0.69	12.3	14.9	11.0	8.3	35.40	180
Average			1600	8.3	0.69	14.1	18.1	12.1	9.2	37.70	186
Background											
From IT Report		Sediment	NR	11.3	0.43	31.2	17.1	37.8	13	52.7	
Risk-based Screening Values (ug/kg for SVOCs, mg/kg for cations)											
Screening Value			182	7.24	1	52.3	18.7	30.2	15.9	124	NR
<p>Notes:</p> <p>IT - IT Corporation.</p> <p>µg/kg - Micrograms per kilogram.</p> <p>mg/kg - Milligrams per liter.</p> <p>NR - No data published in reference document.</p> <p>TPH - Total petroleum hydrocarbon compounds.</p> <p>SVOC - Semivolatile organic compound.</p> <p>Shaded areas - not analyzed.</p> <p>Blank areas - less than method detection limit.</p> <p>Risk-based concentrations from Region III, April 2000.</p>											
Table reproduced from: CH2M Hill, 2000, <i>Draft Range 23A Site Investigation Report, U.S. Army Fort McClellan, Alabama, December</i> .											

Table 2-5

Detected Constituents - Groundwater
 CH2M Hill Range 23A Site Investigation Report
 Fort McClellan, Calhoun County, Alabama

Sample Identification	Lab Report #	Sample Type	VOCs					Explosives	Cations																
			Bromodichloromethane (µg/L)	Chloroform (µg/L)	Dibromochloromethane (µg/L)	Methyl Chloride (µg/L)	Toluene (µg/L)		1,3-Dinitrobenzene (µg/L)	Aluminum (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Calcium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Magnesium (µg/L)	Manganese (µg/L)	Potassium (µg/L)	Sodium (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	
Groundwater Samples																									
GW1-A	D0126	Groundwater						14	89.0		10.9					139.0		43.2							
GW1-S	D0126	Split							187.0		11.2				330.0	1.3	48.2			905.0		0.6			
GW2-A	D0126	Groundwater						15	3420.0	4.1	30.0	1660.0			4840.0	9.1	1050.0	217.0	1430.0	2970.0				21.4	
GW2-D	D0126	Duplicate							5700.0	7.1	37.0	1730.0		14.1	7790.0	11.7	1280.0	256.0	1670.0	3400.0			13.5	41.2	
GW3-A	D0126	Groundwater				0.20		2	4030.0	2.4	24.1	629.0	15.9	12.2	9840.0	9.2	680.0	270.0	2040.0	2950.0			12.0	48.6	
GW4-A	D0126	Groundwater	2.00	10.00	0.30		0.10		1410.0			552.0			1710.0	3.4	429.0	121.0	1010.0	848.0					
Equipment Rinse Blank																									
Method Blank	D0126	Method Blank	2.00	11.00	0.40																				
Concentrations Detected																									
Maximum			2.00	10.00	0.30	0.20	0.10	15.00	5700.00	7.10	37.00	1730.00	15.90	14.10	9840.00	11.70	1280.00	270.00	2040.00	3400.00	0.60		13.50	48.60	
Minimum			2.00	10.00	0.30	0.20	0.10	2.00	89.00	2.40	10.90	552.00	15.90	12.20	139.00	1.30	429.00	43.20	1010.00	848.00	0.60		12.00	21.40	
Average			2.00	10.00	0.30	0.20	0.10	10.33	2472.67	4.53	22.64	1142.75	15.90	13.15	4108.17	6.94	859.75	159.23	1537.50	2215.60	0.60		12.75	37.07	
Background																									
From IT Report		Groundwater	NR	NR	NR	NR	NR	NR	2340	17.8	127	56500	23.4	25.5	7040	8.00	21300	581	7200	14800	1.46		17	220	
Region III Tap Water Values for Groundwater (µg/L)																									
			0.17	0.15	0.13	4.100	750		3.70	37000	0.045	2600	NR	2200	1500	11000	15	NR	730	NR	NR	2.6	260	11000	
Notes: IT - IT Corporation. µg/L - Micrograms per liter. NR - No data published in reference document. VOC - Volatile organic compound. Shaded areas - not analyzed. Blank areas - less than method detection limit. Risk-based concentrations from Region III, April 2000.																									
Table reproduced from: CH2M Hill, 2000, <i>Draft Range 23A Site Investigation Report, U.S. Army Fort McClellan, Alabama, December.</i>																									

3.0 Site-Specific Data Quality Objectives

3.1 Overview

The data quality objective (DQO) process is followed to establish data requirements. This process ensures that the proper quantity and quality of data are generated to support the decision-making process associated with the action selection for Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X. This section incorporates the components of the DQO process described in the publication EPA 540-R-93-071 *Data Quality Objectives Process for Superfund* (EPA, 1993). The DQO process as applied to Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X is described in more detail in Section 4.3 of the WP. Table 3-1 provides a summary of the factors used to determine the appropriate quantity of samples, and the procedures necessary to meet the objectives of the SI and establish a basis for any future action at these sites.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Chapter 4.0 in this SFSP and Table 6-1 in the QAP. Data will be reported in accordance with definitive data requirements of Chapter 2 of the USACE Engineering Manual 200-1-6, *Chemical Quality Assurance For Hazardous, Toxic And Radioactive Waste (HTRW) Projects*, (USACE, 1997) and evaluated by the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported by the laboratory via hard copy data packages using Contract Laboratory Program-like forms, along with electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

3.2 Data Users and Available Data

The available information summary, presented in Table 3-1, related to the SI at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X have been used to formulate a site-specific conceptual model. This conceptual model was developed to support the development of this SFSP, which is necessary to meet the objectives of these activities and to establish a basis for future action at the sites. The data users for the data and information generated during field activities are primarily EPA, USACE, ADEM, FTMC, and the USACE supporting contractors. This SFSP, along with the necessary companion documents, has been designed to provide the regulatory agencies with sufficient detail to reach a determination as to the adequacy of the scope of work. The program has also been designed to provide the level of defensible data and information required to confirm or rule out the existence of residual chemical contamination in site media.

Table 3-1

**Summary of Data Quality Objectives
Site Investigation
Range 23A, Multipurpose Range, Parcels 109(7)/152Q-X
Fort McClellan, Calhoun County, Alabama**

Potential Data Users	Available Data	Conceptual Site Model	Media of Concern	Data Uses and Objectives	Data Types	Analytical Level	Data Quantity						
EPA, ADEM USACE, DOD FTMC, IT Corporation, other contractors, and possible future land users	Previous Site Investigations by SAIC presented in the CH2M Hill 2000 <i>Draft Range 23A Site Investigation Report</i>	<u>Contaminant Source</u> Range 23A, Multipurpose Range, (munitions, explosives, ordnance, FFE) <u>Migration Pathways</u> Infiltration to subsurface soil, infiltration and leaching to groundwater, biotransfer to venison, dust emissions and volatilization to ambient air, groundwater discharge to surface water, and runoff and erosion to surface water and sediment <u>Potential Receptors</u> Recreational site user (current and future), resident (future) and National Guardsperson (to be developed) <u>PSSCs</u> metals, nitroexplosives, fuel products	<u>Surface soil</u>	SI to confirm the presence or absence of contamination in the site media Definitive quality data for future decision- making	<u>Surface soil</u> TAL Metals, Nitroaromatic and Nitramine Explosives, TCL VOCs, and TCL SVOCs,	Definitive data with definitive data package deliverables as required by USACE EM 200-1-6	11 direct-push surface soil samples + QC						
			<u>Subsurface Soil</u>		<u>Subsurface Soil</u> TAL Metals, Nitroaromatic and Nitramine Explosives, TCL VOCs, and TCL SVOCs,			Definitive data with definitive data package deliverables as required by USACE EM 200-1-6	11 direct-push subsurface soil samples + QC				
			<u>Groundwater</u>		<u>Groundwater</u> TAL Metals, Nitroaromatic and Nitramine Explosives, TCL VOCs, and TCL SVOCs,					Definitive data with definitive data package deliverables as required by USACE EM 200-1-6	4 groundwater samples + QC		
			<u>Surface Water</u>		<u>Surface Water</u> TAL Metals, Nitroaromatic and Nitramine Explosives, TCL VOCs, and TCL SVOCs,							Definitive data with definitive data package deliverables as required by USACE EM 200-1-6	6 surface water samples + QC
			<u>Sediment</u>		<u>Sediment</u> TAL Metals, Nitroaromatic and Nitramine Explosives, TCL VOCs, and TCL SVOCs,								

ADEM - Alabama Department of Environmental Management.
CESAS - Corps of Engineers South Atlantic Savannah.
DOD - U.S. Department of Defense.
EPA - U.S. Environmental Protection Agency.
FFE - Flame Field Expedient
FTMC - Fort McClellan.

PSSC - Potential Site-Specific Chemical
QC - Quality control.
SI - Site investigation.
TAL - Target analyte list.
TOC - Total organic carbon.
USACE - U.S. Army Corps of Engineers.

3.3 Conceptual Site Exposure Model

The conceptual site exposure model (CSEM) provides the basis for identifying and evaluating potential risks and hazards to human health in the risk assessment. The CSEM includes receptors and potential exposure pathways appropriate to all plausible scenarios. The CSEM facilitates a consistent and comprehensive evaluation of risk to human health through graphically presenting all possible exposure pathways, including sources, release and transport pathways, and exposure routes. In addition, the CSEM helps to ensure that potential pathways are not overlooked. The elements of a complete exposure pathway and CSEM are:

- Source (i.e., contaminated environmental) media
- Contaminant release mechanisms
- Contaminant transport pathways
- Receptors
- Exposure pathways.

Contaminant release mechanisms and transport pathways are not relevant for direct receptor contact scenarios with a contaminated source medium.

Primary contaminant releases were probably limited to leaks and spills that entered surface soil. Potential contaminant transport pathways include infiltration and leaching to subsurface soil and groundwater, dust emissions and volatilization to ambient air, surface water runoff, and erosion to surface water and sediment, and biotransfer to deer through browsing.

