PELHAM RANGE

MAIN POST

CHOCCOLOCCO CORRIDOR

GALLOWAY GATE (CLOSED)

BALTZELL GATE (OPEN)

BAKER GATE (CLOSED)

SUMMERALL GATE (CLOSED)

TRAINING AREA T-38

NORTHEAST ALABAMA REGIONAL MEDICAL CENTER

LEGEND:

- ROUTE TO NORTHEAST ALABAMA REGIONAL MEDICAL CENTER
- U.S. HIGHWAY
- HOSPITAL
- INVESTIGATION SITES

DRIVING DIRECTIONS FROM BALTZELL GATE ROAD TO THE NORTHEAST ALABAMA MEDICAL CENTER

- LEAVING FORT MCCLELLAN ON BALTZELL GATE ROAD, TURN LEFT (SOUTH) ONTO AL HWY 21
- GO ~ 2.5 MILES WHERE AL HWY 21 MERGES WITH U.S. HWY 431 AND CONTINUE SOUTH
- CONTINUE SOUTH ON AL21/US431 FOR ~ 2.7 MILES
- TURN LEFT ONTO EAST 10th STREET
- GO ~ 0.2 MILE TO MEDICAL CENTER ON RIGHT
- PHONE NUMBER: (256)235-5121

SCALE

0 8000 16000 FEET

FIGURE 1-2
HOSPITAL EMERGENCY ROUTE

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

IT CORPORATION
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Final
Supplemental Remedial Investigation
Site-Specific Field Sampling Plan, Site Specific Safety and Health Plan, and Site-Specific Unexploded Ordnance Safety Plan Attachments
Training Area T-38, Former Technical Escort Reaction Area, Parcel 186(6)

Fort McClellan
Calhoun County, Alabama

Prepared for:

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

Prepared by:

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Knoxville, Tennessee 37923

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

August 2000

Revision 1

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK10, IT Corporation (IT) will conduct a supplemental remedial investigation of Training Area T-38, the Former Technical Escort Reaction Area, Parcel 186(6), at Fort McClellan, Calhoun County, Alabama to determine the nature and extent of contamination at the site resulting from U.S. Army chemical waste disposal and training activities. The purpose of this site-specific field sampling plan is to provide technical guidance for sampling activities at the Training Area T-38.

Training Area T-38 was the Former Technical Escort Reaction area also known as the Toxic Gas Yard. The site, approximately 6 acres in size, is located along a topographic ridge, Reservoir Ridge, east of the cantonment area on the Main Post. The area was reportedly used from 1961 to 1972 for training technical escort personnel in techniques of eliminating toxic hazards caused by mishaps to chemical munitions during transport. The area was also reportedly used from the early 1980s through the late 1980s as a chemical agent identification area, however the precise dates are unknown. However, aerial photographs prepared by the Environmental Photographic Interpretation Center for the U.S. Army Toxic and Hazardous Material Agency indicate that some activities began at the site as early as 1954. In addition to training activities, the area also was used for storage of toxic agents and munitions. The storage facilities included four 1-ton containers of distilled mustard. In addition, decontaminants were reportedly stored on at least two locations and were used for demonstration purposes. Extensive decontamination was reportedly conducted at the site for spills and for decontaminating training aids. The types of decontaminants used, quantities and frequency of use are unknown but assumed to include decontamination agent (noncorrosive), supertropical bleach and decontamination solution number 2.

Training Area T-38 is fenced with an entrance gate in the northern section. Several buildings and structures are located within the fenced area. Buildings include general installation buildings 4450, 4456, storage buildings 4452 , and 4454/4455, field latrines 4458, and 4459, and mess shelter 4461. A concrete pad located to the central eastern portion of the site (Building 4453) was reported as a decontamination pad by Science Applications International Corporation, but as a storage pad by Parsons. Buildings 4462, 4463, 4464, 4465, 4466, 4467, and 4468 are grandstand/bleachers located to the southwest and south of the site. Reportedly, a former

disposal pit area, approximately 10 by 20 by 10 feet used for disposal of decontaminants and other hazardous wastes and a burial site for the drum of distilled mustard are located in the central-eastern and southern portion of the site, respectively.

Specifically, IT will collect multiple discrete groundwater samples from 17 temporary boring locations, 13 surface soil samples, 1 depositional soil sample, 13 subsurface soil samples, groundwater samples from 17 temporary boring locations and 32 monitoring wells, 4 seep water samples, 6 surface water samples, and 6 sediment samples at this site. Potential contaminant sources at Training Area T-38, Parcel 186(6), include Chemical Warfare Agent decontaminating agents and toxic agents and munitions. Chemical analyses of the samples collected during the field program will include volatile organic compounds, semivolatile organic compounds, metals, agent breakdown products and explosives. 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 specified in the installation-wide work plan and regulatory agency guidelines.

The possibility of unexploded ordnance (UXO) exists at Training Area T-38; therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at the Training Area T-38 site. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purposes of UXO avoidance.

Prior to IT conducting any field work at the site, the U.S. Army Corps of Engineers-Huntsville will clear the site for CWM. Therefore, data related to CWM will not be collected as part of this supplemental remedial investigation. A CWM investigation will be provided in the CWM Site Engineering Evaluation/Cost Analysis that is being proposed by U.S. Army Corps of Engineers-Huntsville (Parsons Engineering Science, Inc., 1999). If based on the CWM Engineering Evaluation and Cost Analysis, contaminant sources are identified in the fenced area, additional intrusive sampling within the fenced area of Training Area T-38 may be performed. Furthermore, if based on the results of the proposed investigations, the extent of groundwater contamination has not been defined, additional investigations may be performed.

This site-specific field sampling plan attachment to the installation-wide sampling and analysis plan (SAP) for Training Area T-38 will be used in conjunction with the site-specific safety and health plan, the site-specific unexploded ordnance safety plan, the work plan, and the

installation-wide SAP. The SAP includes the installation-wide safety and health plan, waste management plan, and quality assurance plan. Site-specific hazard analyses are included in the site-specific safety and health 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 supplemental remedial investigation (RI) of Training Area T-38, Parcel 186 (6); under Task Order CK10, Contract Number DACA21-96-D-0018.

This supplemental RI site-specific field sampling plan (SFSP) attachment to the installation-wide sampling and analysis plan (SAP) (IT, 1998a) for FTMC has been prepared to provide technical guidance and rationale for sample collection and analysis at Training Area T-38, Parcel 186 (6), (Figure 1-1). The objective of this investigation is to establish and characterize the presence of hazardous, toxic, and radioactive wastes (HTRW) contamination resulting from chemical warfare material (CWM) training at the site and to better define the extent of groundwater contamination. IT will collect samples at this site as part of a supplemental RI effort to characterize the source and the nature and extent of contamination. The data collected will also be used to evaluate the level of risk to human health and the environment posed by releases of chemicals. The supplemental RI SFSP will be used in conjunction with the site-specific safety and health plan (SSHP), the site-specific unexploded ordnance safety plan, the installation-wide work plan (WP) (IT, 1998b), and the SAP. The SAP includes the installation-wide safety and health plan (SHP), waste management plan, and quality assurance plan (QAP).

If based on the CWM engineering evaluation and cost analysis (EE/CA), contaminant sources are identified in the fenced area, additional intrusive sampling within the fenced area of Training Area T-38 may be performed. Furthermore, if based on the results of the proposed investigations, the extent of groundwater contamination has not been defined, additional investigations may be performed.

1.2 FTMC Site Description and History

FTMC is located in the foothills of the Appalachian Mountains of northeastern Alabama near the cities of Anniston and Weaver in Calhoun County (Figure 1-1). FTMC is approximately 60 miles northeast of Birmingham, 75 miles northwest of Auburn, and 95 miles west of Atlanta,

LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- PROPOSED SEEP/SPRING WATER SAMPLE LOCATION

FIGURE 1-1
SITE LOCATION MAP
TRAINING AREA T-38, FORMER
TECHNICAL ESCORT REACTION AREA
PARCEL 186(6)

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

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Georgia. FTMC consists of three main areas of government-owned and leased properties: Main Post, Pelham Range, and Choccolocco Corridor (lease terminated in May 1998). The size of each property is presented below:

- Main Post 18,929 acres
- Pelham Range 22,245 acres
- Choccolocco Corridor (leased) 4,488 acres.

The Main Post is bounded on the east by the Choccolocco Corridor, which connects the Main Post with the Talladega National Forest. Pelham Range is located approximately 5 miles west of the Main Post and adjoins the Anniston Army Depot on the southwest. Pelham Range is located to the west of U.S Highway 431.

FTMC is under the jurisdiction of the U.S. Army Training and Doctrine Command (TRADOC). Until September 1999, the installation housed three major organizations including the U.S. Army Military Police School, the U.S. Army Chemical School, and the Training Center (under the direction of the training brigade), in addition to other major support units and tenants.

The U.S. government purchased 18,946 acres of land near Anniston in 1917 for use as an artillery range and a training camp due to the outbreak of World War I. The site was named Camp McClellan in honor of Major General George B. McClellan, a former leader of the Union Army during the Civil War. Camp McClellan was used to train troops for World War I from 1917 until the armistice. It was then designated as a demobilization center. Between 1919 and 1929, Camp McClellan served as a training area for active army units and other civilian elements. Camp McClellan was redesignated as FTMC in 1929 and continued to serve as a training area.

In 1940, the government acquired an additional 22,245 acres west of FTMC. This tract of land was named Pelham Range. In 1941, the Alabama legislature leased approximately 4,488 acres to the U.S. government to provide an access corridor from the Main Post to Talladega National Forest. This corridor provides access to additional woodlands for training.

The U.S. Army operated the Chemical Corps School at FTMC from 1951 until the school was deactivated in 1973. The Chemical Corps School offered advance training in all phases of

chemical, biological, and radiological warfare to students from all branches of the military service.

Until closure date, activities at FTMC could be divided into support activities, academic training, and practical training. Support activities included housing, feeding, and moving individuals during training. Academic training included classroom, laboratory, and field instruction. Practical training included weapons, artillery and explosives, vehicle operation and maintenance, and physical and tactical training activities.

1.3 Training Area T-38 Site Description and History

Training Area T-38 was the Former Technical Escort Reaction Area also known as the Toxic Gas Yard. The site, approximately 6 acres in size, is located along a topographic ridge, Reservoir Ridge, east of the cantonment area on the Main Post. The training area was reportedly used from 1961 to 1972 for training technical escort personnel in techniques of eliminating toxic hazards caused by mishaps to chemical munitions during transport. The area also was used for storage of toxic agents and munitions. The storage facilities included four, 1-ton containers of distilled mustard (HD). In addition, decontaminants were reportedly stored on at least two locations and were used for demonstration purposes. Extensive decontamination was reportedly conducted at the site for spills and for decontaminating training aids. The types of decontaminants used, quantities and frequency of use are unknown but assumed to include decontamination agent (noncorrosive) (DANC), supertropical bleach (STB), and Decontamination Solution (DS2) (Environmental Science and Engineering, Inc. [ESE], 1998). The area was reportedly used from the early 1980s through the late 1980s as a chemical agent identification area, however the precise dates are unknown.

Training Area T-38 is fenced with an entrance gate in the northern section. Several buildings and structures are located within the fenced area. Buildings include general installation buildings 4450 and 4456, storage buildings 4452, 4454/4455, field latrines 4458, 4459, and mess shelter 4461. A concrete pad located to the central eastern portion of the site (Building 4453) was reported as a decontamination pad by Science Applications International Corporation (SAIC) (1995), but as a storage pad by Parsons Engineering Science, Inc. (Parsons) (1999). Buildings 4462, 4463, 4464, 4465, 4466, 4467, and 4468 are grandstand/bleachers located to the southwest and south at the site. Reportedly, a former disposal pit area, approximately 10 by 20 by 10 feet used for disposal of decontaminants and other hazardous wastes, and a burial site for the drum of

HD are located in the central eastern and southern portion of the site, respectively, however the precise location of the suspected HD drum is unknown based on geophysical surveying results. The geophysical survey area is shown on Figure 1-2. Table 1-1 is a summary of buildings within the Training Area T-38 site.

Chemicals that were used at Training Area T-38 as decontaminating agents may have been either inorganic or organic materials that contained chlorine readily available for use as an oxidizing or chlorinating agent. Inorganic materials included bleach in various forms, calcium hypochlorite, and chlorine itself. Inorganic materials that decontaminate by oxidation were used for large-scale decontamination. Organic compounds included the chloroamides and closely related compounds. Organic compounds decontaminate in the absence of moisture, by chlorination and, in the presence of moisture, by oxidation. These compounds were usually dissolved in an organic solvent such as carbon tetrachloride or 1,1,2,2-tetrachloroethane (acetylene tetrachloride). However, these materials are expensive and were used only for small scale operations such as destroying a blister agent on equipment (U.S. Department of the Army and Air Force, 1963).

Following are the types of chemical agents, decontaminants and the description of each chemical that was presumably used at Training Area T-38:

- HD
- Supertropical bleach (STB)
- Decontamination agent (noncorrosive) (DANC)
- Decontamination Solution Number 2 (DS2)
- Chloroacetophenone, benzene, and carbon tetrachloride (CNB)
- Sulfur Tricoxide (FS)
- Phosgene
- Sarin (GB)
- Nerve Agent (O-ethyl-S-[diisoproplaminoethyl]-methylphosphnothiolate) (VX).

HD. HD (bis-[2-chloroethyl] sulphide is an oily chemical that has a high boiling point. HD was used extensively in World War I (WWI). HD hydrolyzes quickly in nature. If diluted, it degrades to form thiodiglycol and if concentrated, it forms either 1,4-dithiane or 1,4-oxathiane.

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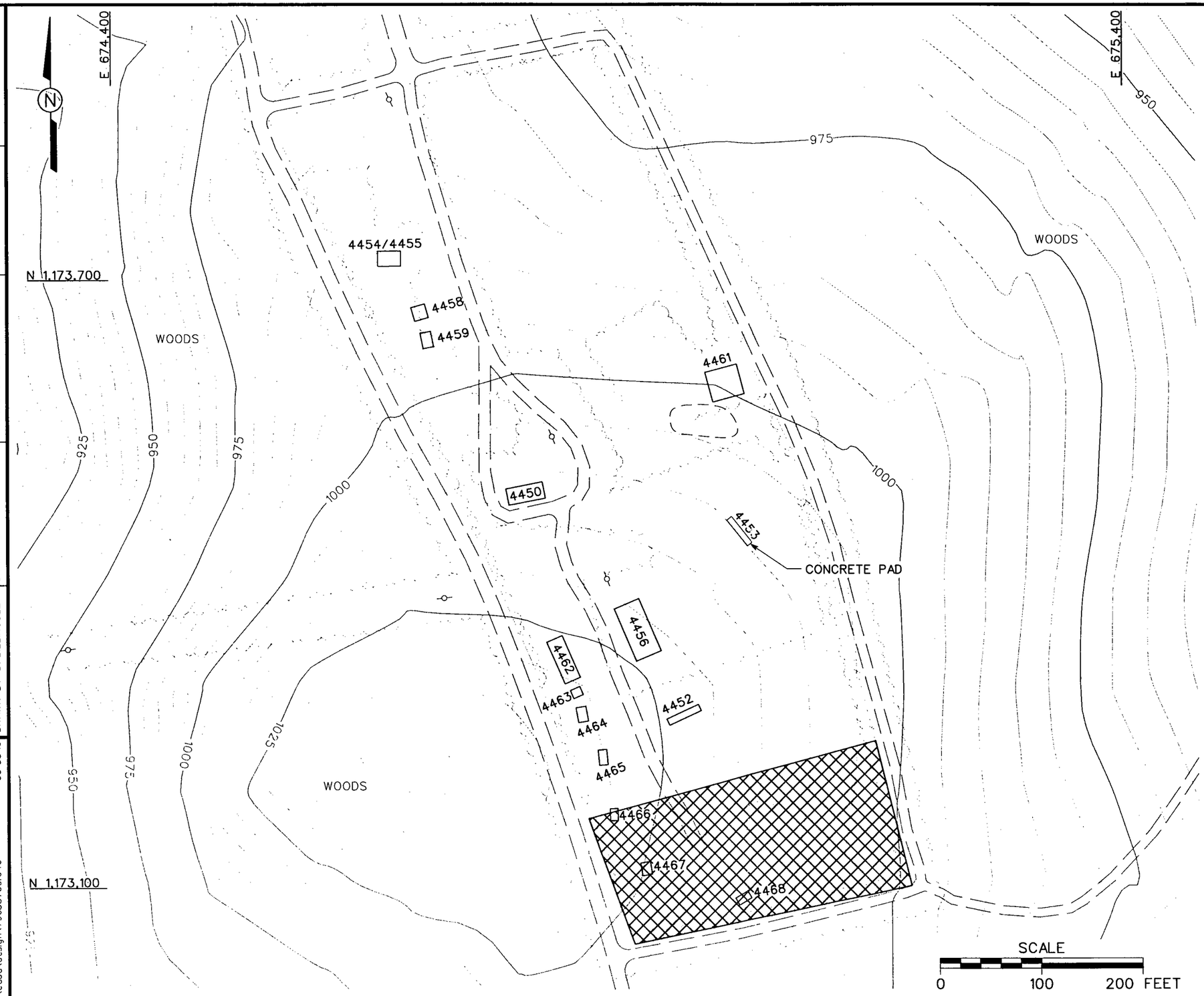

LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- INFERRED DISPOSAL PIT AREA
- APPROXIMATE LOCATION OF GEOPHYSICAL SURVEY GRID (SAIC, 1995)

FIGURE 1-2
SITE MAP
TRAINING AREA T-38, FORMER
TECHNICAL ESCORT REACTION AREA
PARCEL 186(6)

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

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Table 1-1

Buildings Located at the Training Area T-38, Former Technical Escort Reaction Area, Parcel 186(6) Fort McClellan, Calhoun County, Alabama

Building No.	Building Description	Year Built	Parcel No.
4450	General Installation Building	1959	186(6)
4452	Storage General Purpose Installation	1960	186(6)
4453	Storage General Purpose Installation	1960	186(6)
4454	Storage General Purpose Installation	1960	186(6)
4455	Storage General Purpose Installation	1960	186(6)
4456	General Installation Building	1967	186(6)
4458	Field Latrines	1981	186(6)
4459	Field Latrines	1981	186(6)
4461	Mess Shelter	unknown	186(6)
4462	Grandstand/Bleacher	1983	186(6)
4463	Grandstand/Bleacher	1983	186(6)
4464	Grandstand/Bleacher	1983	186(6)
4465	Grandstand/Bleacher	1983	186(6)
4466	Grandstand/Bleacher	1983	186(6)
4467	Grandstand/Bleacher	1983	186(6)
4468	Grandstand/Bleacher	1983	186(6)

STB. STB is referred to as bleach, bleaching powder, supertropical bleach, bleaching material, or chlorinated lime. STB is a white powder containing about 30 percent available chlorine (U.S. Department of Army and Air Force, 1963).

DANC. Prior to World War II, a well-known and often used decontaminating agent, DANC may have been used or disposed of at the site in conjunction with other types of decontaminants such as DS2 and/or STB. DANC is a 6.25 percent solution of RH-195 (1,3-dichloro-5, 5-dimethylhydantoin) in 1,1,2,2-tetrachloroethane (acetylene tetrachloride) and was adopted as a satisfactory HD decontaminant in small scale operations. It is an effective decontaminant for arsenicals, if sufficient time is allowed for it to react (U.S. Department of Army and Air Force, 1963).

DS2. DS2 is a clear solution general-purpose decontaminant consisting of 70 percent diethylenetriamine, 28 percent solvent (ethylene glycol monomethylether), and 2 percent active agent booster (sodium hydroxide). DS2 decontaminant reacts with GB and HD to effectively reduce their hazard within 5 minutes of application. It is effective for all toxic chemical agents. DS2 was applied manually or by using a portable decontaminating apparatus such as the M11 (U.S. Department of Army and Air Force, 1963).

CNB. CNB solution consists of 10 percent CN, 45 percent carbon tetrachloride and 45 percent benzene by weight. It was used in training and riot control (U.S. Department of the Air Force, 1963).

FS. FS solution during 1929 and 1930 was used as a smoke screen without creating a fire hazard. It exerts its effect in vapor form and was used in the final phase of World War II. Sulfuric acid is produced with hydration.

Phosgene. (carbonyl chloride) CG a gaseous chemical agent used in WWI. It has a vapor density of 3.4 compared to air and is not readily hydrolzed under usual field conditions. (U.S. Department of the Air Force, 1963)

GB. Sarin Nerve agent. A gaseous chemical agent that produced hydrogen fluoride under acidic conditions, isopropyl and alkaline conditions.

VX. VX can be absorbed by vegetation. Used in large-caliber artillery shells, sprays, rockets and mines (U.S. Department of the Air Force, 1963)

Although the site was reported to have been in use for training from 1961, review of aerial photographs prepared by Environmental Photographic Interpretation Center (EPIC) for the U.S. Army Toxic and Hazardous Material Agency (USATHAMA) indicates that activities were being conducted at the sites as early as 1954. The following site descriptions were obtained from aerial photographs taken in 1954, 1957, 1961, 1969, and 1972 (U.S. Environmental Protection Agency [EPA], 1983). The legend for the aerial photograph descriptions is included in Table 1-2.

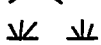
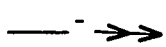
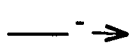
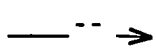
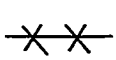
October 17, 1954. An aerial photograph with descriptive information of the site is provided as Figure 1-3. Training Area T-38 is accessible via a dirt road from the southeast. A number of ground scars are noted along the trail; a small structure is present adjacent to one of the ground scars. Activity at Training Area T-38 appears to be concentrated in a grass-covered clearing seen just northwest of the center of the 1954 photo. Six small, similar structures line the northern side of the clearing; the ground surface around these structures is barren and scarred. Two larger sheds stand near the western side of the clearing. Several indistinct objects are noted at the clearing's center. Ground scarred areas are evident south and east of the clearing. A mound of light-toned material or a possible structure is present on the eastern area.

A denuded, rectangular area is present northeast of the clearing. A primitive dirt road connects the two areas. Two other trails lead northward from the clearing. The larger of these joins a perimeter road of the adjacent goat yard.

December 21, 1957. An aerial photograph with descriptive information of the site is provided as Figure 1-4. Activity has increased around Training Area T-38. A new vehicle trail, atop a possible utility corridor (buried pipe or electric), leads up the western side of the ridge to the site. Major access to Training Area T-38 continues to come from the southeast; however, the dirt trail which leads northward from the site to the goat yard has been improved, creating a second entrance route. Most of the scarred areas noted along the southeast entrance road in 1954 have revegetated. Shed and remnant ground scars now stand on what was the southernmost of these 1954 areas. The small structure noted east of the entrance road in 1954, however, apparently has been removed.