Training activity has temporarily been suspended. Access is restricted because Pelham Range is an active range, however, gates are not always controlled. The site is barren with few trees and little vegetation cover; there are areas of erosion over most of the site. Because trespassers may access the site to hunt, a recreational site user will be evaluated for the current land-use scenario. There is not sufficient surface water to support fish habitat for fish consumption. The following are additional potential receptors considered but not included under current land-use scenarios.

- **Groundskeeper.** The site is not currently maintained by a groundskeeper.
- **Construction Worker.** The site is unused and no development or construction is occurring or scheduled.
- **Resident.** The site is not currently used for residential purposes.
- **National Guardsperson.** A risk-based scenario for exposure to National Guard troops on Pelham Range will be developed. Analytical data collected to complete

this SI will be compared to the SSSLs developed for this new scenario to determine risk to current site users.

Future land use in this area is for an active range for training to be used by the Army National Guard. Plausible future land-use receptor scenarios addressed in the CSEM include:

- **Resident.** Although the site is not planned for residential use, the residential scenario is considered in order to provide information for the project manager and regulators.
- **Recreational Site User.** Although the site is not expected to be utilized by the recreational site user, his exposure to sediment and surface water will be evaluated. Deer hunting is a possibility near this area. Therefore, venison consumption is also a potential exposure pathway.
- **National Guardsperson.** A risk-based scenario for exposure to National Guard troops on Pelham Range will be developed. Analytical data collected to complete this SI will be compared to the SSSLs developed for this new scenario to determine risk to future site users.

A summary of relevant contaminant release and transport mechanisms, source and exposure media, and receptors and exposure pathways for the sites is provided in Table 3-1 and Figure 3-1.

3.4 Decision-Making Process, Data Uses, and Needs

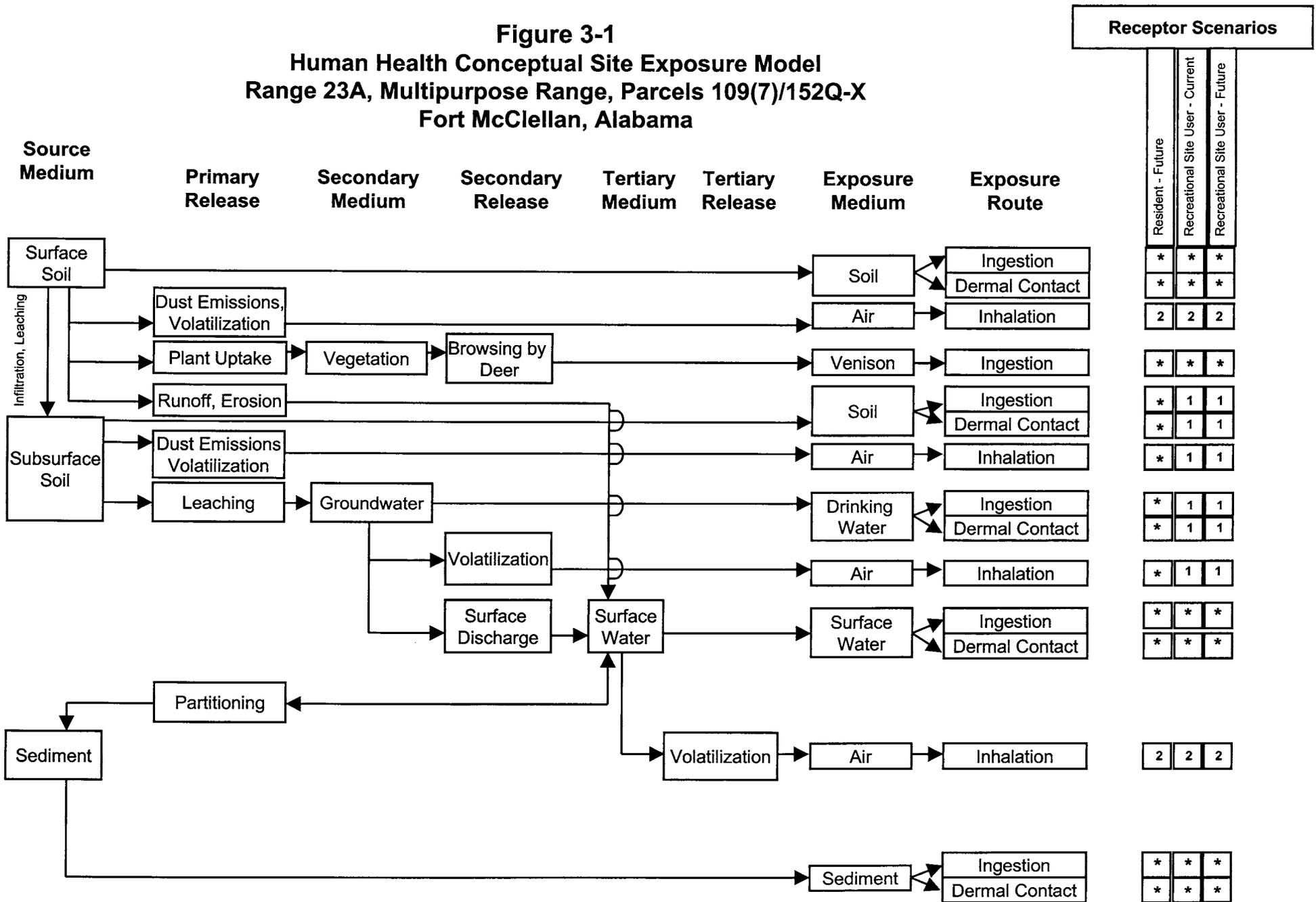
The decision-making process consists of a seven-step process that is presented in detail in Section 4.3 of the WP and will be followed during the SI at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X. Data uses and needs are summarized in Table 3-1.

3.4.1 Risk Evaluation

Confirmation of contamination at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X will be based on comparing detected site chemicals of potential concern to site-specific screening levels developed in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). EPA definitive data will be used to determine whether or not PSSCs are detected in site media. Definitive data will be adequate for confirming the presence of site contamination and for supporting a feasibility study and risk assessment.

Assessment of potential ecological risk associated with sites or parcels (e.g., surface water and sediment sampling, specific ecological assessment methods, etc.) will be addressed in accordance with the procedures in the WP.

Figure 3-1
Human Health Conceptual Site Exposure Model
Range 23A, Multipurpose Range, Parcels 109(7)/152Q-X
Fort McClellan, Alabama



* = Complete exposure pathway evaluated in the streamlined risk assessment.
 1 = Incomplete exposure pathway.
 2 = Although theoretically complete, this pathway is judged to be insignificant and is not evaluated in the streamlined risk assessment.

3.4.2 Data Types and Quality

Surface soil, subsurface soil, surface water, groundwater and sediment samples will be collected and analyzed to meet the objectives of the SI at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X. Quality assurance/quality control (QA/QC) samples will be collected for all sample types as described in Chapter 4.0 of this SFSP. Samples will be analyzed by EPA-approved SW-846 methods update III, where available; comply with EPA definitive data requirements; and be reported using hard copy data packages. In addition to meeting the quality needs of this SI, data analyzed at this level of quality are appropriate for all phases of site characterization, remedial investigation, and risk assessment.

3.4.3 Precision, Accuracy, and Completeness

Laboratory requirements of precision, accuracy, and completeness for this SI are provided in Section 9.0 of the QAP.

4.0 Field Activities

4.1 UXO Survey Requirements and Utility Clearances

Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X, is located on Pelham Range, which is an active range. Therefore, IT will conduct UXO avoidance activities, including surface sweeps and downhole surveys of soil borings. The site-specific UXO safety plan provides technical guidance for ordnance and explosives avoidance and construction activities for sample collection activities at Range 23A. The site-specific UXO safety plan attachment has been written in conjunction with Appendix E of the SAP (IT, 2000b).

4.1.1 Surface UXO Survey

A UXO sweep will be conducted over areas that will be included in the sampling and surveying activities to identify UXO on or near the surface that may present a hazard to on-site workers during field activities. Low-sensitivity magnetometers will be used to locate surface and shallow-buried metal objects. UXO located on the surface will be identified and conspicuously marked for each avoidance. Subsurface metallic anomalies will not be disturbed, and will also be marked for easy avoidance. UXO personnel requirements, procedures, and detailed descriptions of the geophysical equipment to be used are provided in the site-specific UXO safety plan and Chapter 4.0 and Appendix E of the approved SAP (IT, 2000a).

4.1.2 Downhole UXO Survey

During the soil boring and downhole sampling, downhole UXO surveys will be performed to determine if buried metallic objects are present. UXO monitoring, as described in Chapter 4.0 of the SAP (IT, 2000a), will continue until undisturbed soils are encountered or the borehole has been advanced to 12 feet below ground surface, whichever is reached first.

4.1.3 Utility Clearances

After the UXO surface survey has cleared the area to be sampled and prior to performing any intrusive sampling, a utility clearance will be performed at locations where soil and groundwater samples will be collected, using the procedure outlined in Section 4.2.6 of the SAP (IT, 2000a). The site manager will mark the proposed locations with stakes, coordinate with the local utility companies to clear the proposed locations for utilities, and obtain digging permits. Once the locations are approved (for both UXO and utility avoidance) for intrusive sampling, the stakes will be labeled as cleared.

4.2 Environmental Sampling

The environmental sampling program at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X includes the collection of surface soil, subsurface soil, surface water, groundwater, and sediment samples for chemical analyses. These samples will be collected and analyzed to provide data for characterizing the sites to determine the environmental condition of the sites and any further action to be conducted at the sites. Additionally, samples will be collected from environmental media in locations that will assist in the assessment of potential ecological impacts resulting from activities at the sites.

4.2.1 Surface Soil Sampling

Surface soil samples will be collected from 11 locations at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X.