Table 1-2

Legend for Aerial Photographs
Training Area T-38, Former Technical Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

T	Tank
GS	Ground Scar
MM	Mounded Material
SL	Standing Liquid
GST	Ground Stain
	Culvert
	Wetlands
	Access Road
	Depressions
	Ditched Drainage
	Drainage
	Intermittent Drainage
	Escarpment
	Fence
	Historical Boundary

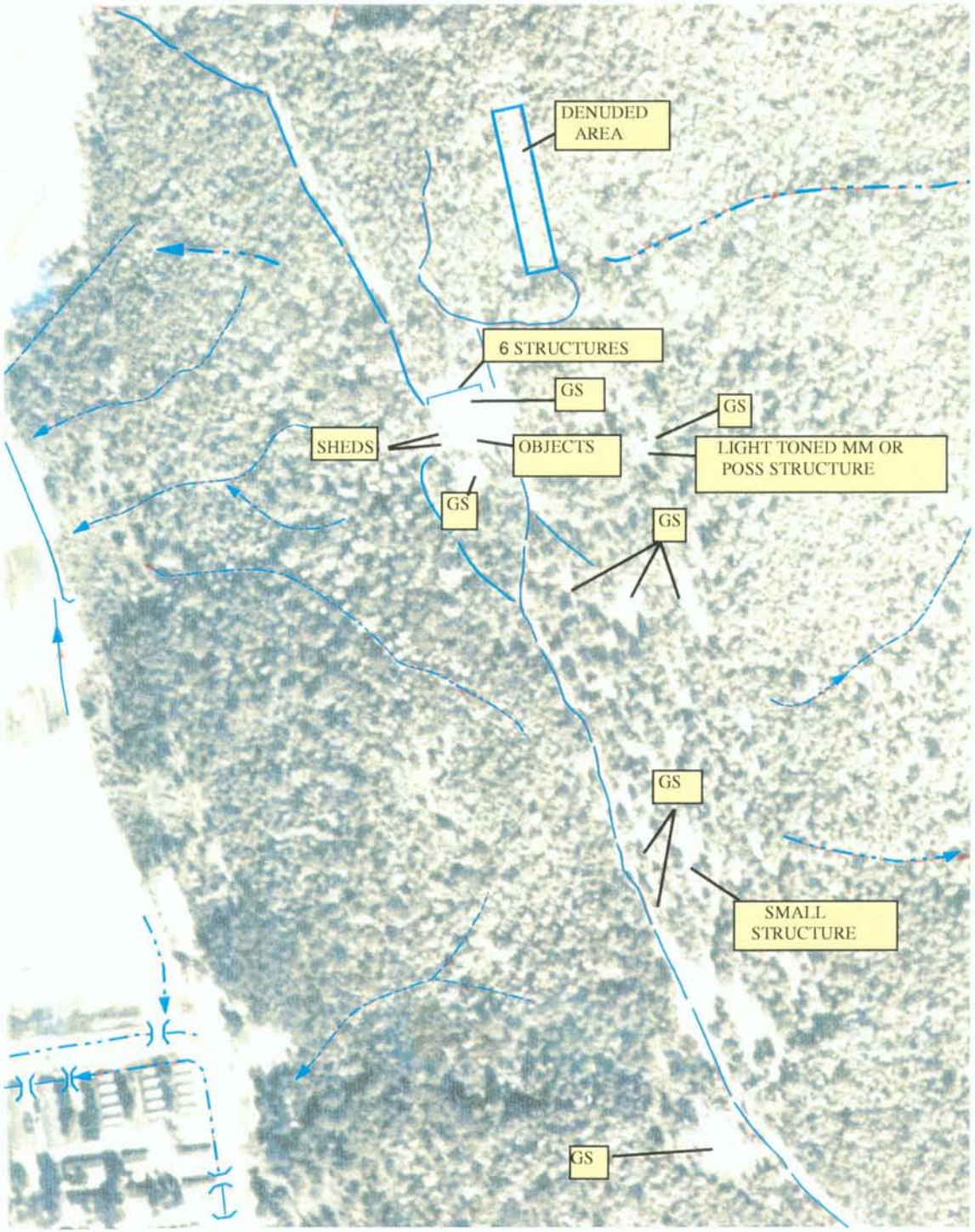


Figure 1-3

Area T – 38, Former Technical Escort Reaction Area
Parcel 186(6)

October 17, 1954
Aerial Photography
Approximate Scale 1"= 300'

Source: U.S. EPA, 1983,
Research and Development
Fort McClellan 24 Alpha, T-38, Range J, Alabama
(TS-PIC-83003)
Environmental Photographic Interpretation Center
Environmental Monitoring System Laboratory

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Mobile District
Fort McClellan
Calhoun County, Alabama
Contract No. DACA21-96-D-0018

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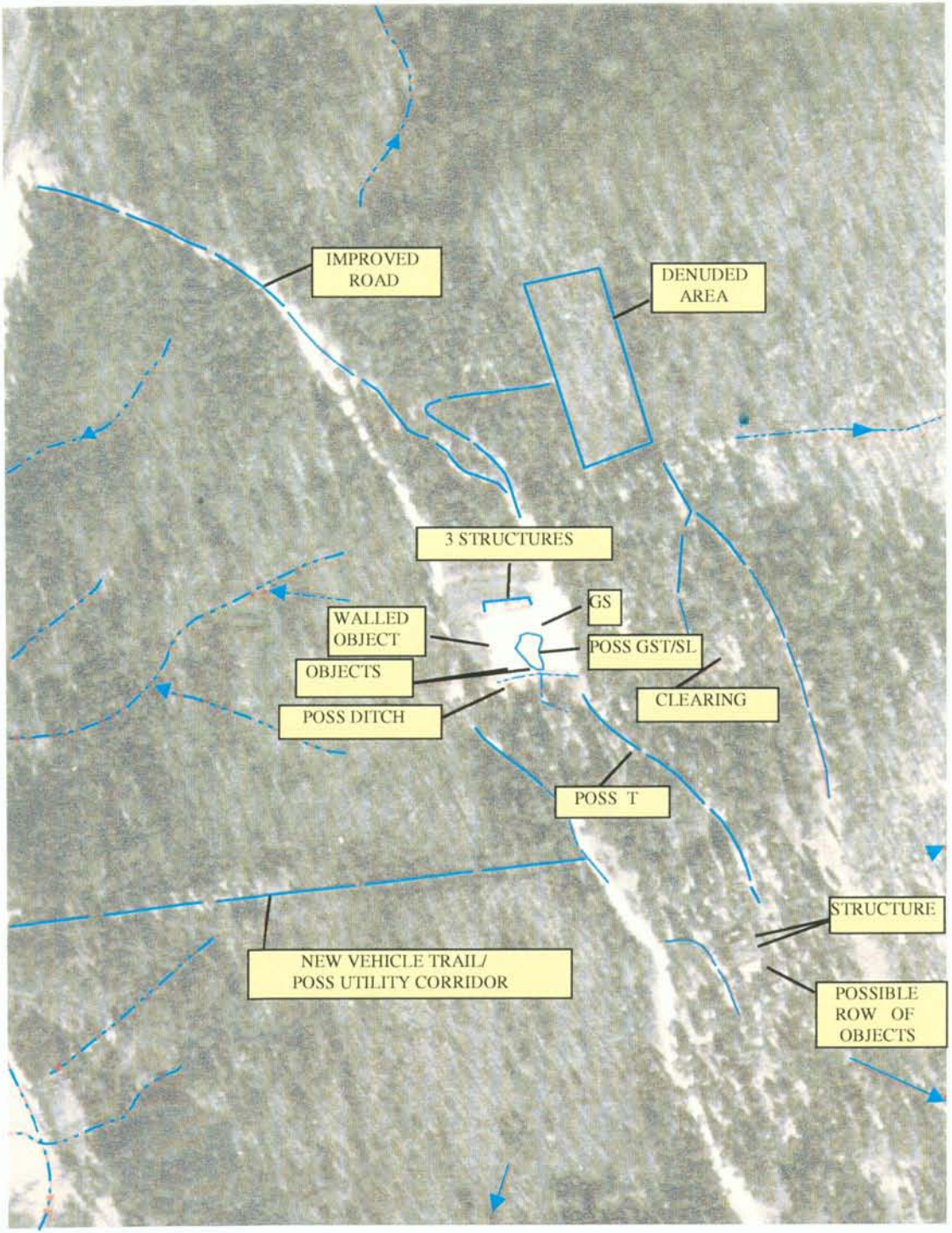

Figure 1-4

Area T – 38, Former Technical Escort Reaction Area
Parcel 186(6)

December 21, 1957
Aerial Photography
Approximate Scale 1"=270'

Source: U.S. EPA, 1983,
Research and Development
Fort McClellan 24 Alpha, T-38, Range J, Alabama
(TS-PIC-83003)
Environmental Photographic Interpretation Center
Environmental Monitoring System Laboratory

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Mobile District
Fort McClellan
Calhoun County, Alabama
Contract No. DACA21-96-D-0018

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A small, new facility is now present just east of the southeastern entrance route. Two shed-like structures stand adjacent to a segmented feature, possibly a row of low objects. A primitive trail services this facility. The most prominent changes at Training Area T-38 have occurred at the central square-shaped clearing. The clearing has been enlarged to the north, and the original area (1954) is now barren and ground scarred. Possible staining or standing liquid is present atop this original area. A possible "T"-shaped ditch is noted along the southern end of the clearing. A primitive trail leads from this area to a possible elevated tank.

The denuded area remains visible northeast of the clearing. This area appears to have increased in size; however, this may be due to seasonal foliage changes. Several primitive trails lead to the area.

Drainage patterns around the site are similar to those observed in 1954. Because of the seasonally reduced foliage canopy, a stream is now visible north of the site.

November 29, 1961. An aerial photograph with descriptive information of the site is provided as Figure 1-5. Training Area T-38 has undergone marked changes since 1957. The facility has expanded to the south and east; woods previously standing on these areas have been cleared to yield open grass-covered spaces. A new fence surrounds the perimeter of Training Area T-38. A similar fence was constructed to section off three major areas within the facility. The large southern facility area exhibits a variety of new features. A large rectangular structure, possibly a house trailer, is present at the center of the area. A line of small white objects parallels the trailer to the north; a line of larger, varying-toned objects is present north of the small white objects. A pair of elevated objects and adjacent ground scarring are noted south of the trailer. A vehicle trail loops around the above features. Possible debris is present along the western side of this trail.

The central "L"-shaped area of the facility contains the original (1954) square-shaped clearing. The surface of the clearing remains barren and scarred and continues to exhibit possible ground staining. A possible house trailer is present at the southern end of the clearing. A small structure stands among the trees south of the clearing, a shed-like structure is noted west of this, outside the perimeter fence. Vehicle trails lead from the original clearing to the eastern end of the central facility area, where an excavated rectangular basin is present. Mounded material is noted around

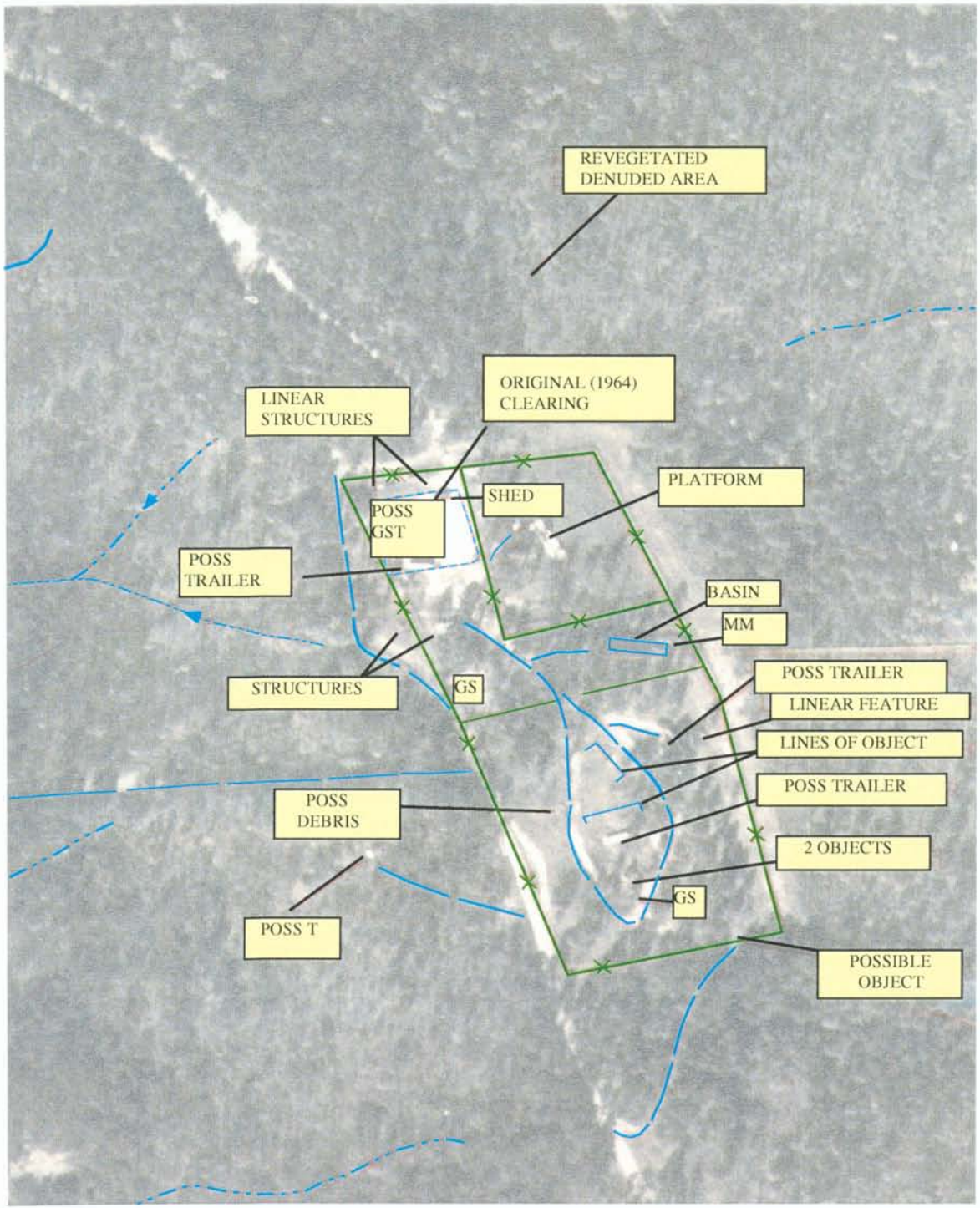

Figure 1-5

Area T – 38, Former Technical Escort Reaction Area
Parcel 186(6)

November 29, 1961
Aerial Photography
Approximate Scale 1"= 225'

Source: U.S. EPA, 1983,
Research and Development
Fort McClellan 24 Alpha, T-38, Range J, Alabama
(TS-PIC-83003)
Environmental Photographic Interpretation Center
Environmental Monitoring System Laboratory

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Mobile District
Fort McClellan
Calhoun County, Alabama
Contract No. DACA21-96-D-0018

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the eastern edge of the basin. Ground scarring is visible along the west side of the central facility area. The possible tank noted in this area in 1957 is no longer present.

An isolated platform, possibly concrete, is present in the cleared northeast fenced section of the facility. A dark line is visible down the center of the platform. A small vehicle trail enters this section from the west. Vehicle routes to the facility at Training Area T-38 are similar to those observed in 1957. Gates in the perimeter fence allow transit. A small remnant ground scar is present along the original southeastern vehicle route. The shed, adjacent to the scar in 1957, is no longer evident. A possible tank stands above the trees west of the facility. A vehicle trail provides access to this structure. Drainage patterns around Training Area T-38 remain similar to those observed in previous years. The earlier denuded area previously delineated northeast of the site has largely revegetated.

November 20, 1969. An aerial photograph with descriptive information of the site is provided as Figure 1-6. Development of Training Area T-38 has continued as roadways through the facility have been improved and additional wooded areas have given way to open grassland. The facility retains its basic 1961 configuration; however, some of the internal fence lines have been altered. The fence, which sectioned the large southern area of the facility in 1961, has been partially dismantled. A small section of this fence remains attached to the eastern perimeter fence. Some areas have been improved for wooded areas and open grassland. A new fence has been erected farther south.

Elements inside the resulting smaller area are similar to those noted in 1961. The possible house trailer remains in the northern end of this southern area and is surrounded by various-sized objects. Three elevated objects are now present south of the trailer; a possible shallow basin lies adjacent to these. Because of the fence changes, the "L"-shaped central facility area has expanded southward. A structure supporting a pair of cylindrical objects is present in its southwest corner. A line of various-sized objects is present to the immediate south, parallel to the perimeter fence. The lines of small objects which stood to the east (inside the loop road) in 1961 are no longer present.

Two drainage ditches are noted flowing eastward from the central area and into a larger channel which parallels the eastern side of the facility. This larger channel appears to flow into a natural drainage basin to the northeast. A second channel on the east side of the site drains to the south.

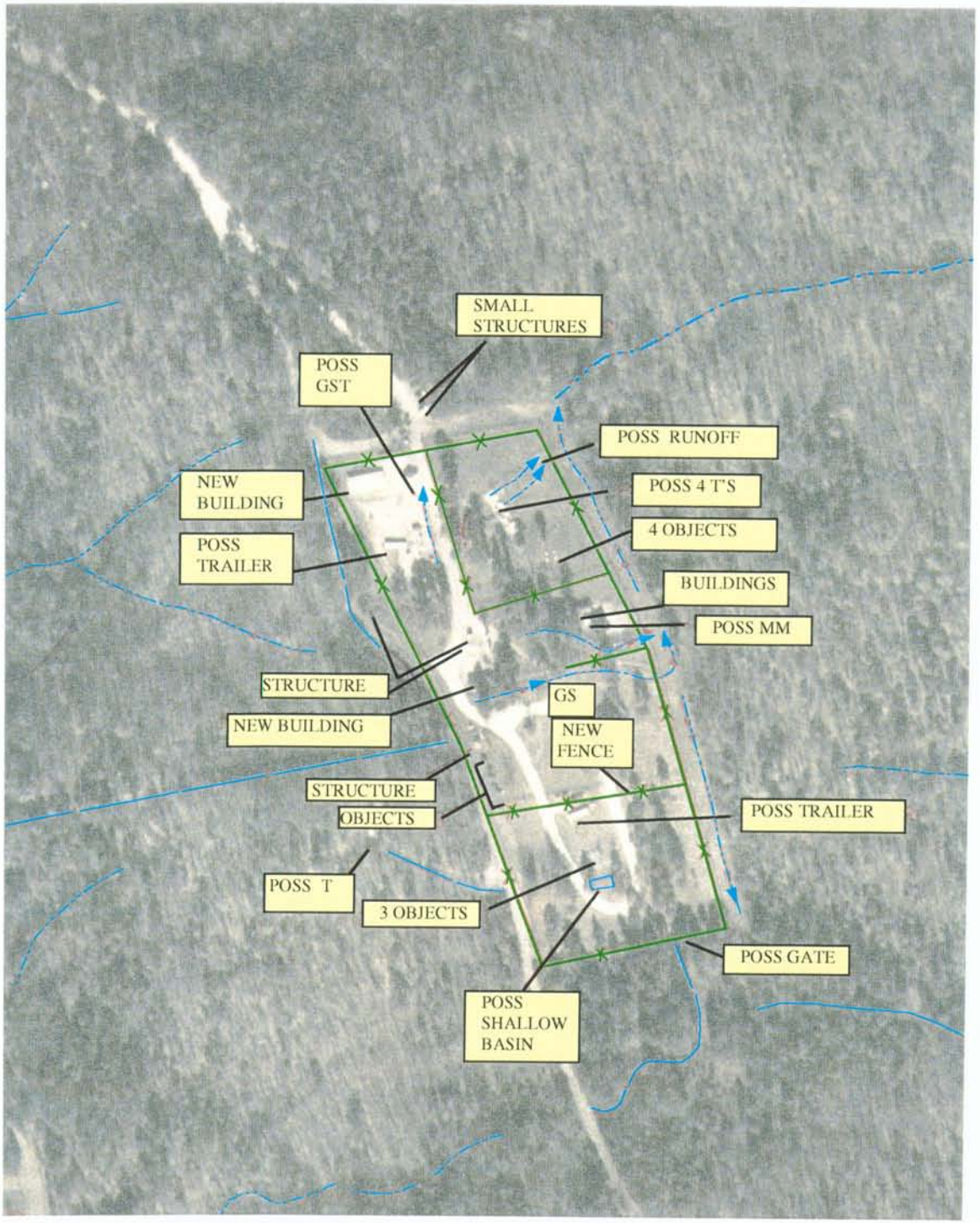

Figure 1-6

Area T – 38, Former Technical Escort Reaction Area
Parcel 186(6)

November 20, 1969
Aerial Photography
Approximate Scale 1"=270'

Source: U.S. EPA, 1983,
Research and Development
Fort McClellan 24 Alpha, T-38, Range J, Alabama
(TS-PIC-83003)
Environmental Photographic Interpretation Center
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Mobile District
Fort McClellan
Calhoun County, Alabama
Contract No. DACA21-96-D-0018

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The rectangular basin seen in the eastern/central section of the facility in 1961 is no longer evident. A pair of buildings and dark, indistinct possible mounded material are now present atop this area. Barren ground scarring is also noted here. A new building and small structure stand along the roadway in the west/central facility section. A dark area, possibly a ground stain, is present immediately south of the structure. A new storage-type building has been constructed at the northwest corner of the facility. A row of small dark objects is present along the north side of this building. Various-sized objects are grouped around the possible trailer that remains to the south. A possible stained runoff pattern is noted along the eastern side of the area. Other features within the area are similar to those observed in 1961.

Four possible tanks are now present atop the platform in the fenced northeastern facility section. Piping appears to interconnect the tanks. Surface runoff patterns are noted from the platform toward the northeast. Light-toned objects are visible in the northeast corner of the fenced area. Two small structures and a probable vehicle are present along the roadway just north of the Training Area T-38. Other features around the facility are basically unchanged.

December 8, 1972. An aerial photograph with descriptive information of the site is provided as Figure 1-7. Few changes are noted at Training Area T-38. Fencelines within the facility are unchanged. The possible house trailer remains on the southernmost fenced section. The possible shallow basin noted to the south in 1969 is indistinct and has probably revegetated. Groups of various-sized objects and mounded materials are present in the southwestern and northeastern corners of the southern site section. Two possible cylindrical objects are visible among the latter group. Three small box-like structures are present along the east side of the central site section. Several smaller, similarly shaped objects stand to the west of these, adjacent to the looped roadway. Two linear, possibly cylindrical objects are noted in the southeast corner of this section.

The drainage ditch remains visible across the central site section. A remnant section of the fence shown in 1969 stands adjacent to the ditch. The mounded material remains atop the 1961 rectangular basin site, in the northeast corner of this central area. The building previously noted adjacent to this material appears to be partially dismantled. The possible trailer and storage-type building still stand on the barren, far northern end of the central site section. A rectangular object has been added to the collection of small objects on the north side of the building. The building remains at the west side of the central site section, adjacent to the perimeter fence. The

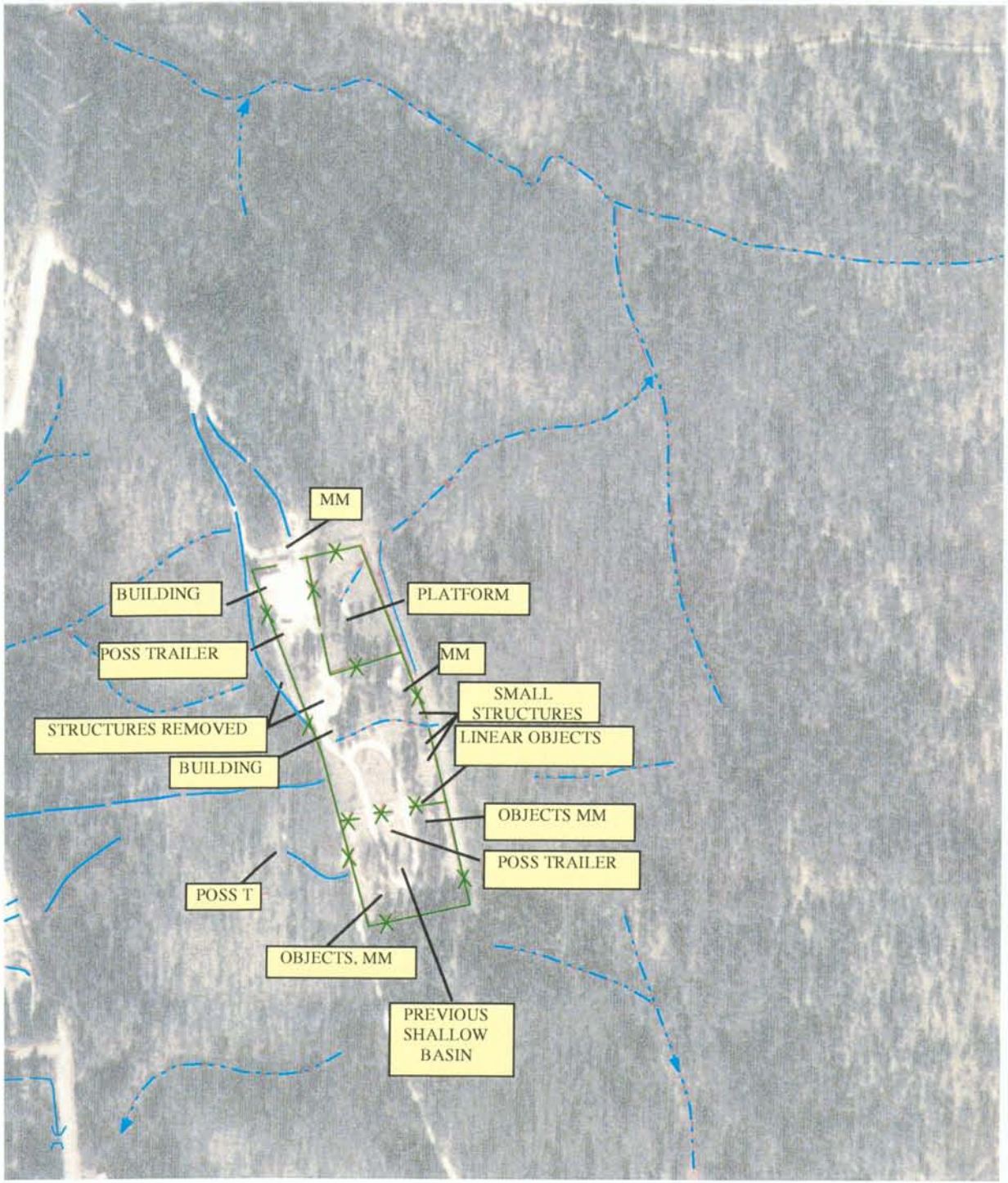

Figure 1-7

Area T – 38, Former Technical Escort Reaction Area
Parcel 186(6)

December 8, 1972
Aerial Photography
Approximate Scale 1"=480'

Source: U.S. EPA, 1983,
Research and Development
Fort McClellan 24 Alpha, T-38, Range J, Alabama
(TS-PIC-83003)
Environmental Photographic Interpretation Center
Environmental Monitoring System Laboratory

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

IT CORPORATION

small structure just north of the building in 1969 has been removed; the surface here remains dark in tone. The small structure outside the adjacent perimeter fence has also been removed. The four tank-like objects are no longer evident on the rectangular platform inside the northeast site section. Some mounted material may now be present on the platform. Runoff patterns continue to be visible from this structure. Mounded earthen-like material is present along the access road north of the facility. The structures noted here in 1969 are no longer present. Other features around Training Area T-38 are unchanged.