4.2.1.1 Sample Locations and Rationale

The surface soil sampling rationale is listed in Table 4-1. Proposed sampling locations are shown in Figure 4-1. Surface soil sample designations and required QA/QC sample requirements are summarized in Table 4-2. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field conditions.

4.2.1.2 Sample Collection

Surface soil samples will be collected from the upper 1 foot of soil by direct-push methodology as specified in Section 4.7.1.1 of the SAP (IT, 2000a). Collected soil samples will be screened using a photoionization detector (PID) in accordance with Section 4.15 of the SAP. Surface soil samples will be screened for information purposes only. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1, of the QAP. Sample documentation and chain-of-custody (COC) will be recorded as specified in Section 4.13 of the SAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

4.2.2 Subsurface Soil Sampling

Subsurface soil samples will be collected from 11 borings installed at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X.

4.2.2.1 Sample Locations and Rationale

Subsurface soil samples will be collected from the soil borings proposed on Figure 4-1. The subsurface soil sampling rationale is listed in Table 4-1. Subsurface soil samples to be collected

Table 4-1

**Sampling Locations and Rationale
Range 23A, Multipurpose Range, Parcels 109(7)/152Q-X
Fort McClellan, Calhoun County, Alabama**

(Page 1 of 2)

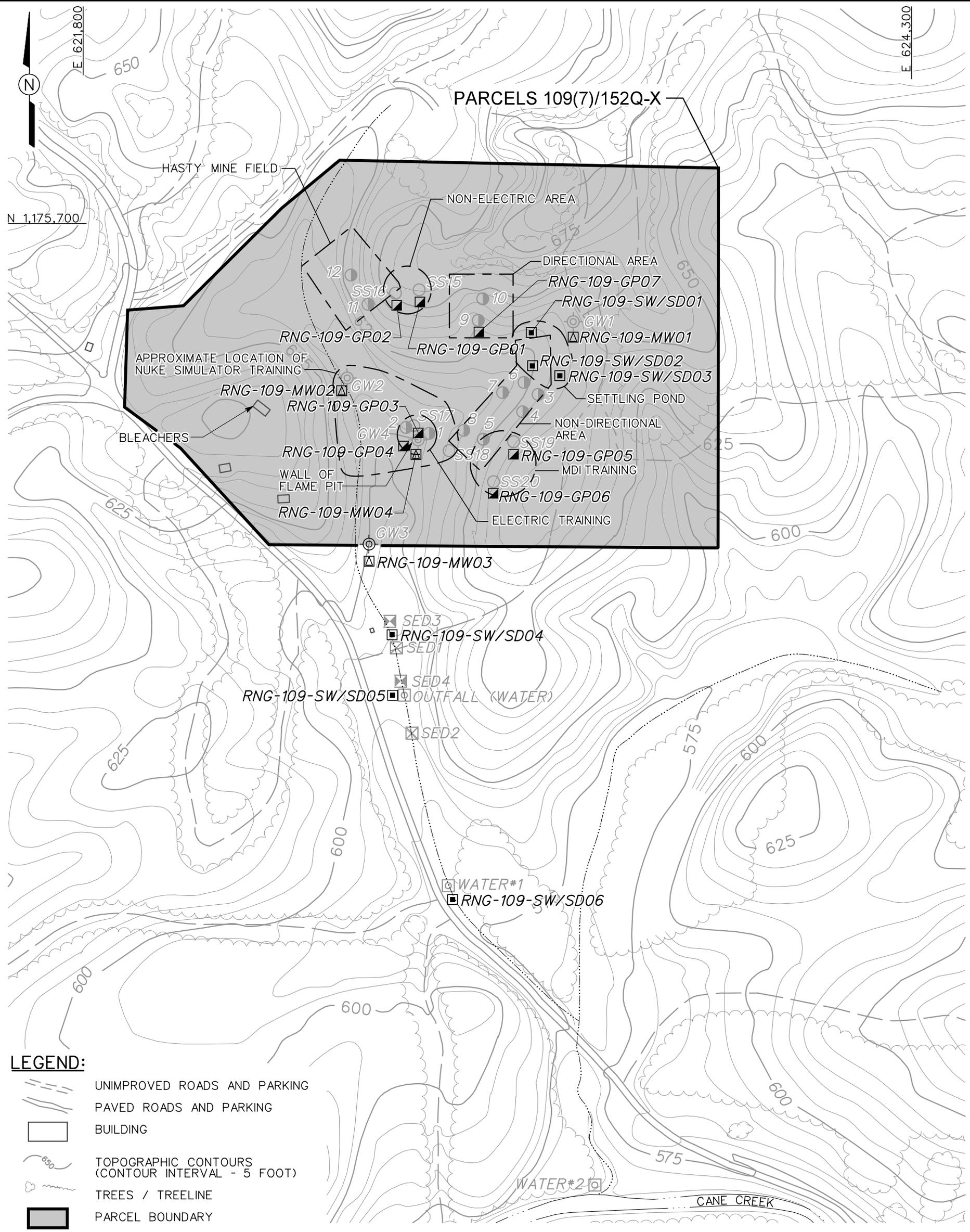
Sample Location	Sample Media	Sample Location Rationale
RNG-109-GP01	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil to be placed in the Non-Electric Training Area, near its eastern boundary, downgradient of the surveyed hand auger location SS15. Sample data will indicate if contaminant releases into the environment have occurred from past training activities in the area. Estimated boring depth is 12 feet. 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.
RNG-109-GP02	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil to be placed in the Non-Electric training area, near its western boundary, downgradient of the surveyed hand auger location SS16. Sample data will indicate if contaminant releases into the environment have occurred from past training activities in the area. Estimated boring depth is 12 feet. 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.
RNG-109-GP03	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil to be placed in the Electric Training Area, near its northern boundary, downgradient of the surveyed hand auger location SS17. Sample data will indicate if contaminant releases into the environment have occurred from past training activities in the area. Estimated boring depth is 12 feet. 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.
RNG-109-GP04	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil to be placed just southeast of the Electric Training Area, downgradient of the surveyed hand auger location SS18. Sample data will indicate if contaminant releases into the environment have occurred from past training activities in the area. Estimated boring depth is 12 feet. 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.
RNG-109-GP05	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil to be placed in the northern portion of the MDI Training Area downgradient of the surveyed hand auger location SS19. Sample data will indicate if contaminant releases into the environment have occurred from past training activities in the area. Estimated boring depth is 12 feet. 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.
RNG-109-GP06	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil to be placed in the MDI Training Area, near its southern boundary, downgradient of the surveyed hand auger location SS20. Sample data will indicate if contaminant releases into the environment have occurred from past training activities in the area. Estimated boring depth is 12 feet. 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.
RNG-109-GP07	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil to be placed downgradient and in close proximity to soil sample location 9. Sample data will indicate if contaminants have been released into the environment and also help define the extent of toluene and ethylbenzene detected at location 9. Estimated boring depth is 12 feet. 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.
RNG-109-MW01	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater to be placed at location of temporary monitoring well GW1. Sample data will indicate if contaminant releases into the environment have occurred from past training activities in the area. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. It is estimated that the monitoring well will be installed at approximately 40.0 feet below ground surface. The depth may be increased depending on where adequate groundwater is encountered.
RNG-109-MW02	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater to be placed near the northwest portion of the Nuke Simulator Training Area at location of temporary monitoring well GW2. Sample data will indicate if contaminant releases into the environment have occurred from past training activities in the area. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. It is estimated that the monitoring well will be installed approximately 14.0 feet below ground surface to intercept shallow perched groundwater. The depth may be increased depending on where adequate groundwater is encountered.
RNG-109-MW03	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater to be placed at location of temporary monitoring well GW3. Sample data will indicate if contaminant releases into the environment have occurred from past training activities in the area. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. It is estimated that the monitoring well will be installed approximately 34.0 feet below ground surface. The depth may be increased depending on where adequate groundwater is encountered.
RNG-109-MW04	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater to be placed near the southern portion of the Electric Training Area at location of temporary monitoring well GW4. Sample data will indicate if contaminant releases into the environment have occurred from past training activities in the area. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. It is estimated that the monitoring well will be installed approximately 50.0 feet below ground surface. The depth may be increased depending on where adequate groundwater is encountered.
RNG-109-SW/SD01	Surface water and sediment	Surface water and sediment sample to be taken from the settling pond near the directional and non-directional training areas. The settling pond receives storm water run-off from the directional and non-directional training areas. Sample data will indicate if contaminant releases into the environment have occurred from the storm water run-off. Sample data will also be used to assess potential impacts to aquatic and terrestrial biota that may utilize the site for food and/or habitat purposes.
RNG-109-SW/SD02	Surface water and sediment	Surface water and sediment sample to be taken from the settling pond near the directional and non-directional training areas. The settling pond receives storm water run-off from the directional and non-directional training areas. Sample data will indicate if contaminant releases into the environment have occurred from the storm water run-off. Sample data will also be used to assess potential impacts to aquatic and terrestrial biota that may utilize the site for food and/or habitat purposes.
RNG-109-SW/SD03	Surface water and sediment	Surface water and sediment sample to be taken from the settling pond near the directional and non-directional training areas. The settling pond receives storm water run-off from the directional and non-directional training areas. Sample data will indicate if contaminant releases into the environment have occurred from the storm water run-off. Sample data will also be used to assess potential impacts to aquatic and terrestrial biota that may utilize the site for food and/or habitat purposes.