1.4 Regional and Site-Specific Geology

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

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold and thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold and thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted with major structures and faults striking in a northeast-southwest direction. Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992), and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group is comprised of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and

conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated, greenish-gray and black mudstone makes up the Nichols Formation with thin interbeds of siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

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

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

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

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weathers to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area and a significant portion of the northwestern corner of the Main Post.

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

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

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

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark- to light-gray limestone with abundant chert nodules and greenish-gray to grayish-red phosphatic shale with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also

of Mississippian Age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale on the basis of fossil data.

The Jacksonville Thrust Fault is the most significant structural geologic feature in the vicinity of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City fault (Osborne and Szabo, 1984). The Ordovician sequence comprising the Eden thrust sheet is exposed at FTMC through an eroded "window" or "fenster" in the overlying thrust sheet. Rocks within the window display complex folding with the folds being overturned, and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome and Conasauga formations, north by the Knox Group, northeast and east by the Shady Dolomite, and southeast and southwest by the Chilhowee Group (Osborne et al., 1989).

Exposures of the Jacksonville fault are rare because of deep weathering and thick colluvium accumulation. However, a trench excavated at Reservoir Ridge, south of Training Area T-38, indicated that the Athens shale and residuum of the Shady Dolomite are in thrust contact on the southeast edge of the window. Geological mapping, conducted recently by Osborne et al., indicated the Jacksonville fault trends northwest-southeast approximately 600 feet to the west of Training Area T-38. The dip of the fault in the vicinity of Training Area T-38 is not known, however trenching on the south side of Reservoir Ridge suggests that the fault dips less than ten degrees to the southeast. The fault contact is characterized by approximately 6 feet of brecciated shale and mudstone. The faulting has resulted in the Shady Dolomite being present as an irregular, wedge-shaped unit, thickening to the east.

The geologic conditions at Training Area T-38 were assessed using monitoring well lithologic logs prepared by SAIC during the RI monitoring well installation program. In general, the sediments at the Training Area T-38 site are brownish yellow sandy clay with sandstone fragments interbedded with clayey sand, sand, sandy silt and clay. These sediments are apparently part of the Cambrian Shady Dolomite (Figure 1-8). Detailed site-specific geology will be documented during the proposed supplemental RI activities.

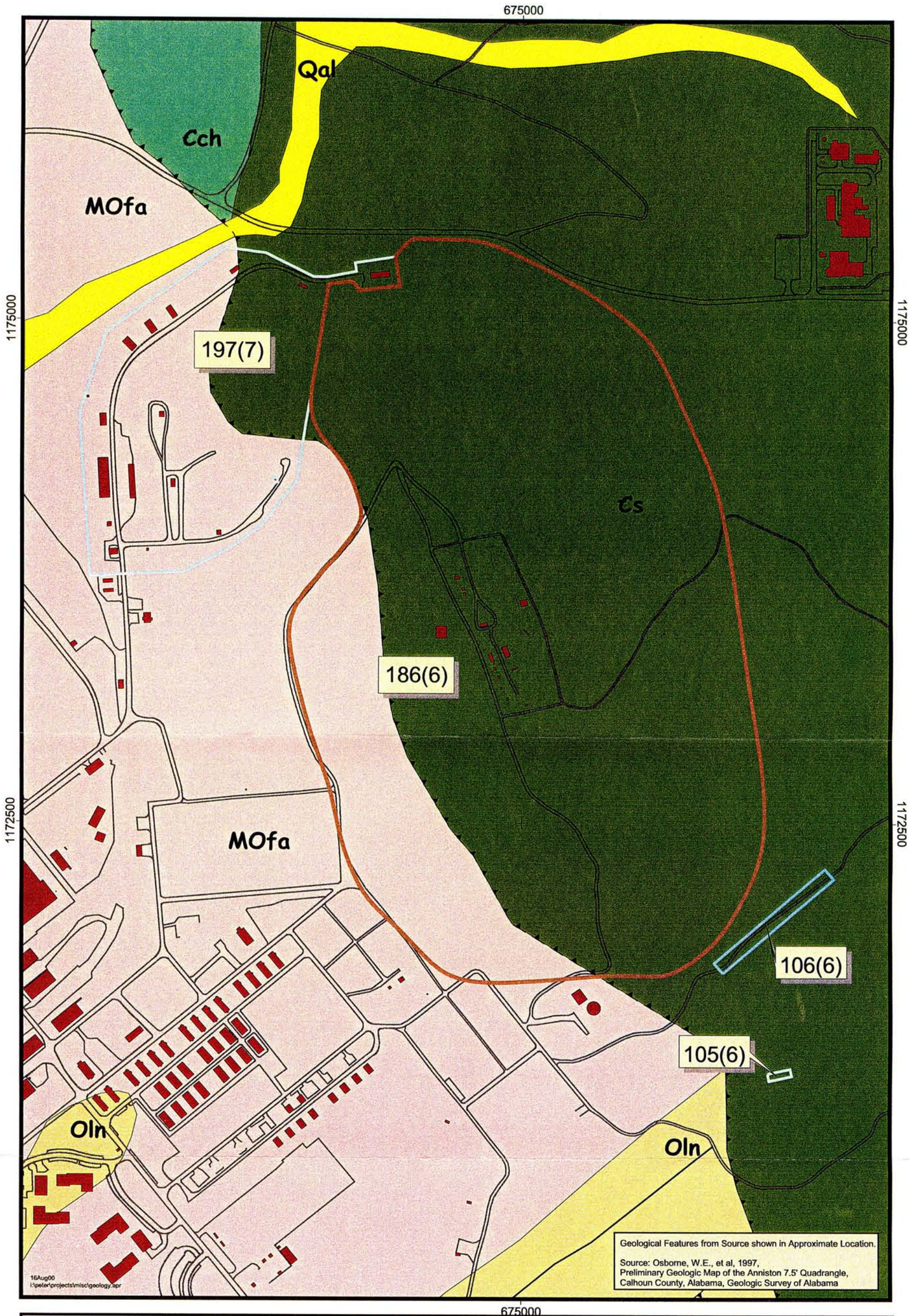

Figure 1-8

Parcel Boundary (ESE, 1998)
CERFA Parcels
Buildings
Roads
Fault

Geology

Cch	Cambrian - Chilhowee Group
Cs	Cambrian - Shady Dolomite
MOfa	Mississippian/Ordovician - Floyd & Athens Shale, Undifferentiated
Oln	Ordovician - Little Oak and Newala Limestones
Qal	Quaternary - alluvium

Geologic Map
Training Area T-38 Parcel 186(6)

0 250 500

State Plane feet, NAD 83

N

August 2000

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

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Site elevation ranges from approximately 1,030 feet near the southwest part of the site to approximately 975 feet on the northeastern corner of the site sloping radially to the north, northeast, east, and southeast. Cave Creek flows west approximately 1,000 feet to the north of Training Area T-38. The soil type at Training Area T-38 is classified as Anniston Gravelly Clay Loam 10 to 15 percent slope, severely eroded (AbD3). The soil type is characterized by strongly acid, deep, well-drained soils that have developed in old local alluvium. The surface horizon is mainly very dark brown loam, and the subsoil is mainly dark-red sandy clay loam. Sandstone and quartzite gravel and cobbles, as much as 8 inches in diameter, are on the surface and throughout the soil. These soils occur on uplands and foot slopes. Permeability is moderate, infiltration is moderately low, runoff is medium and rapid and the capacity for supplying available moisture is low. Natural fertility is low to moderate and organic matter is low.

1.5 Regional and Site-Specific Hydrogeology

A hydrogeologic assessment of regional groundwater flow patterns to determine the approximate groundwater flow directions with respect to the various geologic units, surface water bodies, and known subsurface conduit (thrust fault) features in the area surrounding FTMC and Pelham Range has not been conducted. Aquifers in the vicinity of FTMC and Pelham Range are developed in residuum derived from bedrock decomposition; within fractured bedrock; along fault zones; and from the development of karst frameworks. Although detailed characterizations of groundwater movement in the region have not been conducted, the ultimate movement of groundwater may be estimated to be toward major surface water features. However, because of the impacts of differential weathering, variable fracturing, and the potential for conduit flow development, the use of surface topography as an indicator for groundwater flow direction must be used with caution in the area. Areas with well-developed residuum horizons may subtly reflect the surface topography, but the groundwater flow direction also may exhibit the influence of pre-existing structural fabrics or the presence of perched water horizons on unweathered ledges or boulders (SAIC, 1998).

Precipitation in the form of rain is the source of most groundwater in Calhoun County. The thrust fault zones typical of the county form large storage reservoirs for groundwater. Precipitation and subsequent infiltration provide recharge to the groundwater flow system. Points of discharge occur as springs, effluent streams, and lakes. Shallow groundwater on FTMC occurs principally in the residuum developed from Cambrian sedimentary and carbonate bedrock units

of the Weisner Formation and locally in lower Ordovician carbonates. Bedrock permeability may be locally enhanced by fracture zones associated with thrust faults and by the development of solution (karst) features (predominantly on Pelham Range).

Depth to groundwater at the site is approximately 55 to 129 feet below land surface (bls) (SAIC, 1995). Groundwater elevations at Training Area T-38 were calculated by measuring depth to groundwater relative to top-of-casing elevations in each of the five existing monitoring wells T38-G05, T38-G06, T38-G07, T38-G08 and T38-G09. Groundwater elevations were measured between May 1994 and June 1995. Groundwater elevation data is presented in Table 1-3. A groundwater elevation map is shown on Figure 1-9. Based on groundwater elevation data in wells T38-G05 through T38-G08, groundwater flow is to the northeast. SAIC (1999) reported an average hydraulic gradient of 0.056 feet per foot (ft/ft). Measurements of groundwater data in well T38-G09 indicated a groundwater divide that is located along the crest of the ridge with well T38-G09 on the downgradient side. The exact location of the groundwater divide has not been determined.

The five monitoring wells installed by SAIC have been renamed by IT to simplify the field investigation. Future work will report the wells with the new IT well designation and the previous well designation. Table 1-3 provides the SAIC monitoring well number and the new IT monitoring well number for each of the five existing monitoring wells.

During a recent site visit (December 1999), four seep locations (points of groundwater discharge, Figure 1-1) were observed at topographically low spots (the base of Reservoir Ridge) (see discussion in Section 2.0, Summary of Existing Environmental Studies). The four seeps were sampled and preliminary data indicated that groundwater discharged from the seeps contained similar contaminants detected in groundwater samples from Training Area T-38 located at a topographically high spot. These discharge areas were radially located to the north, northeast southwest and southeast of the site. The seeps suggest a local groundwater flow system with the crest of the ridge being a recharge area, and the base of the hill being a discharge area. However, groundwater elevation data for the five monitoring wells at the site, between May 1994 and June 1995 (SAIC, 1999), shows no water level fluctuations. Groundwater fluctuations would normally be observed relative to seasonal variations in a local flow system. The absence of seasonal fluctuations in groundwater levels suggest that the flow system in the vicinity of the site contains both a regional and local flow component.

Table 1-3

Groundwater Elevation Data
1994-1995 Remedial Investigation
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

SAIC Monitoring	IT Monitoring Well Number	Screened Interval	Measuring Point	Groundwater Elevation (ft-msl)											
				May-94	Jul-94	Aug-94	Sep-94	Oct-94	Nov-94	Dec-94	Jan-95	Feb-95	Mar-95	Apr-95	Jun-95
T38-G05	CWM-186-MW01	55-65	991.01	944.2	939	928.5	938.7	938	937.7	937.4	937	936.9	938.1	938	
T38-G06	CWM-186-MW02	67-77	987.79		922.9	923.1	923	922.7	922.4	922.2	922.2	921.1	923	922.4	
T38-G07	CWM-186-MW03	83-93	1003.19		921.1	920.9	920.8	920.4	920	919.9	919.9	920	921.2	920.3	
T38-G08	CWM-186-MW04	90-100	1017.94	931.5	930.5	930.2	929.2	929.8	929.6	929.5	929.3	929.6	931.1	929.8	
T38-G09	CWM-186-MW05	133-143	1043.20										914.2	913.3	913.5

IT - IT Corporation.
SAIC - Science Application International Corporation.
msl - Mean sea level.
Source: Science Applications International Corporation, *Remedial Investigation/Basement Risk Assessment Report*, February 1999.

DWG. NO: ...\796887es.041	
PROJ. NO.: 796887	
INITIATOR: J. JENKINS	
PROJ. MGR.: J. YACOUB	
DRAFT. CHCK. BY:	
ENGR. CHCK. BY: J. JENKINS	
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DRAWN BY: D. BILLINGSLEY	

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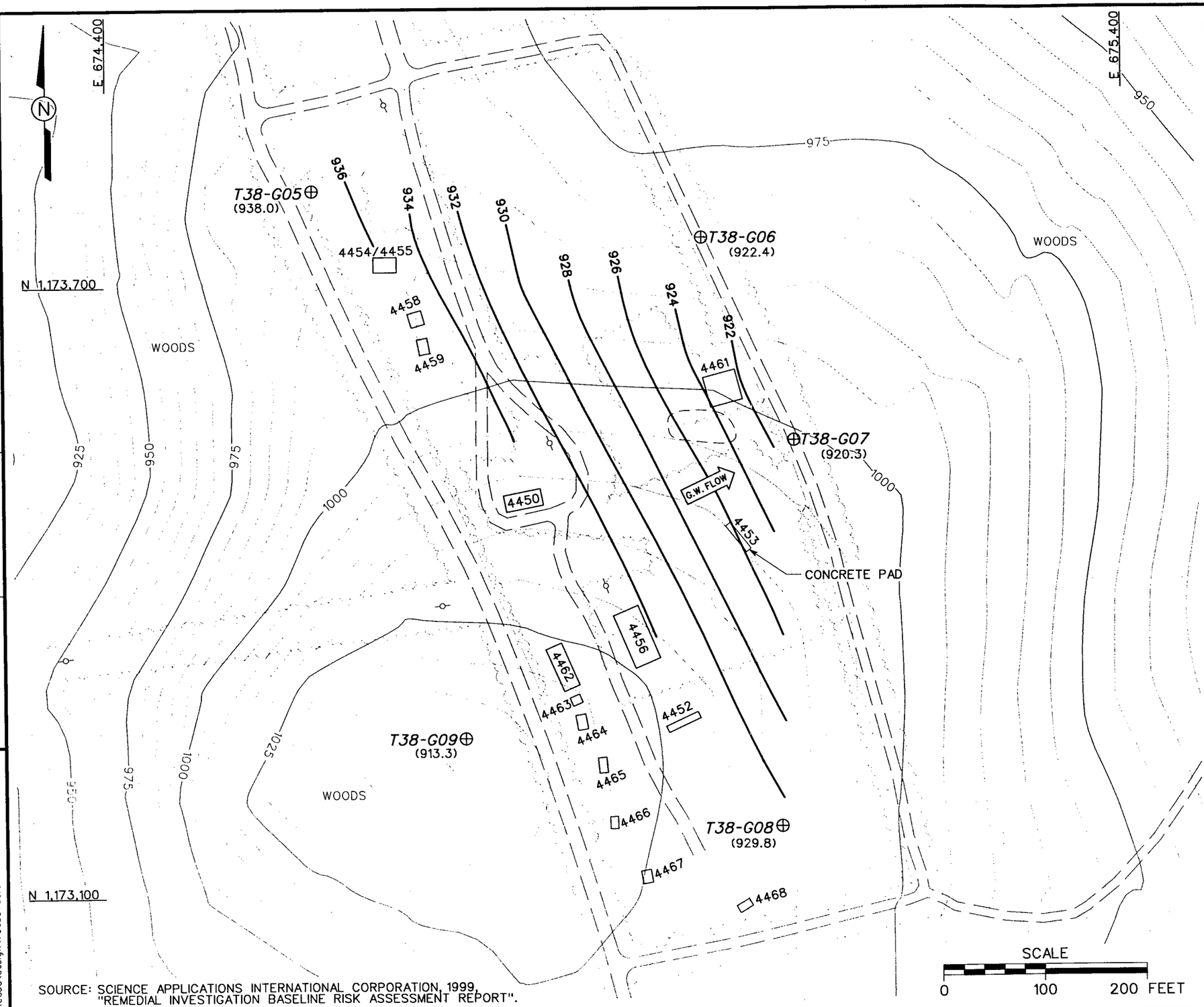

LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- GROUNDWATER ELEVATION CONTOURS
- (922.4) GROUNDWATER ELEVATION (FT MSL)
- G.W. FLOW GROUNDWATER FLOW DIRECTION
- TREES / TREELINE
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- INFERRED DISPOSAL PIT AREA
- ⊕ SAIC RESIDUUM MONITORING SAMPLE LOCATION

SOURCE: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION, 1999, "REMEDIAL INVESTIGATION BASELINE RISK ASSESSMENT REPORT".

FIGURE 1-9
GROUNDWATER ELEVATION MAP APRIL 1995 TRAINING AREA T-38, FORMER TECHNICAL ESCORT REACTION AREA PARCEL 186(6)

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

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Based on its location, the Jacksonville fault is suspected to deflect regional groundwater movement to the northeast-southwest following the general strike of the fault. However, the influence of the Jacksonville fault on groundwater movement in the vicinity of Parcel 186(6) is not known.

1.6 Scope of Work

The scope of work for activities associated with the supplemental RI for the Training Area T-38 site includes the following tasks:

- Develop the supplemental RI SFSP attachment.
- Develop the supplemental RI SSHP attachment.
- Develop the UXO safety plan attachment.
- Conduct a surface and near surface UXO survey over all areas to be included in the sampling effort.
- Provide downhole UXO support for all intrusive direct-push and drilling activity to determine the presence of potential downhole hazards.
- Install 17 temporary borings to collect discreet groundwater screening samples and obtain lithologic and structural data.
- Perform a surface water survey of the tributary of Cave Creek
- Install 27 groundwater monitoring wells (10 shallow and 17 deep wells).
- Collect 13 surface soil samples, 13 subsurface soil samples, 1 depositional soil sample, 32 groundwater samples, 4 seep water samples, 6 surface water samples and 6 sediment samples.
- Samples will be analyzed for the parameters listed in Section 5.5.

The possibility of UXO exists at the Training Area T-38; therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at the Training Area T-38. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purposes of UXO avoidance.

At completion of the field activities and sample analyses, draft and final supplemental RI summary reports will be prepared. Reports will be prepared in accordance with current EPA Region IV and Alabama Department of Environmental Management (ADEM) requirements.

2.0 Summary of Existing Environmental Studies

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

1. Areas where no storage, release, or disposal (including migration) has occurred
2. Areas where only release or disposal of petroleum products has occurred
3. Areas of contamination below action levels
4. Areas where all necessary remedial actions have been taken
5. Areas of known contamination with removal and/or remedial action underway
6. Areas of known contamination where required response actions have not been taken
7. Areas that are not evaluated or require further evaluation.

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

SAIC conducted an initial site investigation (SI) in 1992 to determine the presence or absence of potential environmental contamination resulting from previous military training activities at the

site. Four soil borings T38-S01, T38-S02, T38-S03and T38-S04 were advanced at the site. Two of the borings, T38-S01 and T38-S02, were downhill from the concrete pad located in the northeastern corner of the site. Boring T38-S03 was located in the vicinity of a reportedly possible drum burial site in the southern portion of the site. Boring T38-S04 was placed in the vicinity of the reportedly former disposal pit area located in the central eastern portion of the site. All soil samples were collected and field screened for chemical warfare agents, HD, nerve agent VX, and GB using miniature continuous air monitoring system (MINICAMS). Soil samples were collected by the U.S. Army Technical Escort Unit (USATEU) with SAIC oversite. The USATEU determined that chemical warfare agent (CWA) were below the alert limit of 0.8 Time Weighted Average (TWA) for the MINICAMS instrument at all sampled locations.

In addition to the field screening, two soil samples were collected from each of the four soil borings at 1 foot bls and 5 feet bls. The soil samples were analyzed for chemical agent degradation products, using USATHMA Method LL03 (organosulfur compounds including 1,4-oxathiane, 1,4-dithiane, p-chlorophenyl-methylsulfoxide, and p-chlorophenylmethylsulfone), USATHMA Method AAA9 (isopropylmethyl phosphonic acid and methyl phosphonic acid in soil), USATHMA Method 99 (Isopropylamine in soil), USATHMA Method TT9 (diisopropylmethylphosphonate and dimethylmethylphosphonate in soil), and USATHMA Method LW18 (Thiodiglycol and Chloroacetic Acid). Soil analytical results indicated that chemical agent degradation products were below certified reporting limits for all samples. The locations of the soil borings and soil samples collected during the SI field investigation are shown on Figure 2-1.

Because of the uncertainty associated with the location of the former disposal pit and the potentially buried drums site, additional supplemental RI activities were performed. The supplemental RI was conducted in 1994 and 1995 to determine the presence, nature, and extent of potential environmental contamination resulting from previously controlled U.S. Army CWA training activities and chemical waste disposal activities at the site. Supplemental remedial investigations included the field screening of CWA using MINICAMS on 72 soil samples from 47 locations. Sample locations T38-1 through T38-42 and T38-S05 to T38-S09 were screened to supplement previous sampling at the location of historical training activity, and to fill gaps in the overall site coverage. Samples were analyzed for HD, GB, and VX. Chemical warfare agents were not detected above the 0.8 TWA in any of the screened samples.