Table 4-1

**Sampling Locations and Rationale
Range 23A, Multipurpose Range, Parcels 109(7)/152Q-X
Fort McClellan, Calhoun County, Alabama**

(Page 2 of 2)

Sample Location	Sample Media	Sample Location Rationale
RNG-109-SW/SD04	Surface water and sediment	Surface water and sediment sample to be taken downgradient of the surveyed sediment sample location SED3. SED3 was taken along discharge to unnamed ditch leading to Cane Creek. The discharge emanates from and crosses the western edge of the detonation field. Sample data will indicate if contaminant releases into the environment have occurred from run-off in the area of Parcels 109(7) and 152 Q-X. Sample data will also be used to assess potential impacts to aquatic and terrestrial biota that may utilize the site for food and/or habitat purposes.
RNG-109-SW/SD05	Surface water and sediment	Surface water and sediment sample to be taken downgradient of the surveyed sediment sample location SED4. SED4 was taken along discharge to unnamed ditch leading to Cane Creek. The discharge emanates from and crosses the western edge of the detonation field. Sample data will indicate if contaminant releases into the environment have occurred from run-off in the area of Parcels 109(7) and 152 Q-X. Sample data will also be used to assess potential impacts to aquatic and terrestrial biota that may utilize the site for food and/or habitat purposes.
RNG-109-SW/SD06	Surface water and sediment	Surface water and sediment sample to be taken downgradient of the previous surface water sample location water #1. Sample data will indicate if contaminant releases into the environment have occurred from run-off in the area of Parcels 109(7)/152Q-X. Sample data will also be used to assess potential impacts to aquatic and terrestrial biota that may utilize the site for food and/or habitat purposes.



LEGEND:

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- TEMPORARY MONITORING WELL (ABANDONED)
- SEDIMENT SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION (APPROXIMATED)
- SOIL SAMPLE LOCATION
- SOIL SAMPLE LOCATION (APPROXIMATED)
- SURFACE WATER SAMPLE LOCATION (APPROXIMATED)
- PROPOSED GROUNDWATER, SURFACE, AND SUBSURFACE SOIL SAMPLE LOCATION
- PROPOSED SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- PROPOSED SURFACE WATER/SEDIMENT SAMPLE LOCATION

FIGURE 4-1
PROPOSED SAMPLE LOCATION MAP
RANGE 23A
MULTIPLE PURPOSE RANGE
PARCELS 109(7)/152Q-X

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

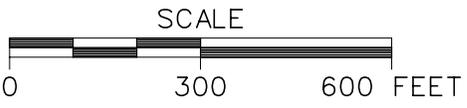


Table 4-2

**Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Range 23A, Multipurpose Range, Parcels 109(7)/152Q-X
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
RNG-109-GP01	RNG-109-GP01-SS-NH0001-REG	0-1			RNG-109-GP01-SS-NH0001-MS/MSD	VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
	RNG-109-GP01-DS-NH0002-REG	a				
RNG-109-GP02	RNG-109-GP02-SS-NH0003-REG	0-1				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
	RNG-109-GP02-DS-NH0004-REG	a				
RNG-109-GP03	RNG-109-GP03-SS-NH0005-REG	0-1				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
	RNG-109-GP03-DS-NH0006-REG	a				
RNG-109-GP04	RNG-109-GP04-SS-NH0007-REG	0-1			RNG-109-GP04-DS-NH0009-FD	VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
	RNG-109-GP04-DS-NH0008-REG	a				
RNG-109-GP05	RNG-109-GP05-SS-NH0010-REG	0-1				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
	RNG-109-GP05-DS-NH0011-REG	a				
RNG-109-GP06	RNG-109-GP06-SS-NH0012-REG	0-1				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
	RNG-109-GP06-DS-NH0013-REG	a				
RNG-109-GP07	RNG-109-GP07-SS-NH0014-REG	0-1				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
	RNG-109-GP07-DS-NH0015-REG	a				
RNG-109-MW01	RNG-109-MW01-SS-NH0016-REG	0-1				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
	RNG-109-MW01-DS-NH0017-REG	a				
RNG-109-MW02	RNG-109-MW02-SS-NH0018-REG	0-1			RNG-109-MW02-DS-NH0020-FD	VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
	RNG-109-MW02-DS-NH0019-REG	a				
RNG-109-MW03	RNG-109-MW03-SS-NH0021-REG	0-1				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
	RNG-109-MW03-DS-NH0022-REG	a				
RNG-109-MW04	RNG-109-MW04-SS-NH0023-REG	0-1				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
	RNG-109-MW04-DS-NH0024-REG	a				

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

ft - Foot.

FD - Field duplicate.

FS - Field split.

MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

REG - Field sample.

SVOC - semivolatile organic compound.

VOC - Volatile organic compound.

are listed in Table 4-2. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field observations and utility clearance results.

4.2.2.2 Sample Collection

Subsurface soil samples will be collected from soil borings at a depth greater than 1 foot below ground surface in the unsaturated zone. The soil borings will be advanced and soil samples collected using the direct-push sampling procedures specified in Section 4.7.1.1 of the SAP (IT, 2000a).

Soil samples will be collected continuously for the first 12 feet or until either groundwater or refusal is reached. 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 analyses. The collected subsurface soil samples will be field-screened using a PID in accordance with Section 4.15 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 sampled and submitted to the laboratory for analyses. Subsurface soil samples will be selected for analyses from any depth interval if the on-site geologist suspects PSSCs at the interval. Site conditions such as lithology may also determine the actual sample depth interval submitted for analyses. 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 Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1 of the QAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

4.2.3 Permanent Residuum Monitoring Wells

Four permanent residuum monitoring wells will be installed at Range 23A, Multipurpose Range, Parcels 109(7)/152Q-X. The permanent residuum monitoring well locations are shown on Figure 4-1. The rationale for each monitoring well location is presented in Table 4-1. The monitoring well boreholes will be drilled to the top of bedrock, or until adequate groundwater is encountered to install a well with a 10- to 20-foot screen. Monitoring wells will be installed using a truck- or all terrain vehicle-mounted hollow-stem auger drill rig. The monitoring well casing will consist of new 2-inch inside-diameter, Schedule 40, threaded, flush-joint polyvinyl

chloride pipe. Attached to the bottom of the well casing will be a section of new threaded, flush-joint, 0.010-inch continuous wrap polyvinyl chloride well screen, approximately 10 to 20 feet long. The well will be installed so the well screen straddles the water table.

Soil samples for lithology will be collected continuously every 5 feet to the total depth of the hole during hollow-stem auger drilling to provide a detailed lithologic log. The samples will be collected for lithology using a 24-inch long, 2-inch or larger diameter, carbon steel split-spoon sampler. The soil borings will be logged in accordance with American Standard for Testing and Materials Method D 2488 using the Unified Soil Classification System. The soil samples will be screened in the field using a PID. The monitoring wells will be drilled, installed, and developed as specified in Section 4.8 and Appendix C of the SAP (IT, 2000a). The exact monitoring well locations will be determined in the field by the on-site geologist, based on actual field conditions.

4.2.4 Groundwater Sampling

Groundwater samples will be collected from the four monitoring wells installed at Range 23A, Multipurpose Range, Parcels 109(7)/152Q-X, as presented in Section 4.2.3.

4.2.4.1 Sample Locations and Rationale

Groundwater samples will be collected from the monitoring well locations shown on Figure 4-1. The groundwater sampling rationale is listed in Table 4-1. The groundwater sample designations, depths, and required QA/QC sample quantities are listed in Table 4-3.

4.2.4.2 Sample Collection

Prior to sampling monitoring wells, static water levels will be measured from each of the monitoring wells installed at the site to define the groundwater flow in the residuum aquifer. Water level measurements will be performed as outlined in Section 4.18 of the SAP (IT, 2000a). Groundwater samples will be collected in accordance with the procedures outlined in Section 4.9.1.4 of the SAP. Low-flow groundwater sampling methodology outlined in the August 2000 letter report to USACE (IT, 2000c) may be used as deemed necessary by the IT Site Manager.

Sample documentation and COC will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1 of the QAP (IT, 2000a). The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

Table 4-3

**Groundwater Sample Designations and QA/QC Sample Quantities
Range 23A, Multipurpose Range, Parcels 109(7)/152Q-X
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
RNG-109-MW01	RNG-109-MW01-GW-NH3001-REG	Groundwater	a			RNG-109-MW01-GW-NH3001-MS/MSD	VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
RNG-109-MW02	RNG-109-MW02-GW-NH3002-REG	Groundwater	a				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
RNG-109-MW03	RNG-109-MW03-GW-NH3003-REG	Groundwater	a				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals
RNG-109-MW04	RNG-109-MW04-GW-NH3004-REG	Groundwater	a	RNG-109-MW04-GW-NH3005-FD			VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals

*Sample depth will depend on where sufficient first water is encountered to collect a water sample.

FD - Field duplicate.

FS - Field split.

MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

REG - Field sample.

SVOC - Semivolatile organic compound.

VOC - Volatile organic compound.

4.2.5 Surface Water Sampling

Six surface water samples will be collected at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X.

4.2.5.1 Sample Locations and Rationale

The surface water sampling rationale are listed in Table 4-1. The surface water samples will be collected from the proposed locations on Figure 4-1. The surface water sample designations and required QA/QC sample requirements are listed in Table 4-4. The exact sampling locations will be determined in the field by the ecological sampler, based on drainage pathways and actual field observations.

4.2.5.2 Sample Collection

The surface water samples will be collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP (IT, 2000a). Sample documentation and COC will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1 of the QAP. The samples will be analyzed for the parameters listed in Section 4.4 of this SFSP.

4.2.6 Sediment Sampling

Six sediment samples will be collected at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X. These sediment samples will be collected at the same locations as the surface water samples described in Section 4.2.5.

4.2.6.1 Sample Locations and Rationale

The proposed locations for the sediment samples are shown in Figure 4-1. Sediment sampling rationale is presented in Table 4-1. The sediment sample designation and required QA/QC sample requirements are listed in Table 4-4. The actual sediment sample points will be at the discretion of the ecological sampler based on the drainage pathways and actual field observations.