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ENGR. CHCK. BY: A. MAYILA	PROJ. MGR.: J. YACOUB
STARTING DATE: 01/20/00	DWG. NO.: ...\796887es.042
DRAWN BY: D. BILLINGSLEY	PROJ. NO.: 796887
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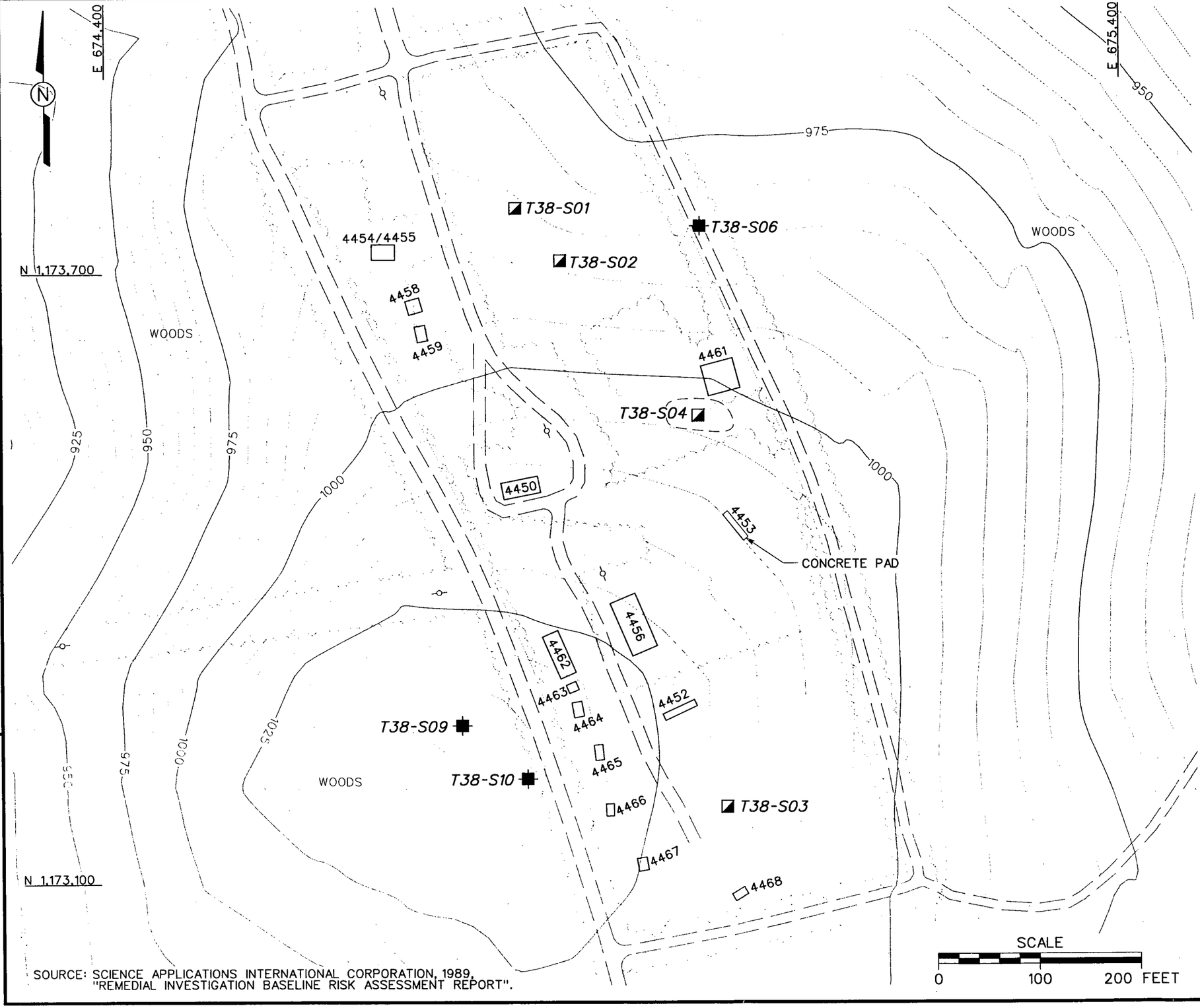

LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- INFERRED DISPOSAL PIT AREA
- SAIC SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- SAIC SUBSURFACE SOIL SAMPLE LOCATION

SOURCE: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION, 1989, "REMEDIAL INVESTIGATION BASELINE RISK ASSESSMENT REPORT".

FIGURE 2-1
SOIL SAMPLE LOCATION MAP 1992 AND 1995 TRAINING AREA T-38, FORMER TECHNICAL ESCORT REACTION AREA PARCEL 186(6)

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

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Four subsurface soils were collected from three borings T38-S06, T38-S09, and T38-S10 during RI activities. Samples were analyzed for volatile organic compounds (VOC), semivolatile organic compounds (SVOC), pesticides, polychlorinated biphenyls (PCB), explosives, metals, and HD, GB, and VX breakdown products. Analytical results indicated that metals, pesticides and nontarget, unidentified, and unknown SVOCs were detected in some soil samples. No target SVOCs were detected at concentrations greater than the reporting limits. VOCs, PCBs, and HD, GB, and VX breakdown products were not detected in soil samples at the site.

Metals detected included aluminum (15,500 to 74,0000 micrograms per gram [µg/g]), antimony (1.35 µg/g), barium (29.6 to 113 µg/g), calcium (255 to 1510 µg/g), chromium (17.1 to 150 µg/g), cobalt (5.05 to 37.5 µg/g), copper (15.3 to 61.7 µg/g), iron (37,900 to 180,000 µg/g), lead (15.5 to 84 µg/g), magnesium (540 to 1230 µg/g), manganese (221 to 666 µg/g), mercury (0.114 to 0.266 µg/g), nickel (7.72 to 107 µg/g), potassium (558 to 2090 µg/g), vanadium (28.1 to 186 µg/g), and zinc (55.1 to 230 µg/g).

Four pesticides, 4,4'-dichlorodiphenyldichloroethane (DDD), 4,4'-dichlorodiphenyl-trichloroethane (DDT), 4,4'-dichlorodiphenyldichloroethene (DDE), and Aldrin were detected in the soil samples collected from borings T38-S09 and T38-S10 at the site. 4,4'-DDD and 4,4'-DDT were detected at concentrations of 0.00398 and 0.0053 µg/g, respectively, in the duplicate surface soil sample collected from boring T38-S09. 4,4'-DDE was found in boring T38-S09 in the duplicate surface soil sample at a concentration of 0.00631 µg/g and in the original soil sample collected from a 45 feet depth interval at a concentration of 0.00353 µg/g. Aldrin was detected in boring T38-S09 in surface soil at a concentration of 0.00552 µg/g and at a 45 feet depth interval at a concentration of 0.00415 µg/g, respectively, and in boring T38-S10 at 0.5 depth interval at a concentration of 0.0014 µg/g. Pesticides were not detected in boring T38-S06. Table 2-1 summarizes soil analytical results from RI sampling activities.

Five groundwater monitoring wells (T38-G05 through T38-G09) were installed during RI activities. Four wells were initially installed and sampled during July 1994 and February 1995, however, an additional well (T38-G09) was installed as an upgradient well after groundwater contamination was detected in the four original wells. The wells were sampled and water analyzed for VOCs, SVOCs, pesticides, PCBs, explosives, metals, and HD, GB, and VX breakdown products.

Table 2-1

Summary of Soil Analytical Results
1994 Remedial Investigation
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Site ID	T38-S06	T38-S09	T38-S09	T38-S09	T38-S10
Field Sample No.	SAIC01	SAIC01	SAIC02D	SAIC03	SAIC01
Sample Matrix	Soil/Boring	Soil/Boring	Soil/Boring	Soil/Boring	Soil/AHOL
Collection Date	5/10/94	6/2/94	6/2/94	6/3/94	5/10/94
Depth (ft)	1	0	0	45	0.5
Sample Type	Original	Original	Duplicate	Original	Original
Metals (µg/g)					
Aluminum	74000	38700	30700D	15500	18500
Antimony	ND (1.0)	1.35	ND (1.0)	ND (1.0)	ND (1.0)
Barium	60.6	113	39 D	29.6	103
Calcium	287	1100	1510 D	255	663
Chromium	53.6	40.1	150 D	26.3	17.1
Cobalt	5.05	8.89 I	ND (2.50)	37.5	6.12 I
Copper	20.3 I	15.3	23.0 D	61.7	23.2 I
Iron	54200	37900	180000 D	75000	20500
Lead	17.4	17.7	15.5 D	17.2	84
Magnesium	1050	1230	540 D	1090	866
Manganese	263	461	310 D	221	666
Mercury	0.266	ND (0.5)	0.114 D	ND (0.5)	ND (0.5)
Nickel	16.7	12.2	12.6 D	107	7.72
Potassium	827	715	850 D	2090	558
Vanadium	85.2	61.6	186 D	59.8	28.1
Zinc	55.1	38.9	30.7 D	230	26.3
Pesticides (µg/g)					
4,4'-DDD	ND (0.0027)	ND (0.0027)	0.00398 DC	ND (0.0027)	ND (0.0027)
4,4'-DDE	ND (0.0027)	ND (0.0027)	0.00631 DC	0.00353 C	ND (0.0027)
4,4'-DDT	ND(0.0035)	ND(0.0035)	0.00530 DC	ND(0.0035)	ND(0.0035)
Aldrin	ND (0.0014)	0.00552 U	0.00524 DU	0.00415 U	0.0014

µg/g - Micrograms per gram.
ND - Not detected.
U - Analysis was unconfirmed.
D - Duplicate analysis.
C - Analysis was confirmed.

Metals, volatile and semi-volatile organic compounds, pesticides, and explosives were detected in groundwater at the site. Eight VOCs including acetone, carbon tetrachloride, chloroform, 1,1,2,2-tetrachloroethane (TCA), 1,2-dichloroethene (total) (DCE), trichloroethene (TCE), 1,1,2-TCA, and tetrachloroethene (PCE) were detected in groundwater at the site.

1,1,2,2-Tetrachloroethane (PCA) was detected in wells T38-G05 through T38-G08 at concentrations ranging from 95 to 2,000 micrograms per liter (µg/L) with the highest concentration in well T38-G06. TCE, at concentrations ranging from 12 to 300 µg/L, was detected in wells T38-G05 through T38-G08 with the highest concentrations in well T38-G06. Total 1,2-DCE was found in wells T38-G06 and T38-G07 at concentrations ranging from 31 to 93 µg/L, with the highest concentration in well T38-G06. Acetone (47 to 77 µg/L), carbon tetrachloride (11 to 53 µg/L), and chloroform (6.8 to 9.2 µg/L) were detected in wells T38-G06 and T38-G07 with maximum concentrations found in well T38-G07. Acetone, carbon tetrachloride, and chloroform were not detected in wells T38-G05 and T38-G08. 1,1,2-TCA and PCE were each found in only one well. 1,1,2-TCA was detected in well T38-G05 at a concentration of 2.1 µg/L. PCE was detected in well T38-G06 at a concentration of 13 µg/L. Organic compound concentrations were below detection limits in well T38-G09. Figure 2-2 shows organic compound concentrations in groundwater.

The organic solvents detected in groundwater at Training Area T-38; acetone, carbon tetrachloride, 1,1,2,2-PCA, PCE, chloroform, and TCE are most likely associated with the use of decontamination solutions.

SVOCs detected included benzo(b)fluoranthene, bis(2-Ethylhexyl)phthalate, chrysene, and indeno(1,2,3-cd)pyrene. Benzo(b)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene were found in only one well, T38-G09, at concentrations of 0.247 (also found in the quality control [QC] blank), 0.0509, and 0.81 µg/L, respectively. Bis(2-Ethylhexyl)phthalate was detected in wells T38-G05, T38-G06, and T38-G09 at concentrations of 32, 3.4, and 11 µg/L, respectively.

Six pesticides including alpha-BHC (0.0067 to 0.129 µg/L), delta- betahexachlorocyclohexane (BHC) (0.00441 and 0.00483 µg/L), endrin aldehyde (0.0995 to 0.133 µg/L), heptachlor (0.00597 to 0.00688 µg/L), heptachlor epoxide (0.0646 µg/L), and isodrin (0.00523 to 0.0083 µg/L) were detected in wells T38-G05 through T38-G08. Pesticide analytical results were unconfirmed and pesticides were found in method blank or QC blank samples.

DWG. NO.: ...\796887es.043 | PROJ. NO.: 796887
INITIATOR: A. MAYILA | PROJ. MGR.: J. YACOUB
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DATE LAST REV.: | DRAWN BY:
STARTNG DATE: 01/18/00 | DRAWN BY: D. BILLINGSLEY
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DBILLING
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E 673,900
E 675,600
E 677,000
N 1,174,500
N 1,173,500
N 1,172,500

CWM-186-SEEP02
CWM-186-SEEP03
CWM-186-SEEP01
CWM-186-SEEP04
T38-G05
T38-G06
T38-G07
T38-G08
T38-G09

Sample Identification		SEEP02	SEEP02
Sample Date		1/14/00	8/09/00
Acetone	ug/L	ND	ND
Carbon Tetrachloride	ug/L	1.60 J	ND
Chloroform	ug/L	0.60 J	ND
Chloromethane	ug/L	ND	ND
1,2-Dichloroethene (total)	ug/L	ND	ND
cis-1,2-Dichloroethene	ug/L	3.30	ND
trans-1,2-Dichloroethene	ug/L	0.63J	ND
1,1,2,2-Tetrachloroethane	ug/L	45	ND
Tetrachloroethene	ug/L	0.82J	ND
1,1,2-Trichloroethane	ug/L	0.73J	ND
Trichloroethene	ug/L	15	0.74 J

Sample Identification		SEEP03	SEEP03
Sample Date		1/14/00	8/09/00
Acetone	ug/L	ND	1.1 J
Carbon Tetrachloride	ug/L	ND	1.0 J
Chloroform	ug/L	ND	0.69 J
Chloromethane	ug/L	ND	ND
1,2-Dichloroethene (total)	ug/L	ND	ND
cis-1,2-Dichloroethene	ug/L	ND	2.4
trans-1,2-Dichloroethene	ug/L	ND	ND
Methylene chloride	ug/L	ND	0.36 J,B
1,1,2,2-Tetrachloroethane	ug/L	0.52 J	21
Tetrachloroethene	ug/L	ND	0.44 J
1,1,2-Trichloroethane	ug/L	ND	ND
Trichloroethene	ug/L	0.82 J	46

Sample Identification		T38-G05	T38-G05
Sample Date		7/19/94	2/3/95
Acetone	ug/L	ND	ND
Carbon Tetrachloride	ug/L	ND	ND
Chloroform	ug/L	ND	ND
Chloromethane	ug/L	ND	ND
1,2-Dichloroethene (total)	ug/L	ND	ND
cis-1,2-Dichloroethene	ug/L	ND	ND
trans-1,2-Dichloroethene	ug/L	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	500	300
Tetrachloroethene	ug/L	ND	ND
1,1,2-Trichloroethane	ug/L	ND	2.1
Trichloroethene	ug/L	46	4.2

Sample Identification		T38-G06	T38-G06
Sample Date		7/19/94	2/3/95
Acetone	ug/L	ND	47
Carbon Tetrachloride	ug/L	12	11
Chloroform	ug/L	8.7	6.8
Chloromethane	ug/L	ND	ND
1,2-Dichloroethene (total)	ug/L	93	77
cis-1,2-Dichloroethene	ug/L	ND	ND
trans-1,2-Dichloroethene	ug/L	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	2000	700
Tetrachloroethene	ug/L	13	ND
1,1,2-Trichloroethane	ug/L	ND	ND
Trichloroethene	ug/L	300	300

Sample Identification		T38-G07	T38-G07
Sample Date		7/19/94	2/3/95
Acetone	ug/L	ND	77
Carbon Tetrachloride	ug/L	41	53
Chloroform	ug/L	9.2	8.5
Chloromethane	ug/L	ND	ND
1,2-Dichloroethene (total)	ug/L	31	36
cis-1,2-Dichloroethene	ug/L	ND	ND
trans-1,2-Dichloroethene	ug/L	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	500	600
Tetrachloroethene	ug/L	ND	ND
1,1,2-Trichloroethane	ug/L	ND	ND
Trichloroethene	ug/L	200	200

Sample Identification		T38-G08	T38-G08
Sample Date		7/19/94	2/3/95
Acetone	ug/L	ND	ND
Carbon Tetrachloride	ug/L	ND	ND
Chloroform	ug/L	ND	ND
Chloromethane	ug/L	ND	ND
1,2-Dichloroethene (total)	ug/L	ND	ND
cis-1,2-Dichloroethene	ug/L	ND	ND
trans-1,2-Dichloroethene	ug/L	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	95	110
Tetrachloroethene	ug/L	ND	ND
1,1,2-Trichloroethane	ug/L	ND	ND
Trichloroethene	ug/L	12	17

Sample Identification		T38-G09	T38-G09
Sample Date		4/27/94	6/26/95
Acetone	ug/L	ND	ND
Carbon Tetrachloride	ug/L	ND	ND
Chloroform	ug/L	ND	ND
Chloromethane	ug/L	ND	ND
1,2-Dichloroethene (total)	ug/L	ND	ND
cis-1,2-Dichloroethene	ug/L	ND	ND
trans-1,2-Dichloroethene	ug/L	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	ND	ND
Tetrachloroethene	ug/L	ND	ND
1,1,2-Trichloroethane	ug/L	ND	ND
Trichloroethene	ug/L	ND	ND

Sample Identification		SEEP01
Sample Date		1/14/00
Acetone	ug/L	ND
Carbon Tetrachloride	ug/L	0.42 J
Chloroform	ug/L	0.68J
Chloromethane	ug/L	0.14 J
1,2-Dichloroethene (total)	ug/L	ND
cis-1,2-Dichloroethene	ug/L	0.35 J
trans-1,2-Dichloroethene	ug/L	ND
1,1,2,2-Tetrachloroethane	ug/L	1.0
Tetrachloroethene	ug/L	ND
1,1,2-Trichloroethane	ug/L	0.36 J
Trichloroethene	ug/L	55 E

Sample Identification		SEEP04
Sample Date		1/28/00
Acetone	ug/L	ND
Carbon Tetrachloride	ug/L	ND
Chloroform	ug/L	ND
Chloromethane	ug/L	ND
1,2-Dichloroethene (total)	ug/L	ND
cis-1,2-Dichloroethene	ug/L	ND
trans-1,2-Dichloroethene	ug/L	ND
1,1,2,2-Tetrachloroethane	ug/L	ND
Tetrachloroethene	ug/L	ND
1,1,2-Trichloroethane	ug/L	ND
Trichloroethene	ug/L	ND

WOODS
RESERVOIR RIDGE
1ST AVENUE

SOURCE: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION, 1999, "REMEDIAL INVESTIGATION BASELINE RISK ASSESSMENT REPORT".

SCALE
0 300 600 FEET

LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- INFERRED DISPOSAL PIT AREA
- ug/L — MICROGRAMS PER LITER
- ⊕ — SAIC RESIDUUM MONITORING SAMPLE LOCATION
- ⊛ — PROPOSED SEEP/SPRING WATER SAMPLE LOCATION
- J — ANALYTE DETECTED IN METHOD BLANK AT CONCENTRATION GREATER THAN THE REPORTING LIMIT (AND GREATER THAN ZERO)
- B — ANALYTE DETECTED IN LABORATORY OR FIELD BLANK AT CONCENTRATION GREATER THAN THE REPORTING LIMIT (AND GREATER THAN ZERO)
- E — EXCEEDS INSTRUMENT CALIBRATION RANGE
- ND — NOT DETECTED

NOTE:

1. SEEP SAMPLES ANALYSIS PERFORMED FOR SCREENING PURPOSES ONLY. THERE WAS NOT ANY QUALITY ASSURANCE/ QUALITY CONTROL SAMPLING/ANALYSIS PERFORMED.

FIGURE 2-2
ORGANIC COMPOUNDS CONCENTRATIONS IN GROUNDWATER AND SEEPS
TRAINING AREA T-38, FORMER TECHNICAL ESCORT REACTION AREA PARCEL 186(6)

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

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Three explosives including 1,3-dinitrobenzene, 1,3,5-trinitrotoluene, and nitroglycerine were detected in groundwater at the site. Nitrogylcerine was found in wells T38-G05 through T38-G08 at concentrations ranging from 2.04 to 3.40 µg/L. 1,3-dinitrobenzene was detected in only one well, T38-G07 at a concentration of 0.563 µg/L (unconfirmed). 1,3,5-trinitrotoluene was found at concentrations of 0.291 and 0.281 µg/L in wells T38-G08 and T38-G09, respectively. A summary of compounds detected in groundwater is presented in Table 2-2.

Surface electromagnetic (EM) geophysical surveys were conducted in two areas; the reported area of a former sump located in the central eastern portion and the reported site of a buried drum in the southern portion of the site. In addition, a tandem magnetometer survey (STOLS) was conducted over open areas of the site. Results of the surveys were inconclusive.

During a recent site visit (December 1999), IT observed four seep locations (CWM-186-SEEP01, CWM-186-SEEP02, CWM-186-SEEP03, and CWM-186-SEEP04) at topographically low spots relative to the site. CWM-186-SEEP01 is located at approximately 650 feet southwest of the Training Area at an elevation of 855 feet mean sea level (msl). CWM-186-SEEP02 discharges into Cane Creek at an elevation of approximately 830 feet msl, 900 feet north of the site. CWM-186-SEEP03, is located at approximately 750 feet northeast of the Training Area at an elevation of 875 feet msl and CWM-186-SEEP04 is located to the southeast of the site at approximately 1,050 feet and at an elevation of 900 feet msl. Water samples were collected from all four seep locations for screening purposes to confirm or deny the presence of contamination in the discharged water.

Preliminary results indicate that site related organic compounds were found in three of the four water samples. TCE and 1,1,2,2-PCA were detected in CWM-186-SEEP01, CWM-186-SEEP02, and CWM-186-SEEP03. TCE was found at concentrations of 55 µg/L (estimated), 15 µg/L, and 0.82 µg/L (estimated) in CWM-186-SEEP01, CWM-186-SEEP02, and CWM-186-SEEP03, respectively. Concentrations of 1,1,2,2-PCA at 1 µg/L , 45 µg/L, and 0.52 µg/L (estimated) were detected in CWM-186-SEEP01, CWM-186-SEEP02, and CWM-186-SEEP03, respectively. Other organic compounds that were detected in CWM-186-SEEP01 and CWM-186-SEEP02 include; carbon tetrachloride at 0.42 µg/L (estimated) and 1.6 µg/L (estimated), chloroform at 0.68 µg/L (estimated) and 0.6 (µg/L [estimated], cis,-1,2-DCE at 0.35 µg/L (estimated) and 3.3 µg/L, and 1,1,2-TCA at 0.36 µg/L (estimated) and 0.73 µg/L (estimated),

Table 2-2

Summary of Groundwater Analytical Results
1994-1995 Remedial Investigation
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Site ID	T38-G05	T38-G05	T38-G06	T38-G06	T38-G07	T38-G07	T38-G08	T38-G08	T38-G09	T38-G09	T38-G09
Field Sample No.	SAIC01	SAIC02	SAIC01	SAIC02	SAIC01	SAIC02	SAIC01	SAIC02	SAIC01	SAIC02	SAIC03D
Sample Matrix	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
Collection Date	7/19/94	2/3/95	7/20/94	2/3/95	7/19/94	2/3/95	7/19/94	2/3/95	4/27/95	6/26/95	6/26/95
Depth (ft)	58	57.2	69	67.9	90	87.1	94	94.7	134.8	133.4	133.4
Sample Type	Original	Original	Original	Original	Original	Original	Original	Original	Original	Original	Duplicate
VOCs (µg/L)											
Acetone	ND (8.0)	ND (8.0)	ND (8.0)	47	ND (8.0)	77	ND (8.0)	ND (8.0)	ND (8.0)	ND (8.0)	ND (8.0)
Carbon Tetrachloride	ND (1.0)	ND (1.0)	12	11	41	53	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Chloroform	ND (1.0)	ND (1.0)	8.7	6.8	9.2	8.5	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
1,1,2,2-Tetrachloreoethane	500	300	2000	700	500	600	95	110	ND(1.5)	ND(1.5)	ND(1.5)
1,2-Dichloroethene (total)	ND (5.0)	ND (5.0)	93	77	31	36	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
1,1,2-Trichloroethane	ND (1.0)	2.1	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Trichloroethene	46	42	300	300	200	200	12	17	ND	ND	ND
Tetrachloroethene	ND (1.0)	ND (1.0)	13	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
SVOCs (µg/L)											
Benzo(b)fluoranthene	ND(0.0402)	ND(0.0402)	ND(0.0402)	ND(0.0402)	ND(0.0402)	ND(0.0402)	ND(0.0402)	ND(0.0402)	0.247B	ND(10)	ND(0.0384)
bis(2-Ethylhexyl)phthalate	32	ND(7.70)	3.4	ND(7.70)	ND(7.70)	ND(7.70)	ND(7.70)	ND(7.70)	11	ND(7.70)	ND(7.70)
Chrysene	ND(0.0195)	ND(0.0195)	ND(0.0195)	ND(0.0195)	ND(0.0195)	ND(0.0195)	ND(0.0195)	ND(0.0195)	0.0509	ND(7.40)	ND(0.0194)
Indeno(1,2,3-cd)pyrene	ND(0.01916)	ND(0.01916)	ND(0.01916)	ND(0.01916)	ND(0.01916)	ND(0.01916)	ND(0.01916)	ND(0.01916)	ND(0.01916)	ND(21)	0.0810D
Pesticides (µg/L)											
alpha-BHC	ND(0.0250)	ND(0.0250)	ND(0.0250)	0.129U	ND(0.0250)	0.00977U	ND(0.0250)	0.0067U	ND(0.0250)	ND(0.0250)	ND(0.0250)
delta-BHC	0.00441U	ND(0.0034)	0.00483U	ND(0.0034)	ND(0.0034)	ND(0.0034)	ND(0.0034)	ND(0.0034)	ND(0.0034)	ND(3.0R)	ND(3.0DR)
Endrin Aldehyde	ND(0.0504)	0.0995UB	ND(0.0504)	ND(0.0504)	ND(0.0504)	0.133UB	ND(0.0504)	0.124UB	ND(0.0504)	ND(5)	ND(5R)
Heptachlor	ND(0.0025)	0.00598UB	ND(0.0025)	0.00597UB	ND(0.0025)	0.00688UB	ND(0.0025)	0.00606UB	ND(0.0025)	ND(38)	ND(38D)
Heptachlor Epoxide	ND(0.0063)	ND(0.0063)	ND(0.0063)	ND(0.0063)	ND(0.0063)	ND(0.0063)	ND(0.0063)	0.0646U	ND(0.0063)	ND(28)	ND(28D)
Isodrin	ND(0.0250)	0.0083UB	ND(0.0250)	0.00552UB	ND(0.0250)	0.0073UB	ND(0.0250)	0.00523UB	ND(0.0250)	ND(7.8)	ND(7.8)
Explosives (µg/L)											
1,3-Dinitrobenzene	ND(0.458)	ND(0.458)	ND(0.458)	ND(0.458)	0.563U	ND(0.458)	ND(0.458)	ND(0.458)	ND(0.458)	NF	10DR
1,3,5-Trinitrotoluene	ND(0.210)	ND(0.210)	ND(0.210)	ND(0.210)	ND(0.210)	ND(0.210)	0.291	ND(0.210)	0.281	NF	NF
Nitroglycerine	ND(1.49)	2.04	ND(1.49)	3.40Q	ND(1.49)	2.18Q	ND(1.49)	2.45	ND(1.49)	NF	NF
Metals (µg/L)											
Aluminum	753	2620	436	748	2580	1140	657	937	1700	2070	1060D

Table 2-2

Summary of Groundwater Analytical Results
1994-1995 Remedial Investigation
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Site ID	T38-G05	T38-G05	T38-G06	T38-G06	T38-G07	T38-G07	T38-G08	T38-G08	T38-G09	T38-G09	T38-G09
Field Sample No.	SAIC01	SAIC02	SAIC01	SAIC02	SAIC01	SAIC02	SAIC01	SAIC02	SAIC01	SAIC02	SAIC03D
Sample Matrix	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
Collection Date	7/19/94	2/3/95	7/20/94	2/3/95	7/19/94	2/3/95	7/19/94	2/3/95	4/27/95	6/26/95	6/26/95
Depth (ft)	58	57.2	69	67.9	90	87.1	94	94.7	134.8	133.4	133.4
Sample Type	Original	Original	Original	Original	Original	Original	Original	Original	Original	Original	Duplicate
Barium	92.6	146	13	55	65.4	31.3	241	262	41.8	40.4	24.9D
Beryllium	ND (1.12)	1.72	ND (1.12)	ND (1.12)	2.84	1.14	ND (1.12)	ND (1.12)	ND (1.12)	ND (1.12)	ND (1.12)
Calcium	5890	7180	921	4040	5740	6870	2330	1830	3290	3040	3120D
Iron	3300	12800	1460	2620	12100	5600	5010	7450	7290	7420	3710D
Lead	ND (4.47)	7.9	ND (4.47)	ND (4.47)	ND (4.47)	15.2	ND (4.47)	ND (4.47)	12.8	N/A	N/A
Magnesium	3940	4260	408	484	2340	1740	989	1010	2190	2100	1770D
Manganese	464	768	101	145	709	206	3100	3160	394	406	353D
Mercury	ND (0.1)	0.266	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	N/A	N/A
Nickel	ND (32.1)	ND (32.1)	ND (32.1)	ND (32.1)	ND (32.1)	ND (32.1)	34.8	46.3	ND (32.1)	ND (32.1)	ND (32.1)
Potassium	2610	2880	3990	7520	7650	5130	4710	5170	3490	3070	3030D
Sodium	1830	1760	1830	3920	1990	1750	1910	1480	5080	4580	5150D
Zinc	27	55.9	21.8	24.5	51.2	26.9	79.5	54.6	321	241M	308D M

µg/L - Micrograms per liter.
ND(1.23) - Not detected (Reporting Limit).
U - Analysis was unconfirmed.
B - Analyte was found in the method blank or QC blank.
M - The high-spike recovery is high.
R - the data is rejected.
D - Duplicate analysis.

respectively. PCE and trans-1,2-DCE were only found in CWM-186-SEEP02 at concentrations of 0.82 µg/L (estimated) and 0.63 µg/L (estimated) respectively. Chloromethane was detected in CWM-186-SEEP02 at a concentration of 0.14 µg/L (estimated). A second set of seep samples were collected from CWM-186-SEEP02 and CWM-186-SEEP03 in August 2000 to provide information on determining monitoring well locations. The results of the August 2000 sampling event are presented in Table 2-3 and Figure 2-2.

Table 2-3

Summary of Seep Water Analytical Results
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample ID	SEEP01	SEEP02	SEEP02	SEEP03	SEEP03	SEEP04
Collection Date	1/14/00	1/14/00	8/9/00	1/14/00	8/9/00	1/28/00
Volatile Organic Compounds (µg/L)						
Acetone	ND	ND	ND	ND	1.4 J	ND
Carbon tetrachloride	0.42 J	1.60 J	ND	ND	1.0 J	ND
Chloroform	0.68 J	0.60 J	ND	ND	0.69 J	ND
Chloromethane	0.14 J	ND	ND	ND	ND	ND
1,2-Dichloroethene (total)	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	0.35 J	3.30	ND	ND	2.4	ND
trans-1,2-Dichloroethene	ND	0.63 J	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	1.0	45	ND	0.52 J	21	ND
Tetrachloroethene	ND	0.82 J	ND	ND	0.44 J	ND
1,1,2-Trichloroethane	0.36 J	0.73 J	ND	ND	ND	ND
Trichloroethene	55 E	15	0.74 J	0.82 J	46	ND
Methylene chloride	ND	ND	ND	ND	0.36 J,B	ND

ND - Not detected.
J - Value reported between minimum detection limit (MDL) and reporting limit (RL).
B- in associated method blank
E - Exceeds instrument calibration range.
µg/L - Micrograms per liter.
Note: Analyses performed for screening purposes only; no quality assurance/ quality control analyses performed

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 future action for the Training Area T-38 site. 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 the Training Area T-38 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 supplemental RI and establish a basis for future action at this site.

To support the RI at Training Area T-38, two types of samples will be collected: groundwater screening samples, and investigation water and soil matrix samples. The DQOs for groundwater screening samples will be different than the confirmatory samples as data from these screening samples will be primarily used to provide a snapshot of groundwater conditions and assist in placing the permanent monitoring wells and selecting screened interval depths. They will not be used for performing risk evaluations. As shown on Table 3-1, the analytical level has been defined as screening level with laboratory certificate of analysis deliverables. This screening data will not be validated.

The RI water and soil matrix 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 quality assurance plan (QAP). Data will be reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah (CESAS) Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported via hard copy data packages by the laboratory using Contract Laboratory Program (CLP)-like forms. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

3.2 Data Users and Available Data

The intended data users and available data related to the supplemental RI SFSP at Training Area T-38, presented in Table 3-1, have been used to formulate a site-specific conceptual model. This conceptual model was developed to support the development of this supplemental RI SFSP, which is necessary to meet the objectives of these activities and to establish a basis for future action at the site. The data users for information generated during field activities are primarily EPA, USACE, ADEM, FTMC, and the USACE supporting contractors. This supplemental RI 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 defensible information required to confirm or deny the existence and nature of residual chemical contamination in site media.

3.3 Conceptual Site Exposure Model

The conceptual site exposure model (CSEM) provides the basis for identifying and evaluating the 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 consistent and comprehensive evaluation of 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 with a contaminated source medium.

Primary contaminant releases were probably leaks and spills that entered surface soil, and potentially through the burial of wastes. Potential contaminant transport pathways include infiltration and leaching to subsurface soil and groundwater, biotransfer to fish and venison, dust emissions and volatilization to ambient air, groundwater to surface water, surface water runoff, and erosion to surface water and sediment.

Current site use is best described as mostly fenced, unused land. However, a portion of the area of concern is not fenced and is wooded, providing hunting habitat. Plausible receptors under current land-use scenarios are likely to include the groundskeeper who maintains the landscaped areas surrounding the buildings on site, and a recreational site user who may fish or hunt on the land outside of the fenced area. Other potential receptors considered, but not included under current land-use scenarios, are the:

- 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.
- Recreational Site User: The site is planned for use as open space, and the fencing now erected at the site may be removed or altered. Fishing and hunting are potential exposure pathways for the recreational site user.
- A summary of relevant contaminant release and transport mechanisms, source and exposure media, and receptors and exposure pathways for this site is provided in Table 3-1 and Figure 3-1.

Future land use in this area will be open space and may not be deemed safe for public access until remediation has been completed because of the potential for UXO (FTMC, 1997). Plausible future land-use receptor scenarios addressed in the CSEM include:

- Resident: Although the site is expected to be used as open space and undeveloped, the resident is considered in order to provide information for the project manager and regulators.
- Groundskeeper: The site will likely continue to have areas that will need to be maintained.
- Construction Worker: Although the site is not expected to be developed, construction or demolition may occur during the future, thus this receptor is evaluated.

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 Sections 3.2 and 4.3 of the installation-wide WP and will be followed during the supplemental RI at the Training Area T-38 site. Data uses and needs are summarized in Table 3-1.

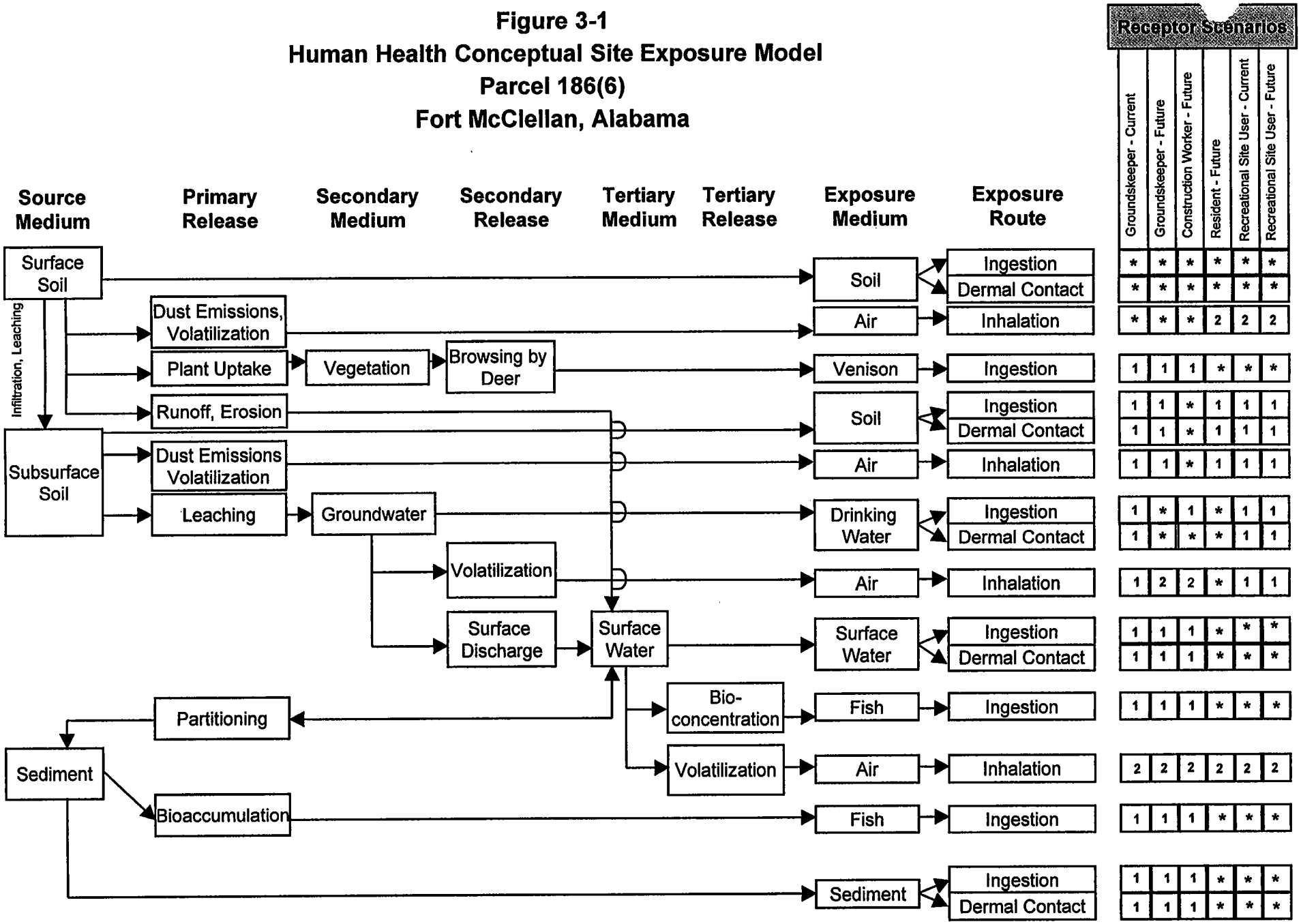
Table 3-1

Summary of Data Quality Objectives
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
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 IT Corporation Other Contractors Possible future land users	SAIC, Site Investigation Report, 1993 SAIC, Remedial Investigation Report, 1995 ESE, 1998 EPA, 1983 SAIC, Remedial Investigation/ Baseline Risk Assessment Report, 1999	<u>Contaminant Source</u> Decontaminating agents used on CWA. Toxic agents and munitions <u>Migration Pathways</u> Infiltration and leaching to subsurface soil and groundwater. Biotransfer to fish and venison. Dust emissions and volatilization from soil to ambient air. Surface water runoff. Erosion from soil to surface water and sediment. Groundwater (seep) discharge to surface water. <u>Potential Receptors</u> Groundskeeper, construction worker, resident, and recreational site user. <u>PSSC</u> decontaminating chemicals metals munitions	Surface Soil Subsurface Soil Groundwater Seep Water Surface Water Sediment Dep. Soil	Obtain sufficient data to support, as appropriate, the following: - Implementing an immediate response. - No further action. - Proceeding with an remedial action. RI to determine the nature and extent of contamination in the site media.	<u>Surface and Dep.Soil</u> TCL-VOCs TCL-SVOCs Metals Agent Breakdown Products Explosives	Definitive + CESAS Level B data	13 surface soil samples (13 residuum monitoring well boreholes) +QC 1 depositional soil sample
					<u>Subsurface Soil</u> TCL-VOCs TCL-SVOCs Metals Agent Breakdown Products Explosives	Definitive + CESAS Level B data	13 subsurface soil samples (13 residuum monitoring well boreholes) +QC
					<u>Groundwater</u> TCL-VOCs		17 locations approximately 115 samples
					<u>Groundwater</u> TCL-VOCs TCL-SVOCs Metals Agent Breakdown - Products Explosives	Definitive + CESAS Level B data	32 monitoring wells + QC (27 proposed wells, 5 existing wells)
					<u>Seep Water</u> TCL-VOCs TCL-SVOCs Metals Agent Breakdown Products Explosives	Definitive + CESAS Level B data	4 seep water samples +QC
					<u>Surface Water</u> TCL-VOCs TCL-SVOCs Metals Agent Breakdown Products Explosives	Definitive + CESAS Level B data	6 surface water samples +QC
					<u>Sediment</u> TCL-VOCs TCL-SVOCs Metals Agent Breakdown Products Explosives	Definitive + CESAS Level B data	6 sediment samples + QC

ADEM - Alabama Department of Environmental Management.
CESAS - Corps of Engineers South Atlantic Savannah.
CWM - Chemical warfare materials.
DOD - U.S. Department of Defense.
EPA - U.S. Environmental Protection Agency.
ESE - Environmental Science and Engineering.
PSSC - Potential site-specific chemicals.
QC - Quality control.
RI - Remedial investigation.
SAIC - Science Application International Corporation.
TCL - Target compound list.
USACE - U.S. Army Corps of Engineers.
VOC - Volatile organic compound.
SVOC - Semi-volatile organic compound.

Figure 3-1
Human Health Conceptual Site Exposure Model
Parcel 186(6)
Fort McClellan, Alabama



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

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3.4.1 Risk Evaluation

Confirmation of contamination at the Training Area T-38 site will be based upon a comparison of detected site contaminants to the most current guidance criteria. The data will be reported and evaluated using EPA definitive data with CESAS Level B criteria. Data packages will contain reporting limits sufficient to determine whether the established guidance criteria are exceeded in site media. Definitive data will be adequate for confirming the presence of site contamination and for supporting additional decision-making steps, such as remedial action and risk assessment, if necessary.

3.4.2 Data Types and Quality

Surface and subsurface soil, groundwater including discrete water and monitoring well water, seep water, surface water and sediment will be sampled and analyzed to meet the objectives of the supplemental RI for the Training Area T-38 site. In association with these definitive samples, quality assurance (QA)/QC samples will be collected for sample types as described in Chapter 4.0 of this SFSP.

Before installation of the monitoring wells during the investigation, several groundwater screening samples will be collected to gather data about subsurface conditions. This data will be used to more accurately site the monitoring wells and select representative screened interval depths. The screening sample data will not be considered definitive; it will not be reported with data packages nor will it be validated. Instead, laboratory certificate of analysis deliverables only will be required. Specific information about these samples is found in Section 4.2 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 supplemental RI SFSP, 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 supplemental RI are provided in Chapter 9.0 of the QAP.

4.0 Technical Approach

4.1 Introduction

The purpose of the field investigations at Parcel 186(6) is to define the extent of contamination associated with previous site activities. However, several factors require consideration when designing a field program to achieve the purpose. A discussion of these factors follows.

4.1.1 Topographic Setting

Parcel 186(6) is situated near the crest of Reservoir Ridge, a local topographic high. The ridge attains a maximum elevation of 1,038 feet msl, with ground surface sloping away from Training Area T-38 on all sides. The northern and western slopes of the ridge are steep, with a maximum relief of 200 feet. Due to the location of the site, potential contaminants released on the ground surface at the site will have a natural tendency to follow surface drainage pathways away from the site.

4.1.2 Geology

Parcel 186(6) is situated in a complex structural geologic setting. Reservoir Ridge is located on the leading edge of the Jacksonville fault, a major thrust fault which influences the geology of the entire Main Post at FTMC. The trace of the fault has been mapped approximately 300 to 600 feet west of Training Area T-38. Bedrock east of the fault underlying Parcel 186(6), is Shady Dolomite. Bedrock west of the fault is mapped as the Floyd and Athens Shales, undifferentiated.

4.1.3 Hydrogeology

Parcel 186(6) is situated in a complex and poorly understood hydrogeologic setting. Groundwater elevations from five existing residuum monitoring wells suggest a groundwater divide is present, roughly following the axis of the ridge crest. Locally, groundwater flow in the residuum appears to be to in a radial pattern, based on the presence of four seeps located southwest, north, northeast, and southeast from the fenced area. The ridge crest is suspected to serve as a local groundwater recharge area.

Regional groundwater flow appears to be to the west-northwest (Scott, et. al, 1987), with the Choccolocco Mountains located to the east of Training Area serving as a regional recharge area.

It is unclear whether the groundwater elevations observed in the existing wells a Training Area T-38 are influenced by regional groundwater flow.

The Shady Dolomite forms a major aquifer system in Calhoun County, and outcrops in a roughly north-south linear pattern in the vicinity of Parcel 186(6). Groundwater associated with the Shady Dolomite is found in fractures and secondary solution features. Springs are not uncommon, and may occur at fault contacts and in topographic lows where the groundwater head intersects the ground surface. Four springs/seeps have been observed on the flanks of Reservoir Ridge. The spring designated CWM-186-SEEP01 is suspected to be associated with the fault contact; springs designated CWM-186-SEEP02, CWM-186-SEEP03, and CWM-186-SEEP04 appear to be springs/seeps at topographic low locations where the groundwater head intersects the ground surface. Groundwater discharge from springs CWM-186-SEEP01, CWM-186-SEEP02, and CWM-186-SEEP03 appears to be associated with Parcel 186(6). This observation is based on screening sample results indicating the presence of 1,1,2,2-PCA and trichloroethene which were also found in residuum monitoring wells at Training Area T-38.

Based on its location, the Jacksonville fault is suspected to deflect regional groundwater movement to the northeast-southwest following the general strike of the fault. This pathway occurs along the brecciated fault zone because of the potential of greater secondary permeability associated with the breccia, or because of the hydraulic barrier created by the juxtaposition of the Shady Dolomite to the Floyd/Athens Shales. However, the influence of the Jacksonville fault on groundwater movement in the vicinity of Parcel 186(6) has not been defined. Spring CWM-186-SEEP01 is believed to emanate at or near the fault, suggesting that the fault or the contact with the underlying shale serves as a hydraulic barrier to groundwater from the overlying Shady Dolomite.

4.1.4 Contaminants of Concern

Contaminants observed in groundwater beneath Training Area T-38 were also observed in spring water discharge at locations ranging from about 1100 to 1500 feet away from Training Area T-38 boundaries. Concentration of contaminants observed in the spring water discharges were one order of magnitude less than that observed in monitoring wells installed at Training Area T-38.

4.2 Objectives

Because of complex site conditions, a thorough understanding of the relationship between the geology and hydrogeology is necessary to define the factors controlling the extent of groundwater contamination associated with Training Area T-38. In order to achieve this, the objectives of the field investigations to be performed are as follows:

- Determine if groundwater discharge is occurring to the tributary of Cave Creek north of the site.
- Characterize and type groundwater discharge at springs and seeps in the immediate area of Training Area T-38.
- Determine the vertical and horizontal, groundwater type and flow directions; characterize groundwater data to define potential groundwater pathways. Evaluate groundwater parameters to define the nature of conduits between springs/seeps and groundwater.
- Determine the attitude of the Jacksonville fault and assess the relationship of the fault and secondary faulting, if present, to groundwater movement.

Information gathered as a result of determining the project objectives will provide a framework for subsequent investigations and remedial alternatives.

4.3 Approach

IT will perform field investigations using a 3-phase approach. This approach will be employed to allow for sequenced evaluations of each phase of data collection so that modification, if necessary, to subsequent phases of field investigations may be employed. A discussion of each phase of the proposed investigation follows.

4.3.1 Phase I

Phase I of the Supplemental RI will consist of the following:

- Surface water surveying
- Discrete groundwater sampling and vertical groundwater profiling
- Lithology/structure determination.

Surface water samples will be collected as part of a surface water survey along the east-west tributary of Cave Creek and along the adjacent, downstream portion of Cave Creek. Samples will be field screened for pH, temperature and specific conductivity, hardness, dissolved oxygen, turbidity and oxidation-reduction potential (redox) potential to determine if marked contrasts in data occur. These changes, if present, would define points along the tributary where groundwater may be discharging to the creek.

Temporary borings will be advanced in the area peripheral to the site to obtain discrete groundwater samples for vertical and horizontal characterization. Analysis performed will include major anion/cation analyses, alkalinity analyses with the addition of VOCs, analyzed. Spring/seep water will also be analyzed for major anions/cations and alkalinity. Field screening parameters such as temperature, pH, dissolved oxygen, turbidity, redox, and specific conductivity will also be measured. VOC analyses of discrete groundwater samples will be performed using a 48-hour turnaround time with no quality control/ quality assurance samples taken. This approach will present a snapshot of site conditions and provide a framework for determining monitoring well placement and subsequent confirmatory investigations which will provide data for risk evaluations. It is intended that sufficient characterization will be obtained from the boring data to type the groundwater and evaluate any potential correlation between the subsurface and surface discharges. This data will assist in evaluating pathways, groundwater retention time, and groundwater flow direction.