4.2.6.2 Sample Collection

The sediment samples will be collected in accordance with the procedures specified in Section 4.9.1.2 of the SAP. Sample documentation and COC will be recorded as specified in Section 4.13 of the SAP. The sediment samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

Table 4-4

**Surface Water and Sediment Sample Designations and QA/QC Sample Quantities
Range 23A, Multipurpose Range, Parcels 109(7)/152Q-X
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
RNG-109-SW/SD01	RNG-109-SW/SD01-SW-NH2001-REG	Surface water	N/A				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals Add TOC and Grain Size for Sediment
	RNG-109-SW/SD01-SD-NH1001-REG	Sediment	0-1	RNG-109-SW/SD01-SD-NH1002-FD			
RNG-109-SW/SD02	RNG-109-SW/SD02-SW-NH2002-REG	Surface water	N/A				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals Add TOC and Grain Size for Sediment
	RNG-109-SW/SD02-SD-NH1003-REG	Sediment	0-1				
RNG-109-SW/SD03	RNG-109-SW/SD03-SW-NH2003-REG	Surface water	N/A				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals Add TOC and Grain Size for Sediment
	RNG-109-SW/SD03-SD-NH1004-REG	Sediment	0-1			RNG-109-SW/SD03-SD-NH1004-MS/MSD	
RNG-109-SW/SD04	RNG-109-SW/SD04-SW-NH2004-REG	Surface water	N/A				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals Add TOC and Grain Size for Sediment
	RNG-109-SW/SD04-SD-NH1005-REG	Sediment	0-1				
RNG-109-SW/SD05	RNG-109-SW/SD05-SW-NH2005-REG	Surface water	N/A				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals Add TOC and Grain Size for Sediment
	RNG-109-SW/SD05-SD-NH1006-REG	Sediment	0-1				
RNG-109-SW/SD06	RNG-109-SW/SD06-SW-NH2006-REG	Surface water	N/A				VOCs, SVOCs, Nitroaromatic/Nitramine Explosives, and Metals Add TOC and Grain Size for Sediment
	RNG-109-SW/SD06-SD-NH1007-REG	Sediment	0-1				

FD - Field duplicate.

FS - Field split.

MS/MSD - Matrix spike/matrix spike duplicate.

N/A - Not applicable.

QA/QC - Quality assurance/quality control.

REG - Field sample.

SVOC - Semivolatile organic compound.

VOC - Volatile organic compound.

4.3 Decontamination Requirements

Decontamination will be performed on sampling and nonsampling equipment to prevent cross-contamination between sampling locations. Decontamination of sampling equipment will be performed in accordance with the requirements presented in Section 4.10.1.1 of the SAP (IT, 2000a). Decontamination of nonsampling equipment will be performed in accordance with the requirements presented in Section 4.10.1.2 of the SAP.

4.4 Surveying of Sample Locations

Sampling locations will be marked with pin flags, stakes, and/or flagging and will be surveyed using either global positioning system (GPS) or conventional civil survey techniques, as necessary to obtain the required level of accuracy. Horizontal coordinates will be referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum, 1983. Elevations will be referenced to the North American Vertical Datum of 1988.

Horizontal coordinates for soil, sediment, and surface water locations will be recorded using a GPS to provide accuracy within 1 meter. Because of the need to use permanent monitoring wells to determine water levels, a higher level of accuracy is required in surveying the wells. Monitoring wells will be surveyed to an accuracy of 0.1 foot for horizontal coordinates and 0.01 foot for elevations, using survey-grade GPS techniques and/or conventional civil survey techniques, as required. Procedures to be used for GPS surveying are described in Section 4.3 of the SAP. Conventional land survey requirements are presented in Section 4.19 of the SAP.

4.5 Analytical Program

Samples collected at locations specified in this chapter of this SFSP will be analyzed for the specific suites of chemicals and elements based on the history of site usage, as well as EPA, ADEM, FTMC, and USACE requirements. Target analyses for samples collected from Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X, consist of the following list of analytical suites:

- Target Compound List Volatile Organic Compounds – Method 8260B
- Target Compound List Semivolatile Organic Compounds – Method 8270C
- Target Analyte List Metals – Method 6010B/7000
- Nitroaromatic/Nitramine Explosives – Method 8330

In addition, the sediment samples will be analyzed for the following list of parameters:

- Total Organic Carbon – Method 9060
- Grain Size – ASTM D-421/D-422.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Chapter 4.0 in this SFSP and Table 6-1 in the QAP. Data will be reported in accordance with definitive data requirements of Chapter 2 of the USACE Engineering Manual 200-1-6, *Chemical Quality Assurance For Hazardous, Toxic And Radioactive Waste (HTRW) Projects*, (USACE, 1997) and evaluated by the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported by the laboratory via hard copy data packages using Contract Laboratory Program-like forms, along with electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

4.6 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping will follow the procedures specified in Section 4.13.2 of the SAP (IT, 2000a). Completed analysis request/COC records will be secured and included with each shipment of coolers to:

Attn: Elizabeth McIntyre
EMAX Laboratories, Inc.
1835 205th Street
Torrance, California 90501
Telephone: (424) 618-8889.

4.7 Investigation-Derived Waste Management

Management and disposal of the investigation-derived wastes (IDW) will follow procedures and requirements as described in Appendix D of the SAP (IT, 2000a). The IDW generated at Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X is expected to include decontamination fluids, drill cuttings, and disposable personal protective equipment. The IDW will be staged at the site while awaiting final disposal.

4.8 Site-Specific Safety and Health

Health and safety requirements for this SI are provided in the SSHP attachment for Range 23A, Multipurpose Range, Parcel 109(7)/152Q-X. The SSHP attachment will be used in conjunction with the installation-wide SHP.

Table 4-5

**Analytical Samples
Range 23A, Multipurpose Range, Parcels 109(7)/152Q-X
Fort McClellan, Calhoun County, Alabama**

Parameters	Analysis Method	Sample Matrix	TAT Needed	Field Samples			QA/QC Samples ^a				EMAX	QA Lab							
				No. of Sample Points	No. of Events	No. of Field Samples	Field Dups (10%)	Splits w/ QA Lab (0%)	MS/MSD (5%)	Trip Blank (1/ship)	Eq. Rinse (1/wk/matrix)	Total No. Analysis	Total No. Analysis						
Range 23A, Multipurpose Range, Parcels 109(7)/152Q-X: 10 water matrix samples (4 groundwater samples and 6 surface water samples); 28 soil matrix samples (11 surface soil samples, 11 subsurface soil samples, and 6 sediment samples)																			
Nitroaromatic/Nitramine Explosives	8330	water	normal	10	1	10	1		1		1	14	0						
TAL Metals	6010B/7000	water	normal	10	1	10	1		1		1	14	0						
TCL SVOCs	8270C	water	normal	10	1	10	1		1		1	14	0						
TCL VOCs	8260B	water	normal	10	1	10	1		1	2	1	16	0						
Nitroaromatic/Nitramine Explosives	8330	soil	normal	28	1	28	3		2		1	36	0						
TAL Metals	6010B/7000	soil	normal	28	1	28	3		2		1	36	0						
TCL SVOCs	8270C	soil	normal	28	1	28	3		2		1	36	0						
TCL VOCs	8260B	soil	normal	28	1	28	3		2		1	36	0						
TOC	9060	sediment	normal	6	1	6						6	0						
Grain Size	D421/D422	sediment	normal	6	1	6						6	0						
Range 23A, Parcels 109(7)/152Q-X Subtotal:				164		16		0		12		2		8		214		0	

^aField 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 in association 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 are anticipated to last more than 1 week. Assumed 20 field samples will be collected per week to estimate number of equipment blanks.

Ship samples to: EMAX Laboratories, Inc.
Attn: Sample Receiving/Elizabeth McIntyre
1835 205th Street
Torrance, CA 90501
Tel: 424-618-8889
Fax: 424-618-0818

ASTM- American Society for Testing and Materials.
Dups - Duplicates.
Eq. Rinse - Equipment rinse blank.
MS/MSD - Matrix spike/matrix spike duplicate.
No. - Number.
QA/QC - Quality assurance/quality control.
SVOC - Semivolatile organic compound.

TAL - Target analyte list.
TAT - Turn around time.
TCL - Target compound list.
TOC - Total organic compound.
VOC - Volatile organic compound.
wk - Week.

5.0 Project Schedule

The project schedule for the SI activities will be provided by the IT project manager to the Base Realignment and Closure Cleanup Team and will be in accordance with the WP.

6.0 References

CH2M Hill, 2000, *Draft Range 23A Site Investigation, US Army, Fort McClellan, Alabama*, December.

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

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

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

IT Corporation (IT), 2000c, Letter to Ellis Pope (USACE) From Jeanne Yacoub (IT), "Groundwater Resampling Results," August 7.

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

U.S. Army Corps of Engineers (USACE), 1997, *Chemical Quality Assurance for Hazardous, Toxic and Radioactive Waste (HTRW) Projects, Engineering Manual 200-1-6*, October 10

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

U.S. Environmental Protection Agency (EPA), 1993, *Data Quality Objectives Process for Superfund, Interim Final Guidance*, EPA 540-R-93-071, September.

ATTACHMENT 1
LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid	BTOC	below top of casing	DDT	dichlorodiphenyltrichloroethane
2,4,5-T	2,4,5-trichlorophenoxyacetic acid	BTV	background threshold value	DEH	Directorate of Engineering and Housing
2,4,5-TP	silvex	BW	biological warfare	DEP	depositional soil
3D	3D International Environmental Group	BZ	breathing zone; 3-quinuclidinyl benzilate	DI	deionized
Abs	skin absorption	C	ceiling limit value	DIMP	di-isopropylmethylphosphonate
Amsl	above mean sea level	Ca	carcinogen	DMMP	dimethylmethylphosphonate
AC	hydrogen cyanide	CAB	chemical warfare agent breakdown products	DOD	U.S. Department of Defense
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded	CAMU	corrective action management unit	DOJ	U.S. Department of Justice
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded	CCAL	continuing calibration	DOT	U.S. Department of Transportation
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded	CCB	continuing calibration blank	DP	direct-push
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded	CD	compact disc	DPDO	Defense Property Disposal Office
ACGIH	American Conference of Governmental Industrial Hygienists	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	DPT	direct-push technology
ADEM	Alabama Department of Environmental Management	CERFA	Community Environmental Response Facilitation Act	DQO	data quality objective
ADPH	Alabama Department of Public Health	CESAS	Corps of Engineers South Atlantic Savannah	DRMO	Defense Reutilization and Marketing Office
AEC	U.S. Army Environmental Center	CG	carbonyl chloride (phosgene)	DRO	diesel range organics
AEL	airborne exposure limit	CFC	chlorofluorocarbon	DS	deep (subsurface) soil
AHA	ammunition holding area	ch	inorganic clays of high plasticity	DS2	Decontamination Solution Number 2
AL	Alabama	CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine	DWEL	drinking water equivalent level
amb.	amber	CK	cyanogen chloride	E&E	Ecology and Environment, Inc.
ANAD	Anniston Army Depot	cl	inorganic clays of low to medium plasticity	EBS	environmental baseline survey
AOC	area of concern	Cl.	chlorinated	EE/CA	engineering evaluation and cost analysis
APT	armor-piercing tracer	CLP	Contract Laboratory Program	Elev.	elevation
ARAR	applicable or relevant and appropriate requirement	CN	chloroacetophenone	EM	electromagnetic
AREE	area requiring environmental evaluation	CNB	chloroacetophenone, benzene, and carbon tetrachloride	EMI	Environmental Management Inc.
ASP	Ammunition Supply Point	CNS	chloroacetophenone, chloropicrin, and chloroform	EM31	Geonics Limited EM31 Terrain Conductivity Meter
ASR	Archives Search Report	Co-60	cobalt-60	EM61	Geonics Limited EM61 High-Resolution Metal Detector
AST	aboveground storage tank	COC	chain of custody; contaminant of concern	EOD	explosive ordnance disposal
ASTM	American Society for Testing and Materials	COE	Corps of Engineers	EODT	explosive ordnance disposal team
ATV	all-terrain vehicle	Con	skin or eye contact	EPA	U.S. Environmental Protection Agency
AWWSB	Anniston Water Works and Sewer Board	COPC	contaminant of potential concern	EPC	exposure point concentration
'B'	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)	COPEC	contaminant of potential environmental concern	EPIC	Environmental Photographic Interpretation Center
BCF	blank correction factor	CRL	certified reporting limit	ER	equipment rinsate
BCT	BRAC Cleanup Team	CRZ	contamination reduction zone	ESE	Environmental Science and Engineering, Inc.
BEHP	bis(2-ethylhexyl)phthalate	Cs-137	cesium-137	ESN	Environmental Services Network, Inc.
BFB	bromofluorobenzene	CS	ortho-chlorobenzylidene-malononitrile	ESV	ecological screening value
BFE	base flood elevation	CSEM	conceptual site exposure model	Exp.	explosives
BG	Bacillus globigii	ctr.	container	E-W	east to west
bgs	below ground surface	CWA	chemical warfare agent	EZ	exclusion zone
BHC	betahexachlorocyclohexane	CWM	chemical warfare material; clear, wide mouth	FAR	Federal Acquisition Regulations
bkg	background	CX	dichloroformoxime	FB	field blank
bls	below land surface	'D'	duplicate; dilution	FD	field duplicate
BOD	biological oxygen demand	DAF	dilution-attenuation factor	FedEx	Federal Express, Inc.
BRAC	Base Realignment and Closure	DANC	decontamination agent, non-corrosive	FEMA	Federal Emergency Management Agency
Braun	Braun Intertec Corporation	°C	degrees Celsius	FFE	field flame expedient
BSC	background screening criterion	°F	degrees Fahrenheit	Fil	filtered
BTAG	Biological Technical Assistance Group	DCE	dichloroethene	Flt	filtered
BTEX	benzene, toluene, ethyl benzene, and xylenes	DDD	dichlorodiphenyldichloroethane	FML	flexible membrane liner
		DDE	dichlorodiphenyldichloroethene	FMP 1300	Former Motor Pool 1300

List of Abbreviations and Acronyms (Continued)

FOMRA	Former Ordnance Motor Repair Area	ICRP	International Commission on Radiological Protection	µg/kg	micrograms per kilogram
Foster Wheeler	Foster Wheeler Environmental Corporation	ICS	interference check sample	µg/L	micrograms per liter
Frtn	fraction	ID	inside diameter	µmhos/cm	micromhos per centimeter
FS	field split; feasibility study	IDL	instrument detection limit	min	minimum
FSP	field sampling plan	IDLH	immediately dangerous to life or health	MINICAMS	miniature continuous air monitoring system
ft	feet	IDM	investigative-derived media	ml	inorganic silts and very fine sands
ft/ft	feet per foot	IDW	investigation-derived waste	mL	milliliter
FTA	Fire Training Area	ILCR	incremental lifetime cancer risk	mm	millimeter
FTMC	Fort McClellan	IMPA	isopropylmethyl phosphonic acid	MM	mounded material
FTRRA	FTMC Reuse & Redevelopment Authority	IMR	Iron Mountain Road	MMBtu/hr	million Btu per hour
g	gram	in.	inch	MOGAS	motor vehicle gasoline
G-856	Geometrics, Inc. G-856 magnetometer	Ing	ingestion	MPA	methyl phosphonic acid
G-858G	Geometrics, Inc. G-858G magnetic gradiometer	Inh	inhalation	MR	molasses residue
gal	gallon	IP	ionization potential	MS	matrix spike
gal/min	gallons per minute	IPS	International Pipe Standard	mS/cm	millisiemens per centimeter
GB	sarin	IRDMIS	Installation Restoration Data Management Information System	MSD	matrix spike duplicate
gc	clay gravels; gravel-sand-clay mixtures	IRP	Installation Restoration Program	MTBE	methyl tertiary butyl ether
GC	gas chromatograph	ISCP	Installation Spill Contingency Plan	msl	mean sea level
GC/MS	gas chromatograph/mass spectrometer	IT	IT Corporation	MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
GCR	geosynthetic clay liner	ITEMS	IT Environmental Management System TM	mV	millivolts
GFAA	graphite furnace atomic absorption	'J'	estimated concentration	MW	monitoring well
GIS	Geographic Information System	JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded	NA	not applicable; not available
gm	silty gravels; gravel-sand-silt mixtures	JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded	NAD	North American Datum
gp	poorly graded gravels; gravel-sand mixtures	JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes	NAD83	North American Datum of 1983
gpm	gallons per minute	JPA	Joint Powers Authority	NAVD88	North American Vertical Datum of 1988
GPR	ground-penetrating radar	K	conductivity	NCP	National Contingency Plan
GPS	global positioning system	L	lewisite; liter	ND	not detected
GS	ground scar	LC ₅₀	lethal concentration for 50 percent of population tested	NE	no evidence; northeast
GSA	General Services Administration; Geologic Survey of Alabama	LD ₅₀	lethal dose for 50 percent of population tested	ne	not evaluated
GSBP	Ground Scar Boiler Plant	l	liter	NFA	No Further Action
GSSI	Geophysical Survey Systems, Inc.	LBP	lead-based paint	ng/L	nanograms per liter
GST	ground stain	LCS	laboratory control sample	NGVD	National Geodetic Vertical Datum
GW	groundwater	LEL	lower explosive limit	NIC	notice of intended change
gw	well-graded gravels; gravel-sand mixtures	LOAEL	lowest-observed-adverse-effects-level	NIOSH	National Institute for Occupational Safety and Health
HA	hand auger	LT	less than the certified reporting limit	NPDES	National Pollutant Discharge Elimination System
HCl	hydrochloric acid	LUC	land-use control	No.	number
HD	distilled mustard	LUCAP	land-use control assurance plan	NOAA	National Oceanic and Atmospheric Administration
HDPE	high-density polyethylene	LUCIP	land-use control implementation plan	NOAEL	no-observed-adverse-effects-level
Herb.	herbicides	max	maximum	NR	not requested; not recorded
HNO ₃	nitric acid	MCL	maximum contaminant level	ns	nanosecond
hr	hour	MDC	maximum detected concentration	N-S	north to south
H&S	health and safety	MDL	method detection limit	NS	not surveyed
HSA	hollow-stem auger	mg/kg	milligrams per kilogram	nT	nanotesla
HTRW	hazardous, toxic, and radioactive waste	mg/L	milligrams per liter	NTU	nephelometric turbidity unit
'I'	out of control, data rejected due to low recovery	mg/m ³	milligrams per cubic meter	nv	not validated
ICAL	initial calibration	mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils	O&G	oil and grease
ICB	initial calibration blank	MHz	megahertz	O&M	operating and maintenance
ICP	inductively-coupled plasma	µg/g	micrograms per gram	OB/OD	open burning/open detonation

List of Abbreviations and Acronyms (Continued)