An additional purpose of the temporary borings will be to better define the subsurface attitude of the Jacksonville Fault and to assess the relationship of the fault and secondary faulting, if present, to groundwater flow. Borings will be advanced east of the fault trace into the Shady Dolomite to determine the plane of the fault at three locations. The locations will be selected to facilitate the determination of the attitude of the fault by descriptive geometry (i.e., three-point determination). Lithologic data will be collected from the temporary borings advanced for the discrete groundwater sample collection, and provide detailed information on the structural geology.

4.3.2 Phase II

Phase II of the supplemental RI will consist of the installation of ten residuum and seventeen bedrock monitoring wells. Thirteen surface and thirteen subsurface soil samples will also be

collected at the residuum monitoring well locations. Proposed soil sample and monitoring well locations are described in Section 5.0, however based on the results of the Phase I field screening data and lithologic data, locations of the Phase II field activities may be modified to provide extent of contamination information.

4.3.3 Phase III

Phase III of the supplemental RI will consist of monitoring well, spring/seep, surface water, and sediment sampling. Potential spring/seep locations, which may be identified during Phase I activities but are currently not identified, will also be sampled at this time. Sample media will be submitted for confirmatory analyses following QA/QC methodology outlined in Section 5.5. Groundwater elevations from well pairs will be measured to construct groundwater flow maps and to determine vertical groundwater flow gradients.

If based on the CWM engineering evaluation and cost analysis (EE/CA), contaminant sources are identified in the fenced area, additional intrusive sampling within the fenced area of Training Area T-38 may be performed. Furthermore, if based on the results of the proposed investigations, the extent of groundwater contamination has not been defined, additional investigations may be performed.

5.0 Field Investigations

Prior to IT conducting any field activities at Training Area T-38, USACE-Huntsville will clear the site for CWM. Therefore, data related to CWM will not be collected as part of this supplemental RI, however data related to CWM breakdown products will be collected as part of the supplemental RI. A CWM investigation will be provided in the CWM EE/CA being prepared by USACE-Huntsville (Parsons, 1999).

5.1 UXO Survey Requirements and Utility Clearance

Training Area T-38 falls within the "Possible Explosive Ordnance Impact Area" shown on Plate 10 of the FTMC Archive Search Report, Maps (USACE, 1999a). The presence of UXO and chemical warfare agents is suggested at the Training Area T-38 site. Therefore, IT will conduct UXO avoidance activities, including surface sweeps and downhole surveys of soil borings in addition to conducting utility clearances before installing soil borings.

5.1.1 Surface UXO Survey

An 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 easy avoidance. UXO personnel requirements, procedures, and detailed descriptions of the geophysical equipment to be used are provided in Chapter 4.0 and Appendices D and E of the approved SAP (IT, 1998a).

5.1.2 Downhole UXO Survey

During the soil boring and downhole sampling activities, a downhole UXO survey will be performed to determine if buried metallic objects are present. UXO monitoring, as described in Chapter 4.0 of the SAP (IT, 1998a), will continue until undisturbed soils are encountered or the borehole has been advanced to 12 feet bgs, whichever is reached first.

5.1.3 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 all locations where soil and groundwater samples will be collected, using the procedure outlined in Section 4.2.6 of the SAP. The site manager will mark the proposed locations with stakes, coordinate with the appropriate 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.

5.2 Environmental Sampling

The environmental sampling program during the supplemental RI for the Training Area T-38 site include the collection of surface and subsurface soil, groundwater including discrete water from temporary borings and monitoring well water, seep water, surface water, and sediment samples for chemical analyses. The proposed sampling is intended to provide sufficient data to complete the RI, however if potential contaminant sources are identified during the CWM investigation by Parsons, additional soil and groundwater samples may be collected. These additional samples will be tracked through Project Variance reports and reported in the RI report.

5.2.1 Discrete Groundwater Sampling/Boring

Seventeen temporary borings will be advanced and discrete groundwater samples collected for screening purposes. The proposed temporary boring locations are shown on Figure 5-1. The estimated boring depths and rationale are included in Table 5-1. Temporary borings will be drilled using the rotosonic drilling technique that allows for the collection of discrete groundwater samples at 20-foot increments, allowing for the vertical delineation of groundwater characteristics. Rotosonic drilling methodology is a drilling technique that employs the use of high frequency mechanical vibration. The methodology was selected for the installation of temporary borings because drilling is performed at faster rates than other conventional drilling methods and substantially reduces investigation derived waste. In addition, the technique allows sampling of multiple aquifers with the capability of preventing cross contamination and formation mixing and has the capability of drilling through any terrain including bedrock, cobbles and boulders without compromising sample volume or integrity.

STARTING DATE: 02/01/00 | DRAWN BY: D. BILLINGSLEY | DATE LAST REV.: | DRAFT. CHCK. BY: | ENGR. CHCK. BY: A. MAYILA | PROJ. MGR.: J. YACOUB | INITIATOR: A. MAYILA | PROJ. NO.: 796887 | DWG. NO.:...\796887es.047

dbomar 10/16/02 02:59:43 PM c:\cadd\design\796887es.047 24 X 36

F 672,900 | F 675,400 | F 677,900

N 1,175,200 | N 1,173,700 | N 1,172,200

PARCEL 186(6)

PARCEL 197(7) | PARCEL 130(7) | PARCEL 156(7) | PARCEL 131(7) | PARCEL 85(7) | PARCEL 106(6) | PARCEL 135Q-X | PARCEL 105(6)

CAVE CREEK | FLOW DIRECTION | FLOW DIRECTION | RIDGE | RESERVOIR | CONCRETE PAD | STORAGE AREA | PAVED PARKING | PARKING | TRAINING AREA | BORROW AREA

WOODS

FTA-197-SW/SD01 | FTA-197-SW/SD02 | FTA-197-SW/SD05 | FTA-197-SW/SD06 | FTA-197-SW/SD07

FTA-197-MW01 | FTA-197-MW02 | FTA-197-MW03 | FTA-197-MW04 | FTA-197-MW06 | FTA-197-MW07 | FTA-197-MW08 | FTA-186-DEP01

CWM-186-SS01 | CWM-186-SS02 | CWM-186-SS03 | CWM-186-SS04 | CWM-186-SS05 | CWM-186-SS06 | CWM-186-SS07 | CWM-186-SS08 | CWM-186-SS09 | CWM-186-SS10 | CWM-186-SS11 | CWM-186-SS12 | CWM-186-SS13 | CWM-186-SS14 | CWM-186-SS15 | CWM-186-SS16 | CWM-186-SS17

CWM-186-MW01 (T38-G05) | CWM-186-MW02 (T38-G06) | CWM-186-MW03 (T38-G07) | CWM-186-MW04 (T38-G08) | CWM-186-MW05 (T38-G09) | CWM-186-MW06 | CWM-186-MW07 | CWM-186-MW08 | CWM-186-MW09 | CWM-186-MW10 | CWM-186-MW11 | CWM-186-MW12 | CWM-186-MW13 | CWM-186-MW14 | CWM-186-MW15 | CWM-186-MW16 | CWM-186-MW17 | CWM-186-MW18 | CWM-186-MW19 | CWM-186-MW20 | CWM-186-MW22 | CWM-186-MW23 | CWM-186-MW24 | CWM-186-MW25 | CWM-186-MW26 | CWM-186-MW27 | CWM-186-MW28 | CWM-186-MW29 | CWM-186-MW30 | CWM-186-MW31 | CWM-186-MW32

CWM-186-SEEP01 | CWM-186-SEEP02 | CWM-186-SEEP03 | CWM-186-SEEP04

CWM-186-SW/SD01 | CWM-186-SW/SD02 | CWM-186-SW/SD03 | CWM-186-SW/SD04 | CWM-186-SW/SD05 | CWM-186-SW/SD06

GSBP-156-MW01 | GSBP-156-MW02 | GSBP-156-MW03 | GSBP-156-MW04

445474459 | 445474459 | 445474459

LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- MANMADE SURFACE DRAINAGE FEATURE
- FENCE
- RAILROAD
- UTILITY POLE
- INFERRED DISPOSAL PIT AREA
- GROUNDWATER SCREENING SAMPLE LOCATION
- EXISTING GROUNDWATER SAMPLE LOCATION (FORMER DESIGNATION IN PARENTHESES)
- EXISTING GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- EXISTING SURFACE WATER/SEDIMENT SAMPLE LOCATION
- PROPOSED RESIDUUM MONITORING WELL LOCATION
- PROPOSED BEDROCK MONITORING WELL LOCATION
- PROPOSED SURFACE WATER/SEDIMENT SAMPLE LOCATION
- PROPOSED SEEP/SPRING WATER SAMPLE LOCATION
- PROPOSED DEPOSITIONAL SOIL SAMPLE LOCATION
- JACKSONVILLE FAULT (OSBORNE, ET AL, 1997)
- INFERRED SURFACE WATER SCREENING SURVEY AREA

NOTE:

1. SURFACE AND SUBSURFACE SOIL SAMPLES WILL BE COLLECTED FROM PROPOSED RESIDUUM MONITORING WELL LOCATIONS AND BEDROCK WELL LOCATIONS CWM-186-MW25 THRU CWM-186-MW27.

SOURCE: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION, 1999. "REMEDIAL INVESTIGATION BASELINE RISK ASSESSMENT REPORT".

SCALE 0 200 400 FEET

FIGURE 5-1
PROPOSED SAMPLE LOCATIONS
TRAINING AREA T-38, FORMER TECHNICAL ESCORT REACTION AREA
PARCEL 186(6)

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

IT CORPORATION
A Member of The IT Group

Table 5-1

Groundwater Screening Rationale
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sampling Location Rationale
CWM-186-SS01	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples approximately 700 feet west of the site. The groundwater screening samples will be used to determine the presence of volatiles and establish a vertical profile of potential groundwater contamination. The boring will be advanced with a sonic drill rig; an estimated 4 discrete groundwater samples will be collected at 20-foot intervals from the top of groundwater to a maximum depth of 125 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well. Groundwater samples to be analyzed for VOCs, cations/anions (K^+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.
CWM-186-SS02	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples about 200 feet east of Building 4427 of the ASP. The groundwater screening samples will be used to determine the presence of volatiles and establish a vertical profile of potential groundwater contamination at a location approximately 1500 feet northwest of the parcel. The boring will be advanced with a sonic drill rig; an estimated 6 discrete groundwater samples will be collected at 20-foot intervals from the top of groundwater to the bottom of the Jacksonville fault or to a maximum depth of 125 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well. Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.
CWM-186-SS03	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples near existing monitoring well FTA-197-MW01 to determine the presence of volatiles and establish a vertical profile of potential groundwater contamination at a location approximately 1500 feet north of the parcel. The boring will be advanced with a sonic drill rig; an estimated 13 discrete groundwater samples will be collected at 20-foot intervals from top of groundwater to the bottom of the Jacksonville fault or to a maximum depth of 250 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well. Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.
CWM-186-SS04	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples near the seep/spring designated CWM-186-SEEP02 to determine the presence of volatiles and establish a vertical profile of potential groundwater contamination at a location approximately 1000 feet north of the parcel. The boring will be advanced with a sonic drill rig; an estimated 13 discrete groundwater samples will be collected at 20-foot intervals from top of groundwater to the bottom of the Jacksonville fault or to a maximum depth of 250 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well. Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.
CWM-186-SS05	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples near existing monitoring well FTA-197-MW05 to determine the presence of volatiles and establish a vertical profile of potential groundwater contamination at a location approximately 800 feet northwest of the parcel. The boring will be advanced with a sonic drill rig; an estimated 5 discrete groundwater samples will be collected at 20-foot intervals from the bottom of the screened interval of FTA-197-MW05 to the bottom of the Jacksonville fault or to a maximum of 200 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well. Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.
CWM-186-SS06	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples at the bottom of the slope 1300 feet southeast of the parcel to determine the presence of volatiles and establish a vertical profile of potential groundwater contamination. The boring will be advanced with a sonic drill rig; an estimated 8 discrete groundwater samples will be collected at 20-foot intervals from the top of groundwater to the bottom of the Jacksonville fault or to a maximum depth of 175 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well. Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.
CWM-186-SS07	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples at the bottom of the slope 1000 feet southeast of the parcel, hydraulically downgradient of the seep/spring designated CWM-186-SEEP01 to determine the presence of volatiles and establish a vertical profile of potential groundwater contamination. The boring will be advanced with a sonic drill rig; an estimated 3 discrete groundwater samples will be collected at 20-foot intervals from the top of ground water to a maximum depth of 100 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well. Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.

Table 5-1

Groundwater Screening Rationale
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sampling Location Rationale
CWM-186-SS08	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples near existing monitoring well FTA-197-MW08 to determine the presence of volatiles and establish a vertical profile of potential groundwater contamination at a location approximately 1000 feet northwest of the parcel. The boring will be advanced with a sonic drill rig; an estimated 4 discrete groundwater samples will be collected at 20-foot intervals from the elevation of the bottom of the screened interval of FTA-197-MW08 to a maximum depth of 100 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well. Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.
CWM-186-SS09	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples near existing monitoring well FTA-197-MW02 to determine the presence of volatiles and establish a vertical profile of potential groundwater contamination at a location approximately 1900 feet northwest of the parcel. The boring will be advanced with a sonic drill rig; an estimated 5 discrete groundwater samples will be collected at 20-foot intervals from the elevation of the bottom of the screened interval of FTA-197-MW02 to a maximum depth of 100 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well. Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.
CWM-186-SS10	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples at the bottom of the slope 1200 feet northeast of the parcel to determine the presence of volatiles and establish a vertical profile of potential groundwater contamination. The boring will be advanced with a sonic drill rig; an estimated 8 discrete groundwater samples will be collected at 20-foot intervals from the top of groundwater to the bottom of the Jacksonville fault or to a maximum depth of 175 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well. Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.
CWM-186-SS11	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples at the bottom of the slope 900 feet east of the parcel to determine the presence of volatiles and establish a vertical profile of potential groundwater contamination. The boring will be advanced with a sonic drill rig; an estimated 8 discrete groundwater samples will be collected at 20-foot intervals from the top of groundwater to the bottom of the Jacksonville fault or to a maximum depth of 175 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well. Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.
CWM-186-SS12	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples at the bottom of the slope 700 feet east-southeast of the parcel to determine the presence of volatiles and establish a vertical profile of potential groundwater contamination. The boring will be advanced with a sonic drill rig; an estimated 8 discrete groundwater samples will be collected at 20-foot intervals from the top of groundwater to a maximum depth of 175 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well. Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.
CWM-186-SS13	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples near existing monitoring well CWM-186-MW01 (formerly designated T38-G05) to determine the vertical extent of volatiles at the northwestern corner of the parcel. The boring will be advanced with a sonic drill rig; an estimated 7 discrete groundwater samples will be collected at 20-foot intervals from the elevation of the bottom of the screened interval of CWM-186-MW01 to the bottom of the contaminant or to a maximum depth of 200 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.
CWM-186-SS14	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples near existing monitoring well CWM-186-MW02 (formerly designated T38-G06) to determine the vertical extent of volatiles at the northeastern corner of the parcel. The boring will be advanced with a sonic drill rig; an estimated 7 discrete groundwater samples will be collected at 20-foot intervals from the elevation of the bottom of the screened interval of CWM-186-MW02 to the bottom of the contaminant or to a maximum depth of 300 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH, and specific conductivity.

Table 5-1

Groundwater Screening Rationale
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sampling Location Rationale
CWM-186-SS15	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples near existing monitoring well CWM-186-MW03 (formerly designated T38-G07) to determine the vertical extent of volatiles at the east central area of the parcel. The boring will be advanced with a sonic drill rig; an estimated 7 discrete groundwater samples will be collected at 20-foot intervals from the elevation of the bottom of the screened interval of CWM-186-MW03 to the bottom of the contaminant or to a maximum depth of 200 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH and specific conductivity.
CWM-186-SS16	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples approximately 300 feet southwest of existing monitoring well CWM-186-MW04 (formerly designated T38-G08) to determine the vertical extent of volatiles at the south central area of the parcel. The boring will be advanced with a sonic drill rig; an estimated 7 discrete groundwater samples will be collected at 20-foot intervals from the top of the saturated zone to the bottom of the contaminant or to a maximum depth of 250 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH and specific conductivity.
CWM-186-SS17	GROUNDWATER	Boring will be advanced to collect site-specific lithologic data and discrete groundwater screening samples near buildings 4458 and 4459 to determine the vertical extent of volatiles at the northwest area of the parcel. The boring will be advanced with a sonic drill rig; an estimated 7 discrete groundwater samples will be collected at 20-foot intervals from the top of the saturated zone to the bottom of the contaminant or to a maximum depth of 225 feet below ground surface. Data will be used to aid in placement of a bedrock monitoring well Groundwater samples to be analyzed for VOCs, cations/anions (K+, Na+, Ca2+, Mg2+, Cl-, SO42-) alkalinity, temperature, pH and specific conductivity.

At each temporary boring location, the borehole will be advanced using a 4-inch inner core barrel, 5 or 10 feet at a time. The inner core acts as both the center bit and sampler. The outer drill casing will be then advanced down over the inner core to hold the boring open. The inner core will be mechanically lifted up by the drill head from the borehole and a 5-foot long, 2-inch internal diameter stainless steel screen set at the bottom of the borehole with the lead rod and K-packer. The outer casing will be vibrated back 5 feet exposing the screen to the formation and allowing groundwater to infiltrate into the screen. Groundwater samples will be collected through a properly decontaminated submersible pump made of stainless steel and Teflon® such as a Grundfos Rediflo-2 ™ or equivalent, affixed with Teflon-coated polyethylene discharge line, and with an inflatable packer located above the pump to effectively seal off the upper casing. The pump will be lowered to the top of the lead rod that is approximately 5 feet long by 3.5 inches diameter. The purpose of the lead rod is to keep the screen from becoming lost in the sediments when the casing is pulled back. The K-packer is attached to the upper end of the lead rod to prevent the sand from coming in between the screen and drill casing.

Prior to collecting a discrete water sample, five volumes of water of the isolated sampling zone will be removed. Groundwater samples will be collected from the sampling zone, screened for field parameters including pH, temperature, and specific conductivity, and a representative sample sent to an off-site laboratory for a 48-hour turn around for VOC analysis. The entire sampling device will be retrieved by a wire line and overshot coupler. Collection of discrete groundwater samples at 20-foot increments will continue at each boring, allowing for the vertical delineation of groundwater characteristics. A figure showing a sonic borehole wire line water sampling system is included as Attachment 2.

Because of the nature of rotosonic drilling, soil/bedrock samples will be collected continuously during drilling. Lithologic samples will be collected for borings to provide a detailed lithologic log. All soil borings will be logged in accordance with ASTM Method D 2488 using the Unified Soil Classification System. Soil samples will be screened in the field using a photoionization detector (PID). There will not be any samples collected for laboratory analyses.

Continuous bedrock cores generated as a result of the rotosonic drilling will be described in accordance with methods outlined in USACE South Atlantic Division Manual DM 1110-1-1 (July 1983). Structural features such as folding, fracturing, and brecciation, which may indicate

the presence of faulting, will be noted. The rock quality data (RQD) will be noted, however this information will be used with the understanding that based on the drilling methodology, the RQD may be greater with rotosonic than with wireline coring.

Temporary borings will be properly abandoned in accordance with the procedures specified in Section 4.7.2 of the SAP. Rotosonic boreholes place at locations encountering large fractured zones or solution features will be abandoned using quick-setting high calcium chloride cement grout. The grout will be added in 10- to 15-foot lifts, with each lift allowed to set for a minimum of 1 hour. If a zone is encountered that continues to take grout, approximately 5- to 10-feet of slow hydrating bentonite chips will be placed in the borehole and allowed to hydrate for a minimum of 1 hour. The remainder of the borehole will then be grouted with quick-setting high calcium chloride grout following procedures outlined above.

Review of the discrete water analytical results will provide vertical contaminant profiling that will aid in the appropriate selection of multiple well cluster locations and in the accurate placement of the permanent well screens. Permanent monitoring well clusters will be installed in the vicinity of the temporary boring at locations where discrete water data indicate that the lateral and vertical extent of groundwater contamination has been fully defined.

5.2.2 Surface Water Quality Surveying

Surface water samples from Cave Creek, west of the Jacksonville fault, and the tributary of Cave Creek east of the Jacksonville fault will be collected for screening of field parameters. The surface water investigation area is shown on Figure 5-1. A point on the western end of the survey area will be arbitrarily selected and marked with a stake and flagging. Screening samples will be collected by field personnel moving upstream (west to east) with samples collected at 20-foot intervals. Approximately 2,000 feet of surface water will be surveyed and screened. The eastern-most screening location will also be marked by a wooden stake and flagging. Grab samples of surface water will be field screened for temperature, pH, specific conductivity, hardness, dissolved oxygen, turbidity, redox and thermal infrared properties. Field screening will be performed under low-flow surface water hydraulic conditions during morning hours to reduce the effects of field parameter fluctuations due to diurnal heating.

5.2.3 Surface and Depositional Soil Sampling

Thirteen surface soil samples and one depositional soil sample will be collected during the supplemental RI to determine if the Training Area T-38 site is the source of organic compounds detected in groundwater at the site.

5.2.3.1 Sample Locations and Rationale

The surface and depositional soil sampling rationale is listed in Table 5-2. Proposed sampling locations are shown on Figure 5-1. Surface soil sample designations and required QA/QC sample requirements are summarized in Table 5-3. If based on the CWM EE/CA, contaminant sources are identified in the fenced area, additional intrusive sampling within the fenced area of Training Area T-38 may be performed. Surface soil samples will be collected from ten residuum and three bedrock monitoring well boreholes.

5.2.3.2 Sample Collection

Surface and depositional soil samples will be collected from the upper 1 foot of soil by hand auger as specified in Section 4.9.1.1 of the SAP. Collected soil samples will be screened using a PID in accordance with Section 4.15 of the SAP. Surface soil samples will be screened for information purposes only, and not to select samples for analysis. 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 5.5 of this SFSP.

5.2.4 Subsurface Soil Sampling

Subsurface soil samples will be collected during the supplemental RI from ten residuum monitoring well boreholes at the Training Area T-38 site. The soil sample from each boring exhibiting the highest reading on a PID will be sent to the laboratory for analysis. If none of the sample intervals indicate elevated PID readings, the deepest sample interval from above the groundwater table will be submitted to the laboratory.

5.2.4.1 Sample Locations and Rationale

Subsurface soil sampling rationale is presented in Table 5-2. A total of 13 subsurface soil samples will be collected. Subsurface soil-sample designations and required QA/QC sample

Table 5-2

Site Sampling Rationale
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sampling Location Rationale
CWM-186-MW01	GROUNDWATER	Samples will be collected from the existing monitoring well (formerly designated T38-G05) to determine the presence or absence of chemical warfare breakdown products, metals, volatiles, semivolatiles and explosives. In addition, current and previous data obtained by SAIC in 1994 and 1995 will be compared and groundwater quality assessed.
CWM-186-MW02	GROUNDWATER	Samples will be collected from the existing monitoring well (formerly designated T38-G06) to determine the presence or absence of chemical warfare breakdown products, metals, volatiles, semivolatiles and explosives. In addition, current and previous data obtained by SAIC in 1994 and 1995 will be compared and groundwater quality assessed.
CWM-186-MW03	GROUNDWATER	Samples will be collected from the existing monitoring well (formerly designated T38-G07) to determine the presence or absence of chemical warfare breakdown products, metals, volatiles, semivolatiles and explosives. In addition, current and previous data obtained by SAIC in 1994 and 1995 will be compared and groundwater quality assessed.
CWM-186-MW04	GROUNDWATER	Samples will be collected from the existing monitoring well (formerly designated T38-G08) to determine the presence or absence of chemical warfare breakdown products, metals, volatiles, semivolatiles and explosives. In addition, current and previous data obtained by SAIC in 1994 and 1995 will be compared and groundwater quality assessed.
CWM-186-MW05	GROUNDWATER	Samples will be collected from the existing monitoring well (formerly designated T38-G09) to determine the presence or absence of chemical warfare breakdown products, metals, volatiles, semivolatiles and explosives. In addition, current and previous data obtained by SAIC in 1994 and 1995 will be compared and groundwater quality assessed.
CWM-186-MW06	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Residuum groundwater monitoring well CWM-186-MW06 will be installed about 1500 feet northwest of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 70 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS02. Surface and subsurface soil and groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW07	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Residuum groundwater monitoring well CWM-186-MW07 will be installed about 1500 feet north of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 70 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS04. Surface and subsurface soil and groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW08	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Residuum groundwater monitoring well CWM-186-MW08 will be installed about 1200 feet northeast of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 70 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS10. Surface and subsurface soil and groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW09	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Residuum groundwater monitoring well CWM-186-MW09 will be installed about 900 feet east of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 70 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS11. Surface and subsurface soil and groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW10	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Residuum groundwater monitoring well CWM-186-MW10 will be installed about 700 feet southeast of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 70 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS12. Surface and subsurface soil and groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW11	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Residuum groundwater monitoring well CWM-186-MW11 will be installed about 1300 feet southeast of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 70 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS06. Surface and subsurface soil and groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW12	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Residuum groundwater monitoring well CWM-186-MW12 will be installed about 1000 feet southwest of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 70 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS07. Surface and subsurface soil and groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.