OD	outside diameter	RfD	reference dose	SU	standard unit
OE	ordnance and explosives	ReB3	Rarden silty clay loams	SVOC	semivolatile organic compound
oh	organic clays of medium to high plasticity	REG	regular field sample	SW	surface water
ol	organic silts and organic silty clays of low plasticity	REL	recommended exposure limit	SW-846	U.S. EPA's <i>Test Methods for Evaluating Solid Waste: Physical/Chemical Methods</i>
OP	organophosphorus	RFA	request for analysis	SWPP	storm water pollution prevention plan
ORP	oxidation-reduction potential	RGO	remedial goal option	SZ	support zone
OSHA	Occupational Safety and Health Administration	RI	remedial investigation	TAL	target analyte list
OWS	oil/water separator	RL	reporting limit	TAT	turn around time
oz	ounce	RPD	relative percent difference	TB	trip blank
PA	preliminary assessment	RRF	relative response factor	TCA	trichloroethane
PAH	polynuclear aromatic hydrocarbon	RSD	relative standard deviation	TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
Parsons	Parsons Engineering Science, Inc.	RTK	real-time kinematic	TCDF	tetrachlorodibenzofurans
Pb	lead	SAD	South Atlantic Division	TCE	trichloroethene
PCB	polychlorinated biphenyl	SAE	Society of Automotive Engineers	TCL	target compound list
PCE	perchloroethene	SAIC	Science Applications International Corporation	TCLP	toxicity characteristic leaching procedure
PCP	pentachlorophenol	SAP	installation-wide sampling and analysis plan	TDGCL	thiodiglycol
PDS	Personnel Decontamination Station	sc	clayey sands; sand-clay mixtures	TDGCLA	thiodiglycol chloroacetic acid
PEL	permissible exposure limit	Sch.	schedule	TERC	Total Environmental Restoration Contract
Pest.	pesticides	SD	sediment	TIC	tentatively identified compound
PETN	pentarey thritol tetranitrate	SDG	sample delivery group	TLV	threshold limit value
PFT	portable flamethrower	SDZ	safe distance zone; surface danger zone	TN	Tennessee
PG	professional geologist	SEMS	Southern Environmental Management & Specialties, Inc.	TNT	trinitrotoluene
PID	photoionization detector	SFSP	site-specific field sampling plan	TOC	top of casing; total organic carbon
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes	SGF	standard grade fuels	TPH	total petroleum hydrocarbons
POL	petroleum, oils, and lubricants	SHP	installation-wide safety and health plan	TRADOC	U.S. Army Training and Doctrine Command
PP	peristaltic pump	SI	site investigation	TRPH	total recoverable petroleum hydrocarbons
ppb	parts per billion	SL	standing liquid	TSCA	Toxic Substances Control Act
PPE	personal protective equipment	SLERA	screening-level ecological risk assessment	TWA	time-weighted average
ppm	parts per million	sm	silty sands; sand-silt mixtures	UCL	upper confidence limit
PPMP	Print Plant Motor Pool	SM	Serratia marcescens	UCR	upper certified range
ppt	parts per thousand	SOP	standard operating procedure	'U'	not detected above reporting limit
PRG	preliminary remediation goal	sp	poorly graded sands; gravelly sands	USACE	U.S. Army Corps of Engineers
PSSC	potential site-specific chemical	SP	submersible pump	USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
pt	peat or other highly organic silts	Sr-90	strontium-90	USAEC	U.S. Army Environmental Center
PVC	polyvinyl chloride	SRA	streamlined human health risk assessment	USAEHA	U.S. Army Environmental Hygiene Agency
QA	quality assurance	Ss	stony rough land, sandstone series	USACMLS	U.S. Army Chemical School
QA/QC	quality assurance/quality control	SS	surface soil	USAMPS	U.S. Army Military Police School
QAP	installation-wide quality assurance plan	SSC	site-specific chemical	USATCES	U.S. Army Technical Center for Explosive Safety
QC	quality control	SSHO	site safety and health officer	USATEU	U.S. Army Technical Escort Unit
QST	QST Environmental, Inc.	SSHP	site-specific safety and health plan	USATHAMA	U.S. Army Toxic and Hazardous Material Agency
qty	quantity	SSL	soil screening level	USCS	Unified Soil Classification System
Qual	qualifier	SSSL	site-specific screening level	USDA	U.S. Department of Agriculture
'R'	rejected data; resample	SSSSL	site-specific soil screening level	USEPA	U.S. Environmental Protection Agency
RAO	removal action objective	STB	supertropical bleach	USGS	U.S. Geological Survey
RBC	risk-based concentration	STC	source term concentrations	UST	underground storage tank
RCRA	Resource Conservation and Recovery Act	STEL	short-term exposure limit	UTL	upper tolerance level
RD	remedial design	STOLS	Surface Towed Ordnance Locator System®	UXO	unexploded ordnance
RDX	cyclonite	Std. units	standard units	VOA	volatile organic analyte

List of Abbreviations and Acronyms (Continued)

VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd ³	cubic yards

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

N/A – Not analyzed

ND – Not detected

Boolean Codes

LT – Less than the certified reporting limit

Flagging Codes

9 – Non-demonstrated/validated method performed for USAEC

B – Analyte found in the method blank or QC blank

C – Analysis was confirmed

D – Duplicate analysis

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

J – Value is estimated

K – Reported results are affected by interfaces or high background

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

Q – Sample interference obscured peak of interest

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

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

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

U – Analysis in unconfirmed

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

Qualifiers

J – The low-spike recovery is low

N – The high-spike recovery is low

R – Data is rejected

List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid	BTV	background threshold value	DEH	Directorate of Engineering and Housing
2,4,5-T	2,4,5-trichlorophenoxyacetic acid	BW	biological warfare	DEP	depositional soil
2,4,5-TP	silvex	BZ	breathing zone; 3-quinuclidinyl benzilate	DI	deionized
3D	3D International Environmental Group	C	ceiling limit value	DIMP	di-isopropylmethylphosphonate
Abs	skin absorption	Ca	carcinogen	DMMP	dimethylmethylphosphonate
Amsl	above mean sea level	CAB	chemical warfare agent breakdown products	DOD	U.S. Department of Defense
AC	hydrogen cyanide	CAMU	corrective action management unit	DOJ	U.S. Department of Justice
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded	CCAL	continuing calibration	DOT	U.S. Department of Transportation
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded	CCB	continuing calibration blank	DP	direct-push
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded	CD	compact disc	DPDO	Defense Property Disposal Office
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	DPT	direct-push technology
ACGIH	American Conference of Governmental Industrial Hygienists	CERFA	Community Environmental Response Facilitation Act	DQO	data quality objective
ADEM	Alabama Department of Environmental Management	CESAS	Corps of Engineers South Atlantic Savannah	DRMO	Defense Reutilization and Marketing Office
AEC	U.S. Army Environmental Center	CG	carbonyl chloride (phosgene)	DRO	diesel range organics
AEL	airborne exposure limit	CFC	chlorofluorocarbon	DS	deep (subsurface) soil
AHA	ammunition holding area	ch	inorganic clays of high plasticity	DS2	Decontamination Solution Number 2
AL	Alabama	CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine	DWEL	drinking water equivalent level
amb.	amber	CK	cyanogen chloride	E&E	Ecology and Environment, Inc.
ANAD	Anniston Army Depot	cl	inorganic clays of low to medium plasticity	EBS	environmental baseline survey
AOC	area of concern	Cl.	chlorinated	EE/CA	engineering evaluation and cost analysis
APT	armor-piercing tracer	CLP	Contract Laboratory Program	Elev.	elevation
ARAR	applicable or relevant and appropriate requirement	CN	chloroacetophenone	EM	electromagnetic
AREE	area requiring environmental evaluation	CNB	chloroacetophenone, benzene, and carbon tetrachloride	EM31	Geonics Limited EM31 Terrain Conductivity Meter
ASP	Ammunition Supply Point	CNS	chloroacetophenone, chloropicrin, and chloroform	EM61	Geonics Limited EM61 High-Resolution Metal Detector
ASR	Archives Search Report	Co-60	cobalt-60	EOD	explosive ordnance disposal
AST	aboveground storage tank	COC	chain of custody; contaminant of concern	EODT	explosive ordnance disposal team
ASTM	American Society for Testing and Materials	COE	Corps of Engineers	EPA	U.S. Environmental Protection Agency
ATV	all-terrain vehicle	Con	skin or eye contact	EPC	exposure point concentration
AWWSB	Anniston Water Works and Sewer Board	COPC	contaminant of potential concern	EPIC	Environmental Photographic Interpretation Center
'B'	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)	COPEC	contaminant of potential environmental concern	ER	equipment rinsate
BCF	blank correction factor	CRL	certified reporting limit	ESE	Environmental Science and Engineering, Inc.
BCT	BRAC Cleanup Team	CRZ	contamination reduction zone	ESN	Environmental Services Network, Inc.
BEHP	bis(2-ethylhexyl)phthalate	Cs-137	cesium-137	ESV	ecological screening value
BFB	bromofluorobenzene	CS	ortho-chlorobenzylidene-malononitrile	Exp.	explosives
BFE	base flood elevation	CSEM	conceptual site exposure model	E-W	east to west
BG	Bacillus globigii	ctr.	container	EZ	exclusion zone
bgs	below ground surface	CWA	chemical warfare agent	FAR	Federal Acquisition Regulations
BHC	betahexachlorocyclohexane	CWM	chemical warfare material; clear, wide mouth	FB	field blank
bkg	background	CX	dichloroformoxime	FD	field duplicate
bls	below land surface	'D'	duplicate; dilution	FedEx	Federal Express, Inc.
BOD	biological oxygen demand	DAF	dilution-attenuation factor	FEMA	Federal Emergency Management Agency
BRAC	Base Realignment and Closure	DANC	decontamination agent, non-corrosive	FFE	field flame expedient
Braun	Braun Intertec Corporation	°C	degrees Celsius	Fil	filtered
BSC	background screening criterion	°F	degrees Fahrenheit	Flt	filtered
BTAG	Biological Technical Assistance Group	DCE	dichloroethene	FML	flexible membrane liner
BTEX	benzene, toluene, ethyl benzene, and xylenes	DDD	dichlorodiphenyldichloroethane	FMP 1300	Former Motor Pool 1300
BTOC	below top of casing	DDE	dichlorodiphenyldichloroethane	FOMRA	Former Ordnance Motor Repair Area
		DDT	dichlorodiphenyltrichloroethane	Foster Wheeler	Foster Wheeler Environmental Corporation

List of Abbreviations and Acronyms (Continued)