Table 5-2

Site Sampling Rationale
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sampling Location Rationale
CWM-186-MW13	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Residuum groundwater monitoring well CWM-186-MW13 will be installed about 700 feet west of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 70 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS01. Surface and subsurface soil and groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW14	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW14 will be installed about 1500 feet northwest of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It will be paired with residuum groundwater monitoring well CWM-186-MW06. It is estimated that the monitoring well will be installed to a depth of approximately 125 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS02. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW15	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW15 will be installed about 1100 feet north of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It will be paired with residuum groundwater monitoring well FTA-197-MW01. It is estimated that the monitoring well will be installed to a depth of approximately 250 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS03. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW16	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW16 will be installed about 1000 feet north of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It will be paired with residuum groundwater monitoring well CWM-186--MW07. It is estimated that the monitoring well will be installed to a depth of approximately 250 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS04. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW17	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW17 will be installed about 800 feet northwest of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It will be paired with residuum groundwater monitoring well FTA-197-MW05. It is estimated that the monitoring well will be installed to a depth of approximately 200 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS05. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW18	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW18 will be installed about 1300 feet southeast of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It will be paired with residuum groundwater monitoring well CWM-186-MW11. It is estimated that the monitoring well will be installed to a depth of approximately 175 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS06. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW19	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW19 will be installed about 1000 feet southwest of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It will be paired with residuum groundwater monitoring well CWM-186-MW12. It is estimated that the monitoring well will be installed to a depth of approximately 100 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS07. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW20	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW20 will be installed about 1000 feet northwest of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It will be paired with residuum groundwater monitoring well FTA-197-MW08. It is estimated that the monitoring well will be installed to a depth of approximately 100 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS08. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW21	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW21 will be installed about 1900 feet northwest of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It will be paired with residuum groundwater monitoring well FTA-197-MW02. It is estimated that the monitoring well will be installed to a depth of approximately 100 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS09. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.

Table 5-2

Site Sampling Rationale
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sampling Location Rationale
CWM-186-MW22	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW22 will be installed about 1200 feet northeast of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It will be paired with residuum groundwater monitoring well CWM-186-MW08. It is estimated that the monitoring well will be installed to a depth of approximately 175 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS10. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW23	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW23 will be installed about 900 feet east of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It will be paired with residuum groundwater monitoring well CWM-186-MW09. It is estimated that the monitoring well will be installed to a depth of approximately 175 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS11. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW24	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW24 will be installed about 700 feet east-southeast of Parcel 186(6) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It will be paired with residuum groundwater monitoring well CWM-186-MW10. It is estimated that the monitoring well will be installed to a depth of approximately 175 feet below ground surface; the location and depth may be modified based on lithology and groundwater screening results from CWM-186-SS12. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW25	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW25 will be installed adjacent to residuum groundwater monitoring well CWM-186-MW01 (formerly designated T38-G05) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 200 feet below ground surface; the depth may be modified based on lithology and groundwater screening results from CWM-186-SS13. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW26	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW26 will be installed adjacent to residuum groundwater monitoring well CWM-186-MW02 (formerly designated T38-G06) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 300 feet below ground surface; the depth may be modified based on lithology and groundwater screening results from CWM-186-SS14. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW27	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW27 will be installed adjacent to residuum groundwater monitoring well CWM-186-MW03 (formerly designated T38-G07) to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 200 feet below ground surface; the depth may be modified based on lithology and groundwater screening results from CWM-186-SS15. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW28	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW28 will be installed adjacent to residuum groundwater monitoring well CWM-186-MW13 to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 125 feet below ground surface; the depth may be modified based on lithology and groundwater screening results from CWM-186-SS01. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW29	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Residuum groundwater monitoring well CWM-186-MW29 will be installed to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 90 feet below ground surface; the depth may be modified based on lithology and groundwater screening results from CWM-186-SS16. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW-30	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW30 will be installed adjacent to residuum groundwater monitoring well CWM-186-MW29 to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 250 feet below ground surface; the depth may be modified based on lithology and groundwater screening results from CWM-186-SS16. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW-31	SURFACE SOIL SUBSURFACE SOIL GROUNDWATER	Residuum groundwater monitoring well CWM-186-MW31 will be installed adjacent to buildings 4458 and 4459 to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 90 feet below ground surface; the depth may be modified based on lithology and groundwater screening results from CWM-186-SS17. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-MW-32	GROUNDWATER	Bedrock groundwater monitoring well CWM-186-MW30 will be installed adjacent to residuum groundwater monitoring well CWM-186-MW13 to provide definitive groundwater quality data and groundwater elevations to establish horizontal and vertical groundwater flow directions. It is estimated that the monitoring well will be installed to a depth of approximately 225 feet below ground surface; the depth may be modified based on lithology and groundwater screening results from CWM-186-SS17. Groundwater samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.

Table 5-2

Site Sampling Rationale
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sampling Location Rationale
CWM-186-SEEP01	GROUNDWATER	Samples will be collected from a groundwater discharge seep located at the base of the hill on the southwest side of the site to determine the presence or absence of chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-SEEP02	GROUNDWATER	Samples will be collected from a groundwater discharge seep located at the base of the hill on the north side of the site to determine the presence or absence of chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-SEEP03	GROUNDWATER	Samples will be collected from a groundwater discharge seep located at the base of the hill on the northeast side of the site to determine the presence or absence of chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-SEEP04	GROUNDWATER	Samples will be collected from a groundwater discharge seep located at the base of the hill on the southeast side of the site to determine the presence or absence of chemical warfare breakdown products, metals, volatile and semivolatile compounds, and explosives.
CWM-186-SW/SD01	SURFACE WATER SEDIMENT	Surface water and sediment will be collected from Cave Creek located approximately 1000 ft to the north of the site to determine the presence or absence of contamination from runoff flowing both to the east and to the north of the site into Cave Creek. Surface water and sediment samples will be analyzed for chemical warfare breakdown products, metals, volatiles, and semivolatile compounds, and explosives.
CWM-186-SW/SD02	SURFACE WATER SEDIMENT	Surface water and sediment samples will be collected from Cave Creek at an upgradient location to determine the presence or absence of contamination from sources other than the Area T-38 site. Surface water and sediment samples will be analyzed for chemical warfare break products, metals, volatile and semivolatile organic compounds, and explosives.
CWM-186-SW/SD03	SURFACE WATER SEDIMENT	Samples will be collected from a point of confluence for two intermittent drainages one flowing north and another flowing east to determine the presence or absence of contamination from runoff flowing to the east and north of the site. Surface water and sediment samples will be analyzed for chemical warfare breakdown products, metals, volatile and semivolatile organic compounds, and explosives.
CWM-186-SW/SD04	SURFACE WATER SEDIMENT	Samples will be collected from an intermittent drainage northeast of the site to determine the presence or absence of contamination from runoff flowing from the site. Surface water and sediment samples will be analyzed for chemical warfare break product, metals, volatile and semivolatile organic compounds, and explosives.
CWM-186-SW/SD05	SURFACE WATER SEDIMENT	Samples will be collected from an intermittent drainage southeast of the site to determine the presence or absence of contamination from runoff flowing from the site. Surface water and sediment samples will be analyzed for chemical warfare break products, metals, volatile and semivolatile organic compounds, and explosives.
CWM-186-SW/SD06	SURFACE WATER SEDIMENT	Samples will be collected from an intermittent drainage southwest of the site to determine presence or absence of contamination from runoff flowing from the site. Surface water and sediment samples will be analyzed for chemical warfare break products, metals, volatile and semivolatile organic compounds, and explosives.
CWM-186-DEP01	DEPOSITIONAL SOIL	Sample will be collected from an intermittent drainage northwest of the site near the Jacksonville Fault trace (see Figure 5-1)to determine presence or absence of contamination from runoff flowing from the site. Surface water and sediment samples will be analyzed for chemical warfare break products, metals, volatile and semivolatile organic compounds, and explosives.

Table 5-3

Surface and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-186-MW06	CWM-186-MW06-SS-TA0001-REG CWM-186-MW06-DS-TA0002-REG	0 - 1.0 a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW07	CWM-186-MW07-SS-TA0003-REG CWM-186-MW07-DS-TA0004-REG	0 - 1.0 a			CWM-186-MW07-SS-TA0003-MS CWM-186-MW07-SS-TA0003-MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW08	CWM-186-MW08-SS-TA0005-REG CWM-186-MW08-DS-TA0008-REG	0 - 1.0 a	CWM-186-MW08-SS-TA0006-FD	CWM-186-MW08-SS-TA0007-FS		TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW09	CWM-186-MW09-SS-TA0009-REG CWM-186-MW09-DS-TA0010-REG	0 - 1.0 a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW10	CWM-186-MW10-SS-TA0011-REG CWM-186-MW10-DS-TA0012-REG	0 - 1.0 a			CWM-186-MW10-SS-TA0011-MS CWM-186-MW10-SS-TA0011-MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW11	CWM-186-MW11-SS-TA0013-REG CWM-186-MW11-DS-TA0014-REG	0 - 1.0 a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW12	CWM-186-MW12-SS-TA0015-REG CWM-186-MW12-DS-TA0016-REG	0 - 1.0 a	CWM-186-MW12-DS-TA0017-FD	CWM-186-MW12-DS-TA0018-FS		TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW13	CWM-186-MW13-SS-TA0019-REG CWM-186-MW13-DS-TA0021-REG	0 - 1.0 a	CWM-186-MW13-DS-TA0020-FD			TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW25	CWM-186-MW25-SS-TA0022-REG CWM-186-MW25-DS-TA0023-REG	0 - 1.0 a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW26	CWM-186-MW26-SS-TA0024-REG CWM-186-MW26-DS-TA0025-REG	0 - 1.0 a			CWM-186-MW26-SS-TA0024-MS CWM-186-MW26-SS-TA0024-MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW27	CWM-186-MW27-SS-TA0026-REG CWM-186-MW27-DS-TA0027-REG	0 - 1.0 a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives

Table 5-3

Surface and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-186-MW29	CWM-186-MW29-SS-TA0028-REG CWM-186-MW29-DS-TA0029-REG	0 - 1.0 [a]				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW31	CWM-186-MW31-SS-TA0030-REG CWM-186-MW31-DS-TA0031-REG	0 - 1.0 [a]				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-DEP01	CWM-186-DEP01-DEP-TA0032-REG	0 - 0.5				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives

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

QA/QC - Quality assurance/quality control.
MS/MSD - Matrix spike/matrix spike duplicate.

requirements are summarized in Table 5-3. If based on the CWM EE/CA, contaminant sources are identified in the fenced area, additional intrusive sampling within the fenced area of Training Area T-38 may be performed. The proposed subsurface soil sampling locations are presented on Figure 5-1.

5.2.4.2 Sample Collection

Subsurface soil samples will be collected from ten residuum and three monitoring well boreholes using hollow-stem auger drilling equipment specified in Section 4.7.1.1 of the SAP.

Subsurface soil samples will be collected continuously to 12 feet bls or until either groundwater or refusal is reached at each of the proposed monitoring well locations. A detailed lithological log of each borehole will be recorded by the on-site geologist. Samples from the entire length of the boring will be field screened using a PID. Samples will be collected for headspace screening as specified in Section 4.15 of the SAP. Typically, the soil sample from each boring exhibiting the highest reading on a PID (above background) will be sent to the laboratory for analysis. If none of the samples indicate readings exceeding background using the PID, the deepest sample interval will be submitted to the laboratory for analyses. Subsurface soil samples will be selected for analyses from any depth interval if the on-site geologist suspects potential site-specific chemicals (PSSC) at the depth 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 PSSCs. Subsurface soil sample designations, depths, and required QA/QC sample quantities are listed in Table 5-3.

Sample documentation and chain of custody 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 supplemental RI SFSP are listed in Chapter 5.0, Table 5-1 of the QAP. The samples will be analyzed for the parameters listed in Section 5.5 of this SFSP.

5.2.5 Monitoring Well Installation

Ten residuum and seventeen bedrock monitoring wells are proposed at Training Area T-38. The monitoring wells will be installed using a combination of hollow-stem auger and air-rotary drilling methods. A drill rig able to employ both methods will be used, if possible, to minimize

mobilization costs. The wells will be installed to provide information on water quality and groundwater flow in both the residuum and bedrock aquifers. Previous investigations by SAIC (1995) indicate the presence of groundwater contamination in the residuum overlying the bedrock at the Training Area T-38 site. Bedrock monitoring wells will be drilled using air-rotary drilling methods and the screen section of each well will be placed a minimum of 15 feet into competent bedrock. The proposed bedrock monitoring well depths are listed in Table 5-2. The monitoring wells will be installed and developed as specified in Section 4.8 and Appendix C of the SAP.

5.2.5.1 Monitoring Well Locations and Rationale

Groundwater samples collected from monitoring wells at Training Area T-38 by SAIC during the 1994 and 1995 RI field activities, were found to contain organic and inorganic compounds. In addition, preliminary seep water analytical results (December 1999) indicated that volatile organic compounds are present in groundwater discharged at three seep locations to the southwest, north, and northeast of the Training Area T-38. Groundwater at the site is assumed to flow from the site radially to topographically low areas. Based on the preliminary seep water analytical results and the assumed groundwater flow pattern, temporary borings for discrete water sampling will be placed at the base of the hill, at locations radially away from the site and beyond the seep locations. Subsequently, permanent shallow and deep monitoring well clusters will be placed at locations where discrete water analytical results show that the lateral and vertical extent of groundwater contamination has been fully defined.

Ten proposed residuum monitoring wells CWM-186-MW06 through CWM-186-MW13, and CWM-186-MW29 and CWM-186-MW31 will be installed to determine the local groundwater flow direction and delineate the lateral extent of contamination in the residuum aquifer. Proposed monitoring wells will be placed radially around the site. Proposed locations are shown on Figure 5-1. Table 5-2 presents monitoring well sampling rationale.

Seventeen proposed bedrock monitoring wells, CWM-186-MW14 through CWM-186-MW28, CWM-186-MW30 and CWM-186-MW32 will be installed to delineate groundwater contamination in the bedrock, if present. The locations of the existing and proposed monitoring wells are presented on Figure 5-1. The exact monitoring well locations will be determined in the

field upon review of discrete water sample analytical results by the on-site geologist. Table 5-2 presents monitoring well sampling rationale.

5.2.5.2 Residuum Monitoring Wells

Residuum monitoring well boreholes will be drilled and installed using 6 5/8-inch inside diameter (ID) hollow stem augers. Residuum monitoring wells will be drilled to a minimum of 15 feet below the first groundwater bearing zone or to the top of bedrock, whichever is encountered first. The well casing will consist of new four-inch ID, Schedule 80, threaded, flush-joint, polyvinyl chloride (PVC) pipe. Attached to the bottom of the well casing will be a section of new threaded, flush-joint, 0.010-inch continuous wrap PVC well screen, approximately 10 feet long. Attached to the bottom of the screen will be a sump, approximately five feet long, composed of new, four-inch ID, Schedule 80, threaded, flush joint PVC pipe. After the casing and screen materials are lowered into the boring, a filter pack will be installed around the well screen. The filter pack will be tremied into place from the bottom of the sump to approximately five feet above the top of the screen. The filter pack will consist of 20/40 silica sand. A bentonite seal, approximately 5 feet thick, will be placed above the filter pack. The remaining annular space will be grouted with a bentonite-cement mixture (described in Section 5.2.5.3) and tremied in place with a side discharge tremie from the top of the bentonite seal to ground surface. The residuum monitoring wells will be developed as specified in Section 4.8 and Appendix C of the SAP. Groundwater samples will not be collected from residuum wells for a period of at least 14 days after well development. Investigation-derived waste (IDW) will be containerized and staged in accordance with Section 5.7 of the SFSP.

5.2.5.3 Bedrock Monitoring Wells

Seventeen bedrock monitoring well boreholes will be drilled using a combination of hollow stem auger (HSA) and air rotary drilling techniques. Estimated bedrock monitoring well depths are included in Table 5-2. Well depths may be modified based on the results of discrete ground water sampling results.

An air rotary rig with a 12-inch percussion bit or rotary bit will be used to drill the borehole from land surface to 5 feet into competent bedrock. The compressor on the drill rig will be equipped with an air filter between the compressor and the drill bit. Ten-inch ID carbon steel International Pipe Standard (IPS) outer casing will be installed into the borehole from land surface to 5 feet

into bedrock. A minimum of 2-inch annular space between the outer casing and borehole wall will be required. The 10-inch carbon steel outer casing will be grouted in-place using a tremie pipe suspended in the annulus outside of the casing. Bentonite-cement grout will be mixed using approximately 6.5 to 7 gallons of water and 5 pounds of bentonite per 94-pound bag of Type I Portland cement. After the grout has cured a minimum of 48 hours, an 8-inch air percussion bit will be used to advance the hole to its target depth.

Four-inch monitoring wells will be installed inside the outer casing at each proposed well location. The well casing will consist of new, four-inch ID, Schedule 80, threaded, flush-joint, PVC pipe. Attached to the bottom of the well casing will be a section of new threaded, flush joint 0.010-inch continuous wrap PVC well screen, approximately 10 feet long. Attached to the bottom of the screen will be a sump, approximately 5 feet long, composed of new, 4-inch ID, Schedule 80, threaded, flush joint PVC pipe. After the casing and screen materials are lowered into the boring, a filter pack will be installed around the well screen and the inside casing will be grouted from the top of the filter pack to land surface. The filter pack will be tremied into place from the bottom of the sump to approximately 5 feet above the top of the screen. The filter pack will consist of 20/40 silica sand. A bentonite seal, approximately 5 feet thick, will be placed above the filter pack. The remaining annular space will be grouted with a bentonite-cement mixture (described above) and tremied in place with a side discharge tremie from the top of the bentonite seal to ground surface. The bedrock monitoring wells will be developed as specified in Section 4.8 and Appendix C of the SAP. Groundwater samples will not be collected from bedrock wells for a period of at least 14 days after well development. IDW will be containerized and staged in accordance with Section 5.7 of the SFSP.

5.2.6 Monitoring Well Groundwater Sampling

Thirty-two groundwater samples will be collected from the five existing wells and twenty seven proposed permanent monitoring wells at Training Area T-38 to determine the nature and extent of agent breakdown products, metals, VOCs, SVOC, and explosives in groundwater.

5.2.6.1 Monitoring Well Sample Locations and Rationale

The groundwater sampling rationale is presented in Table 5-2. A total of 32 groundwater samples will be collected at Training Area T-38. Five groundwater samples will be collected for chemical analysis from the 5 existing permanent monitoring wells (CWM-186-MW01, formerly

designated T38-G05, CWM-186-MW02, formerly designated T38-G06, CWM-186-MW03, formerly designated T38-G07, CWM-186-MW04, formerly designated T38-G08, and CWM-186-MW05, formerly designated T38-G09) and 27 groundwater samples from the proposed permanent monitoring wells. The existing and proposed permanent monitoring well locations are presented on Figure 5-1.

5.2.6.2 Monitoring Well Sample Collection

Prior to sampling monitoring wells, static water levels will be measured from the 32 monitoring wells to be sampled as part of the supplemental RI, plus 8 monitoring wells from Parcel 197(7) and 4 monitoring wells from Parcel 156(7). Groundwater elevations will be used to define the groundwater flow in the residuum and bedrock aquifers. Water levels will be measured as outlined in Section 4.18 of the SAP. Groundwater samples will be collected from the existing and proposed permanent monitoring wells for the parameters listed in Table 5-4. Monitoring well locations are presented on Figure 5-1. Groundwater samples will be collected in accordance with the procedures outlined in Section 4.9.1.4 of the SAP.

Sample documentation and chain of custody 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, 1998a). The samples will be analyzed for the parameters listed in Section 5.5 of this SFSP.

5.2.7 Seep Sampling

Water samples will be collected from four seep locations to confirm or deny the presence of contamination in the discharged water in the vicinity of the Training Area T-38.

5.2.7.1 Sample Locations and Rationale

Water samples will be collected from four groundwater discharge locations (seeps) at the base of the hill where Training Area T-38 is located. The four seeps are located to the southwest (CWM-186-SEEP01), north (CWM-186-SEEP02), northeast (CWM-186-SEEP03) and southeast (CWM-186-SEEP04) of Training Area T-38. Seep water sampling rationale is presented in Table 5-1. The sampling locations are shown on Figure 5-1. Seep water designations and required QA/QC samples are listed in Table 5-5.

Table 5-4

Groundwater Sample Designations and QA/QC Sample Quantities
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-186-MW01	CWM-186-MW01-GW-TA3001-REG	55-65				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW02	CWM-186-MW02-GW-TA3002-REG	67-77				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW03	CWM-186-MW03-GW-TA3003-REG	83-93	CWM-186-MW03-GW-TA3004-FD	CWM-186-MW03-GW-TA3005-FS		TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW04	CWM-186-MW04-GW-TA3006-REG	90-100			CWM-186-MW04-GW-TA3006-MS CWM-186-MW04-GW-TA3006-MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW05	CWM-186-MW05-GW-TA3007-REG	133-143				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW06	CWM-186-MW06-GW-TA3008-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW07	CWM-186-MW07-GW-TA3009-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW08	CWM-186-MW08-GW-TA3010-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW09	CWM-186-MW09-GW-TA3011-REG	a	CWM-186-MW09-GW-TA3012-FD			TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW10	CWM-186-MW10-GW-TA3013-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives

Table 5-4

Groundwater Sample Designations and QA/QC Sample Quantities
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-186-MW11	CWM-186-MW11-GW-TA3014-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW12	CWM-186-MW12-GW-TA3015-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW13	CWM-186-MW13-GW-TA3016-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW14	CWM-186-MW14-GW-TA3017-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW15	CWM-186-MW15-GW-TA3018-REG	a	CWM-186-MW15-GW-TA3019-FD	CWM-186-MW15-GW-TA3020-FS		TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW16	CWM-186-MW16-GW-TA3021-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW17	CWM-186-MW17-GW-TA3022-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW18	CWM-186-MW18-GW-TA3023-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW19	CWM-186-MW19-GW-TA3024-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW20	CWM-186-MW20-GW-TA3025-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives

Table 5-4

Groundwater Sample Designations and QA/QC Sample Quantities
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-186-MW21	CWM-186-MW21-GW-TA3026-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW22	CWM-186-MW22-GW-TA3027-REG	a			CWM-186-MW22-GW-TA3027-MS CWM-186-MW22-GW-TA3027-MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW23	CWM-186-MW23-GW-TA3028-REG	a	CWM-186-MW23-GW-TA3029-FD			TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW24	CWM-186-MW24-GW-TA3030-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW25	CWM-186-MW25-GW-TA3031-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW26	CWM-186-MW26-GW-TA3032-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW27	CWM-186-MW27-GW-TA3033-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW28	CWM-186-MW28-GW-TA3034-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW29	CWM-186-MW29-GW-TA3035-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW30	CWM-186-MW30-GW-TA3036-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives

Table 5-4

Groundwater Sample Designations and QA/QC Sample Quantities
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-186-MW31	CWM-186-MW31-GW-TA3037-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-MW32	CWM-186-MW32-GW-TA3038-REG	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives

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

MS/MSD - Matrix spike/matrix spike duplicate.
NA - Not available until after wells are installed.
QA/QC - Quality assurance/quality control.
SVOC - Semivolatile organic compound.
TCL - Target compound list.
VOC - Volatile organic compound.
CWM BD - Chemical warfare material breakdown product.
TAL - Target analyte list.

Table 5-5

Seep Water Sample Designations and QA/QC Sample Quantities
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-186-SEEP01	CWM-186-SEEP01-SEP-TA3039-REG	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-SEEP02	CWM-186-SEEP02-SEP-TA3040-REG	N/A	CWM-186-SEEP02-SEP-TA3041-FD	CWM-186-SEEP02-SEP-TA3042-FS	CWM-186-SEEP02-SEP-TA3040-MS/MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-SEEP03	CWM-186-SEEP03-SEP-TA3043-REG	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives
CWM-186-SEEP04	CWM-186-SEEP04-SEP-TA3044-REG	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM BD, Explosives

QA/QC - Quality assurance/quality control.
TCL - Target compound list.
CWM BD - Chemical warfare material breakdown product.
VOC - Volatile organic compound.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.

5.2.7.2 Sample Collection

Seep water sample collection will be conducted similar to surface water collection and in accordance with the procedures specified in Section 4.9.1.3 of the SAP. 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 5.5 of this SFSP.

5.2.8 Surface Water Sampling

Six surface water samples will be collected from the intermittent streams and Cave Creek that flow in the vicinity of the Training Area T-38 Site.

5.2.8.1 Sample Locations and Rationale

Surface water sampling rationale is listed in Table 5-1. Surface water samples will be collected from the proposed locations on Figure 5-1. Surface water sample designations and required QA/QC samples are listed in Table 5-6. The exact sampling locations will be determined in the field by the ecological sampler, based on drainage pathways and actual field observations.

5.2.8.2 Sample Collection

Surface water samples will be collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP. 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 5.5.

5.2.9 Sediment Sampling

Six sediment samples will be collected from the Training Area T-38 site. These sediment samples will be collected at the same locations as the surface water samples described in Section 5.2.8.

5.2.9.1 Sample Locations and Rationale

The proposed locations for sediment samples are shown in Figure 5-1. The sediment sampling rationale is presented in Table 5-1. The sediment sample designation and QA/QC sample

Table 5-6

Surface Water and Sediment Sample Designations and QA/QC Sample Quantities
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-186-SW/SD01	CWM-186-SW/SD01-SW-TA2001-REG CWM-186-SW/SD01-SD-TA1001-REG	N/A 0-0.5			CWM-186-SW/SD01-SW-TA2001-MS/MSD CWM-186-SW/SD01-SD-TA1001-MS/MSD	TCL VOCs, TCL SVOCs, TAL Metals w/TOC, CWM BD, Explosives, Grain size (sediment only), field turbidity (SW only)
CWM-186-SW/SD02	CWM-186-SW/SD02-SW-TA2002-REG CWM-186-SW/SD02-SD-TA1002-REG	N/A 0-0.5	CWM-186-SW/SD02-SW-TA2003-REG CWM-186-SW/SD02-SD-TA1003-REG	CWM-186-SW/SD02-SW-TA2004-REG CWM-186-SW/SD02-SD-TA1004-REG		TCL VOCs, TCL SVOCs, TAL Metals w/ TOC, CWM BD, Explosives, Grain size (sediment only), field turbidity (SW only)
CWM-186-SW/SD03	CWM-186-SW/SD03-SW-TA2005-REG CWM-186-SW/SD03-SD-TA1005-REG	N/A 0-0.5				TCL VOCs, TCL SVOCs, TAL Metals w/ TOC, CWM BD, Explosives, Grain size (sediment only), field turbidity (SW only)
CWM-186-SW/SD04	CWM-186-SW/SD04-SW-TA2006-REG CWM-186-SW/SD04-SD-TA1006-REG	N/A 0-0.5				TCL VOCs, TCL SVOCs, TAL Metals w/ TOC, CWM BD, Explosives, Grain size (sediment only), field turbidity (SW only)
CWM-186-SW/SD05	CWM-186-SW/SD05-SW-TA2007-REG CWM-186-SW/SD05-SD-TA1007-REG	N/A 0-0.5				TCL VOCs, TCL SVOCs, TAL Metals w/ TOC, CWM BD, Explosives, Grain size (sediment only), field turbidity (SW only)
CWM-186-SW/SD06	CWM-186-SW/SD06-SW-TA2008-REG CWM-186-SW/SD06-SD-TA1008-REG	N/A 0-0.5				TCL VOCs, TCL SVOCs, TAL Metals w/ TOC, CWM BD, Explosives, Grain size (sediment only), field turbidity (SW only)

QA/QC - Quality assurance/quality control.
MS/MSD - Matrix spike/matrix spike duplicate.
TCL - Target compound list.
CWM BD - Chemical warfare material breakdown product.
VOC - Volatile organic compound.
SVOC - Semivolatile organic compound.
AL - Target analyte list.

requirements are listed in Table 5-6. The actual sediment sample points will be at the discretion of the ecological sampler, based on the drainage pathways and actual field observations.

5.2.9.2 Sample Collection

Sediment samples will be collected in accordance with the procedures specified in Section 4.9.1.2 of the SAP. Sample documentation and chain-of-custody will be recorded as specified in Section 4.13 of the SAP. The sediment samples will be analyzed for the parameters listed in Section 5.5.

5.3 Decontamination Requirements

Decontamination will be performed on sampling and nonsampling equipment primarily to ensure that contaminants are not introduced into samples from location to location. Decontamination of sampling equipment will be performed in accordance with the requirements presented in Section 4.10.1.1 of the SAP. Decontamination of nonsampling equipment will be performed in accordance with the requirements presented in Section 4.10.1.2 of the SAP.

5.4 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 (NAD83) 1983. Elevations will be referenced to the North American Vertical Datum of 1988.

Horizontal coordinates for soil, sediment, seep water and surface water locations will be recorded using a GPS to provide accuracy within 1 meter. Because of the need to use monitoring wells to determine water levels, a higher level of accuracy is required. 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. All areas at this site must be cleared for UXO avoidance before any surveying activities will commence.

5.5 Analytical Program

Before final monitoring well locations have been selected and screened interval depths determined, approximately 115 groundwater screening samples from 17 locations will be analyzed for VOCs by Method 8260B on a 48-hour turnaround. In addition, the groundwater screening samples and four seep/spring samples will be analyzed for the following inorganic parameters:

- Potassium, sodium, calcium, and magnesium by EPA Method 6010B
- Chlorides and sulfates by EPA Method 300.0
- Alkalinity by Hach® field titration.

Definitive samples collected at the locations specified in this chapter will be analyzed for various chemical constituents (including agent breakdown products) and physical properties based on the PSSC historically used at the site and EPA, ADEM, FTMC, and USACE requirements. Definitive target analyses for soil and water samples collected from the Training Area T-38 consist of the following list of analytical suites:

- Target Compound List VOCs by EPA Method 5035/8260B
- Target Compound List SVOCs by EPA Method 8270C
- TAL Metals by EPA Method 6010B/7000
- Agent breakdown products by EPA Method 8270 (modified) and Method 8321
- Explosives by EPA 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.

Definitive samples will be analyzed using EPA SW-846 Update III Method where applicable, as presented in Table 5-7 of this SFSP and Table 6-1 of the QAP. Data will be reported and evaluated in accordance with CESAS Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported via hard copy data packages by the laboratory using CLP-like forms. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

Table 5-7

Analytical Samples
Training Area T-38, Former Technical
Escort Reaction Area, Parcel 186(6)
Fort McClellan, Calhoun County, Alabama

Parameters	Analysis Method	Sample Matrix	TAT Needed	Field Samples: No. of Sample Points	Field Samples: No. of Events	Field Samples: No. of Field Samples	QA/QC Samplesa: Field Dups (10%)	QA/QC Samplesa: Splits w/ QA Lab (5%)	QA/QC Samplesa: MS/MSD (5%)	QA/QC Samplesa: Trip Blank (1/ship)	QA/QC Samplesa: Eq. Rinse (1/wk/matrix)	Quanterra Total No. Analysis	QA Lab Total No. Analysis
Training Area T-38 - Parcel 186(6): 38 water matrix: 28 groundwater, 4 seep water, 6 surface water, 22 soil matrix: 8 surface, 8 subsurface, 6 sediment													
TCL VOCs	8260B	water	normal	38	1	38	4	2	2	10	2	58	2
TCL SVOCs	8270C	water	normal	38	1	38	4	2	2		2	48	2
TAL Metals	6010B/7000	water	normal	38	1	38	4	2	2		2	48	2
CWM BD Products	8270 CWM/8321	water	normal	38	1	38	4	2	2		2	48	2
Explosives	8330	water	normal	38	1	38	4	2	2		2	48	2
TCL VOCs	8260B	soil	normal	32	1	32	4	3	4		1	44	3
TCL SVOCs	8270C	soil	normal	32	1	32	4	3	4		1	44	3
TAL Metals	6010B/7000	soil	normal	32	1	32	4	3	4		1	44	3
CWM BD Products	8270 CWM/8321	soil	normal	32	1	32	4	3	4		1	44	3
Explosives	8330	soil	normal	32	1	32	4	3	4		1	44	3
Tot Org Carb	9060	sediment	normal	6	1	6						6	0
Grain Size	ASTM D-421/D422	sediment	normal	6	1	6						6	0
Training Area T-38, Parcel 186(6) Subtotal:				362			40	25	30	10	15	482	25

[a] Field duplicate, QA split, and MS/MSD samples were calculated as a percentage of the field samples collected per site and were rounded to the nearest whole number.
Trip blank samples will be collected in association with water matrix samples for VOC analysis only. Assumed four field samples per day to estimate trip blanks. Equipment rinsates 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 rinsates.

Ship samples to:

Quanterra Environmental Services
5815 Middlebrook Pike
Knoxville, Tennessee 37921
Attn: John Reynolds
Tel: 865-588-6401
Fax: 865-584-4315

USACE Laboratory split samples are shipped to:

USACE South Atlantic Division Laboratory
Attn: Sample Receiving
611 South Cobb Drive
Marietta, Georgia 30060-3112
Tel: 770-919-5270

MS/MSD - Matrix spike/matrix spike duplicate.
CWM BD - Chemical Warfare Material Breadown Products.
QA/QC - Quality assurance/quality control.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TAT - Turnaround time.
VOC - Volatile organic compound.

5.6 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping will follow the procedures specified in Section 4.13.2 of the SAP. Completed analysis request/chain-of-custody records will be secured and included with each shipment of coolers to both laboratories.

The addresses are:

Quanterra-Knoxville
Attention: Sample Receiving
Quanterra Environmental Services
5815 Middlebrook Pike
Knoxville, Tennessee 37921
Telephone: (865) 588-6401.

QA split samples collected for the USACE laboratory will be shipped to the following address:

U.S. Army Engineer District, Savannah
Environmental & Materials Unit
Attn: Sample Receiving
200 North Cobb Parkway
Building 400, Suite 404
Marietta, Georgia 30062
Telephone: (678) 354-0310.

5.7 Investigation-Derived Waste Management

Management and disposal of the IDW will follow procedures and requirements as described in Appendix D of the SAP (IT, 1998a). The IDW expected to be generated at the Training Area T-38 site will include drill cuttings, purge water from temporary borings and permanent monitoring well development and sampling activities, decontamination fluids, and disposable personal protective equipment. The IDW will be staged within the fenced area surrounding Buildings 335 and 336 while awaiting final disposal.

5.8 Site-Specific Safety and Health

Safety and health requirements for the supplemental RI are provided in the SSHP attachment for the Training Area T-38 site. The SSHP attachment will be used in conjunction with the installation-wide SHP.

6.0 Project Schedule

The project schedule for the supplemental RI 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.

7.0 References

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ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

AC	hydrogen cyanide
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ADEM	Alabama Department of Environmental Management
AL	Alabama
amb.	amber
APT	armor piercing tracer
ASP	Ammunition Supply Point
ASR	Archives Search Report, July 1999
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
B	analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCT	BRAC Cleanup Team
BFB	bromofluorobenzene
bgs	below ground surface
bkg	background
bls	below land surface
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BTEX	benzene, toluene, ethylbenzene, and xylenes
BTOC	below top of casing
BZ	breathing zone
CCAL	continuing calibration
CCB	continuing calibration blank
CD	compact disc
CDZ	contamination reduction zone
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CFC	Chlorofluorocarbon
CG	cyanogen chloride
ch	inorganic clays of high plasticity
CK	carbonyl chloride
cl	inorganic clays of low to medium plasticity
Cl.	chlorinated
CLP	Contract Laboratory Program
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
COC	chain of custody
COE	Corps of Engineers
CRL	certified reporting limit
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
ctr.	container
CWA	chemical warfare agent
CWM	chemical warfare materials
CX	dichloroformoxime
D	duplicate
DANC	decontamination agent, non-corrosive
DDT	dichlorodiphenyltrichloroethane
DEP	depositional
DI	deionized
DIMP	di-isopropylmethylphosphonate
DMMP	dimethylmethylphosphonate
DOD	U.S. Department of Defense
DP	direct-push
DPDO	Defense Property Disposal Office
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DS2	Decontamination Solution Number 2
E&E	Ecology and Environment, Inc.
EBS	environmental baseline survey
Elev.	elevation
EM	electromagnetic
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive and ordnance disposal
EODT	explosive and ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
ER	equipment rinsate
ESE	Environmental Science and Engineering, Inc.
ESV	ecological screening value
E-W	east to west
EZ	exclusion zone
FB	field blank
FD	field duplicate
FedEx	Federal Express, Inc.
FFE	field flame expedient
Fil	filtered
Flt	filtered
FMP 1300	Former Motor Pool 1300 Site
Frtn	fraction
FS	field split
ft	feet
ft/ft	feet per foot
FTA	fire training area
FTMC	Fort McClellan
g	gram
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
GFAA	graphite furnace atomic absorption
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GSSI	Geophysical Survey Systems, Inc.
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
HA	hand auger
HCl	hydrochloric acid
HD	distilled mustard
HDPE	high-density polyethylene
HNO_3	nitric acid
hr	hour
HSA	hollow stem auger
HTRW	hazardous, toxic, and radioactive waste
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDW	investigation-derived waste
IMPA	isopropylmethyl phosphonic acid
in.	inch
IPS	International Pipe Standard
IRDMIS	Installation Restoration Data Management Information System
IT	IT Corporation
ITEMS	IT Environmental Management System ™
J	estimated concentration
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
K	conductivity
L	lewisite; liter
l	liter
LCS	laboratory control sample
LEL	lower explosive limit
LT	less than the certified reporting limit
max	maximum
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils

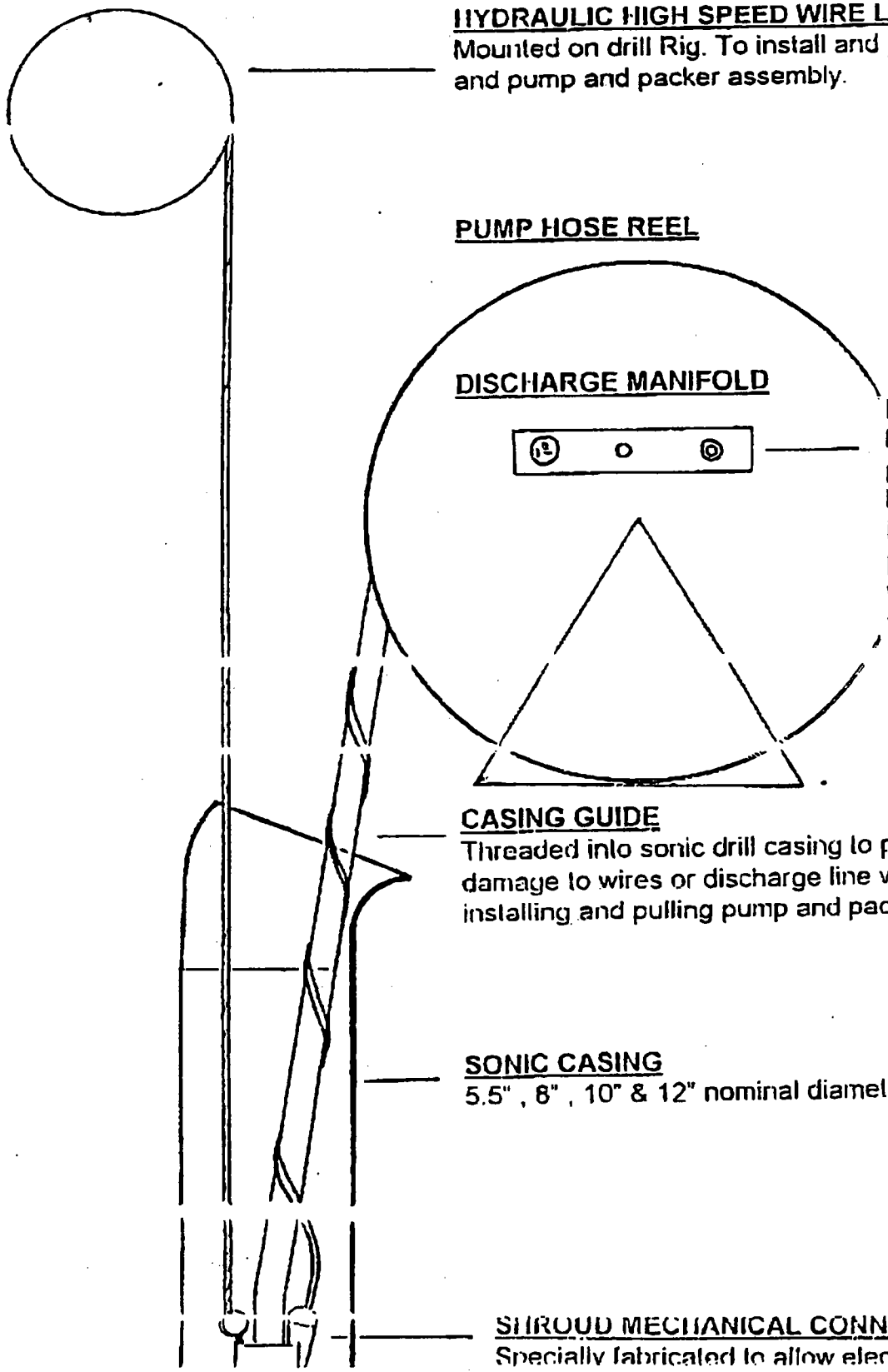
List of Abbreviations and Acronyms *(continued)*

MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimer
min	minimum
MINICAMS	miniature continuous air sampling system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MOGAS	motor vehicle gasoline
MPA	methyl phosphonic acid
MR	molasses residue
MS	matrix spike
mS/cm	milliSiemens per centimeter
MSD	matrix spike duplicate
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
N/A	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
ND	not detected
NFA	No Further Action
NGVD	National Geodetic Vertical Datum
NIOSH	National Institute for Occupational Safety and Health
No.	number
NOAA	National Oceanic and Atmospheric Administration
NR	not requested
ns	nanosecond
N-S	north to south
nT	nanotesla
NTU	nephelometric turbidity unit
O&G	oil and grease
°C	degrees Celsius
OD	outside diameter
°F	degrees Fahrenheit
OE	Ordnance and explosives
oh	organic clays of medium to high plasticity
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus pesticide
OWS	oil/water separator
oz	ounce
PAH	polynuclear aromatic hydrocarbon
Pb	lead
PCB	polychlorinated biphenyl
PCE	perchlorethene
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
POL	petroleum, oils, and lubricants
PP	peristaltic pump
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental Inc.
qty	quantity
Qual	qualifier
R	rejected
RCRA	Resource Conservation and Recovery Act
REG	field sample
RFA	request for analysis
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
RTK	real-time kinematic
SAD	South Atlantic Division
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
sc	clayey sands; sand-clay mixtures
Sch.	schedule
SD	sediment
SDG	sample delivery group
SDZ	safe distance zone
SEMS	Southern Environmental Management & Specialties
SFSP	site-specific field sampling plan
SHP	installation-wide safety and health plan
SI	site investigation
sm	silty sands; sand-silt mixtures
SOP	standard operating procedure
sp	poorly graded sands; gravelly sands
SP	sump pump
Ss	stony rough land, sandstone
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSSL	site-specific screening level
STB	supertropical bleach
STEL	short-term exposure limit
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TERC	Total Environmental Restoration Contract
TIC	tentatively identified compounds
TN	Tennessee
TOC	top of casing
TPH	total petroleum hydrocarbons
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TWA	time weighted average
UCL	upper confidence limit
UCR	upper certified range
UJ	not detected above reporting limit; result should be estimated
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USAMCLS	U.S. Army Chemical School
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon

VQual	validated qualifier
VX	nerve agent (O-ethyl-S- [diisoproplaminoethyl]-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

ATTACHMENT 2

SONIC BOREHOLE WIRELINE WATER SAMPLING SYSTEM



HYDRAULIC HIGH SPEED WIRE LINE WINCH
Mounted on drill Rig. To install and pull screen and pump and packer assembly.

PUMP HOSE REEL

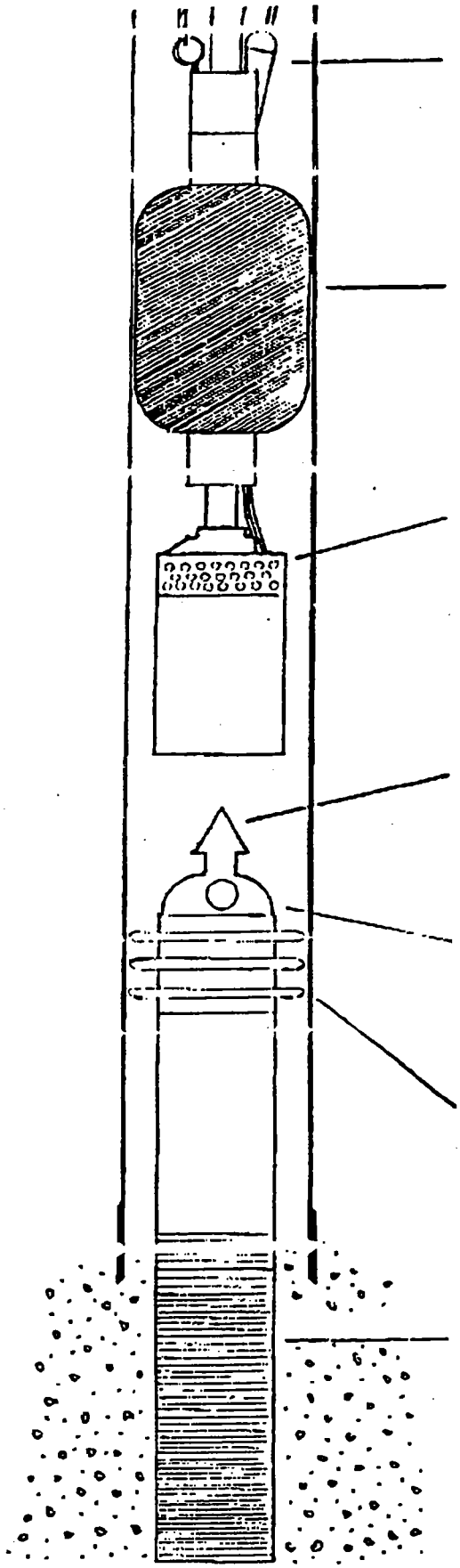
DISCHARGE MANIFOLD

Electrical hookup for pump. Airline hookup to inflate packer water sample valve.

CASING GUIDE
Threaded into sonic drill casing to prevent damage to wires or discharge line while installing and pulling pump and packer system.

SONIC CASING
5.5" , 8" , 10" & 12" nominal diameter.

SHROUD MECHANICAL CONNECTOR
Specially fabricated to allow electrical leads to



SHROUD MECHANICAL CONNECTOR
Specially fabricated to allow electrical leads to pass through connector inside the packer.

INFLATED PACKER
Expandable "plug" used to isolate drilling fluid in hole from water at zone to be tested.

SUBMERSIBLE PUMP
Various sizes. Pumping rates from .5 to 400 GPM. Depending upon well. diameter, design and aquifer.

WIRE LINE SPEAR
For installation and fast retrieval of screen after pumping test has been completed.

SPECIAL MACHINE WIRELINE SCREEN ADAPTER WITH WATER TRANSFER PORTS
To allow water from the screen to enter the casing.

K-PACKER
To seal between sonic casing and screen to hold out the formation.

SS SCREEN
Can be "sized" at job site to accommodate different formations or use a prepacked,dual wall screen, to control or eliminate fine sand pumping.