Frtn	fraction	ID	inside diameter	MINICAMS	miniature continuous air sampling system
FS	field split; feasibility study	IDL	instrument detection limit	ml	inorganic silts and very fine sands
FSP	field sampling plan	IDLH	immediately dangerous to life or health	mL	milliliter
ft	feet	IDM	investigative-derived media	mm	millimeter
ft/ft	feet per foot	IDW	investigation-derived waste	MM	mounded material
FTA	Fire Training Area	ILCR	incremental lifetime cancer risk	MOGAS	motor vehicle gasoline
FTMC	Fort McClellan	IMPA	isopropylmethyl phosphonic acid	MPA	methyl phosphonic acid
FTRRA	FTMC Reuse & Redevelopment Authority	IMR	Iron Mountain Road	MR	molasses residue
g	gram	in.	inch	MS	matrix spike
G-856	Geometrics, Inc. G-856 magnetometer	Ing	ingestion	mS/cm	millisiemens per centimeter
G-858G	Geometrics, Inc. G-858G magnetic gradiometer	Inh	inhalation	MSD	matrix spike duplicate
gal	gallon	IP	ionization potential	MTBE	methyl tertiary butyl ether
gal/min	gallons per minute	IPS	International Pipe Standard	msl	mean sea level
GB	sarin	IRDMIS	Installation Restoration Data Management Information System	MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
gc	clay gravels; gravel-sand-clay mixtures	ISCP	Installation Spill Contingency Plan	mV	millivolts
GC	gas chromatograph	IT	IT Corporation	MW	monitoring well
GC/MS	gas chromatograph/mass spectrometer	ITEMS	IT Environmental Management System™	NA	not applicable; not available
GCR	geosynthetic clay liner	'J'	estimated concentration	NAD	North American Datum
GFAA	graphite furnace atomic absorption	JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded	NAD83	North American Datum of 1983
GIS	Geographic Information System	JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded	NAVD88	North American Vertical Datum of 1988
gm	silty gravels; gravel-sand-silt mixtures	JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes	NCP	National Contingency Plan
gp	poorly graded gravels; gravel-sand mixtures	JPA	Joint Powers Authority	ND	not detected
gpm	gallons per minute	K	conductivity	NE	no evidence; northeast
GPR	ground-penetrating radar	L	lewisite; liter	ne	not evaluated
GPS	global positioning system	LC ₅₀	lethal concentration for 50 percent of population tested	NFA	No Further Action
GS	ground scar	LD ₅₀	lethal dose for 50 percent of population tested	ng/L	nanograms per liter
GSA	General Services Administration; Geologic Survey of Alabama	l	liter	NGVD	National Geodetic Vertical Datum
GSBP	Ground Scar Boiler Plant	LCS	laboratory control sample	NIC	notice of intended change
GSSI	Geophysical Survey Systems, Inc.	LEL	lower explosive limit	NIOSH	National Institute for Occupational Safety and Health
GST	ground stain	LOAEL	lowest-observed-adverse-effects-level	NPDES	National Pollutant Discharge Elimination System
GW	groundwater	LT	less than the certified reporting limit	No.	number
gw	well-graded gravels; gravel-sand mixtures	LUC	land-use control	NOAA	National Oceanic and Atmospheric Administration
HA	hand auger	LUCAP	land-use control assurance plan	NOAEL	no-observed-adverse-effects-level
HCl	hydrochloric acid	LUCIP	land-use control implementation plan	NR	not requested; not recorded
HD	distilled mustard	max	maximum	ns	nanosecond
HDPE	high-density polyethylene	MCL	maximum contaminant level	N-S	north to south
Herb.	herbicides	MDC	maximum detected concentration	NS	not surveyed
HNO ₃	nitric acid	MDL	method detection limit	nT	nanotesla
hr	hour	mg/kg	milligrams per kilogram	NTU	nephelometric turbidity unit
H&S	health and safety	mg/L	milligrams per liter	nv	not validated
HSA	hollow-stem auger	mg/m ³	milligrams per cubic meter	O&G	oil and grease
HTRW	hazardous, toxic, and radioactive waste	mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils	O&M	operating and maintenance
'I'	out of control, data rejected due to low recovery	MHz	megahertz	OD	outside diameter
ICAL	initial calibration	µg/g	micrograms per gram	OE	ordnance and explosives
ICB	initial calibration blank	µg/kg	micrograms per kilogram	oh	organic clays of medium to high plasticity
ICP	inductively-coupled plasma	µg/L	micrograms per liter	ol	organic silts and organic silty clays of low plasticity
ICRP	International Commission on Radiological Protection	µmhos/cm	micromhos per centimeter	OP	organophosphorus
ICS	interference check sample	min	minimum	ORP	oxidation-reduction potential

List of Abbreviations and Acronyms (Continued)

OSHA	Occupational Safety and Health Administration	RPD	relative percent difference	TB	trip blank
OWS	oil/water separator	RRF	relative response factor	TCA	trichloroethane
oz	ounce	RSD	relative standard deviation	TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
PA	preliminary assessment	RTK	real-time kinematic	TCDF	tetrachlorodibenzofurans
PAH	polynuclear aromatic hydrocarbon	SAD	South Atlantic Division	TCE	trichloroethene
Parsons	Parsons Engineering Science, Inc.	SAE	Society of Automotive Engineers	TCL	target compound list
Pb	lead	SAIC	Science Applications International Corporation	TCLP	toxicity characteristic leaching procedure
PCB	polychlorinated biphenyl	SAP	installation-wide sampling and analysis plan	TDGCL	thiodiglycol
PCE	perchloroethene	sc	clayey sands; sand-clay mixtures	TDGCLA	thiodiglycol chloroacetic acid
PCP	pentachlorophenol	Sch.	schedule	TERC	Total Environmental Restoration Contract
PDS	Personnel Decontamination Station	SD	sediment	TIC	tentatively identified compound
PEL	permissible exposure limit	SDG	sample delivery group	TLV	threshold limit value
Pest.	pesticides	SDZ	safe distance zone; surface danger zone	TN	Tennessee
PFT	portable flamethrower	SEMS	Southern Environmental Management & Specialties, Inc.	TOC	top of casing; total organic carbon
PG	professional geologist	SFSP	site-specific field sampling plan	TPH	total petroleum hydrocarbons
PID	photoionization detector	SGF	standard grade fuels	TRADOC	U.S. Army Training and Doctrine Command
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes	SHP	installation-wide safety and health plan	TRPH	total recoverable petroleum hydrocarbons
POL	petroleum, oils, and lubricants	SI	site investigation	TWA	time-weighted average
PP	peristaltic pump	SL	standing liquid	UCL	upper confidence limit
ppb	parts per billion	SLERA	screening-level ecological risk assessment	UCR	upper certified range
PPE	personal protective equipment	sm	silty sands; sand-silt mixtures	'U'	not detected above reporting limit
ppm	parts per million	SM	Serratia marcescens	USACE	U.S. Army Corps of Engineers
PPMP	Print Plant Motor Pool	SOP	standard operating procedure	USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
ppt	parts per thousand	sp	poorly graded sands; gravelly sands	USAEC	U.S. Army Environmental Center
PRG	preliminary remediation goal	SP	submersible pump	USAEHA	U.S. Army Environmental Hygiene Agency
PSSC	potential site-specific chemical	Sr-90	strontium-90	USACMLS	U.S. Army Chemical School
pt	peat or other highly organic silts	SRA	streamlined human health risk assessment	USAMPS	U.S. Army Military Police School
PVC	polyvinyl chloride	Ss	stony rough land, sandstone series	USATEU	U.S. Army Technical Escort Unit
QA	quality assurance	SS	surface soil	USATHAMA	U.S. Army Toxic and Hazardous Material Agency
QA/QC	quality assurance/quality control	SSC	site-specific chemical	USCS	Unified Soil Classification System
QAP	installation-wide quality assurance plan	SSHO	site safety and health officer	USDA	U.S. Department of Agriculture
QC	quality control	SSHP	site-specific safety and health plan	USEPA	U.S. Environmental Protection Agency
QST	QST Environmental, Inc.	SSL	soil screening level	USGS	U.S. Geological Survey
qty	quantity	SSSL	site-specific screening level	UST	underground storage tank
Qual	qualifier	SSSSL	site-specific soil screening level	UTL	upper tolerance level
'R'	rejected data; resample	STB	supertropical bleach	UXO	unexploded ordnance
RAO	removal action objective	STC	source term concentrations	VOA	volatile organic analyte
RBC	risk-based concentration	STEL	short-term exposure limit	VOC	volatile organic compound
RCRA	Resource Conservation and Recovery Act	STOLS	Surface Towed Ordnance Locator System [®]	VOH	volatile organic hydrocarbon
RDX	cyclonite	Std. units	standard units	VQlfr	validation qualifier
RfD	reference dose	SU	standard unit	VQual	validation qualifier
ReB3	Rarden silty clay loams	SVOC	semivolatile organic compound	VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
REG	regular field sample	SW	surface water	Weston	Roy F. Weston, Inc.
REL	recommended exposure limit	SW-846	U.S. EPA's <i>Test Methods for Evaluating Solid Waste: Physical/Chemical Methods</i>	WP	installation-wide work plan
RFA	request for analysis	SWPP	storm water pollution prevention plan	WS	watershed
RGO	remedial goal option	SZ	support zone	WSA	Watershed Screening Assessment
RI	remedial investigation	TAL	target analyte list	WWI	World War I
RL	reporting limit	TAT	turn around time	WWII	World War II

List of Abbreviations and Acronyms (Continued)

XRF x-ray fluorescence
yd³ cubic yards

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

N/A – Not analyzed

ND – Not detected

Boolean Codes

LT – Less than the certified reporting limit

Flagging Codes

9 – Non-demonstrated/validated method performed for USAEC

B – Analyte found in the method blank or QC blank

C – Analysis was confirmed

D – Duplicate analysis

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

J – Value is estimated

K – Reported results are affected by interfaces or high background

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

Q – Sample interference obscured peak of interest

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

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

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

U – Analysis in unconfirmed

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

Qualifiers

J – The low-spike recovery is low

N – The high-spike recovery is low

R – Data is rejected