FINAL

CORRECTIVE ACTION PLAN - PART A REPORT

FOR

Facility ID #9-089069
Underground Storage Tank 14
At
Building 1811
Fort Stewart, Georgia

PREPARED FOR

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT

CONTRACT No. DACA21-95-D-0022
DELIVERY ORDER 0003

March 1997

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UNDERGROUND STORAGE TANK 14
AT
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FORT STEWART, GEORGIA

Prepared for:

U.S. Army Corps of Engineers - Savannah District
and
Fort Stewart Directorate of Public Works
Under Contract Number DACA21-95-D-0022
Delivery Order 0003

Prepared by:

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March 1997

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

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LIST OF ACRONYMS

Anderson Columbia	Anderson Columbia Environmental, Inc.
ATL	Alternate Threshold Level
BTEX	benzene, toluene, ethylbenzene, xylenes
CAP	Corrective Action Plan
DPW	Directorate of Public Works
FSMR	Fort Stewart Military Reservation
GDNR	Georgia Department of Natural Resources
GUST	Georgia Underground Storage Tank
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
μg/L	micrograms per liter
PAH	polynuclear aromatic hydrocarbon
PVC	polyvinyl chloride
QCSR	Quality Control Summary Report
SAIC	Science Applications International Corporation
TPH	total petroleum hydrocarbon
USACE	U.S. Army Corps of Engineers
UST	underground storage tank

I. CORRECTIVE ACTION PLAN - PART A FORM & CERTIFICATION

This document represents the Corrective Action Plan (CAP)-Part A Report for underground storage tank (UST) 14 that was located at Building 1811 (Facility ID #9-089069), Fort Stewart, Georgia. This report has been prepared in accordance with requirements defined in the Georgia Underground Storage Tank (GUST) CAP-Part A guidance document GUST-7A *Underground Storage Tank Release: Corrective Action Plan - Part A Content*. The version of guidance document GUST-7A used for this report was issued by the Georgia Department of Natural Resources (GDNR), Environmental Protection Division, Underground Storage Tank Management Program, in November 1995.

Part I of this report contains the completed CAP-Part A form and certification. Supporting documentation related to information indicated on the CAP-Part A form is presented in Parts II through VI of the report, and in the attached appendices.

Georgia Department of Natural Resources
Environmental Protection Division
Underground Storage Tank Management Program
4244 International Parkway, Suite 104, Atlanta, Georgia 30354
Lonice C. Barrett, Commissioner
Harold Reheis, Director
(404)362-2687

CORRECTIVE ACTION PLAN
PART A

Facility Name: Building 1811 Area, UST 14 Site
Street Address: W. 15th Street west of McFarland Avenue
City: Fort Stewart County: Liberty Facility ID: 9-089069

Submitted by UST Owner/Operator:
Name: John H. Spears
Company: U.S. Army/HQ3d Inf. Div. (Mech.)
Address: ATTN: AFZP-DEV (Spears)
Building 1139
City: Fort Stewart State: Georgia
Zip Code: 31314-5000

Prepared by:
Name: Patricia Stoll
Company: SAIC
Address: 800 Oak Ridge Turnpike
City: Oak Ridge State: Tennessee
Zip Code: 37830

I. PLAN CERTIFICATION:

A. UST Owner/Operator

I hereby certify that the information contained in this plan and in all the attachments is true, accurate, and complete, and the plan satisfies all criteria and requirements of Rule 391-3-15-.09 of the Georgia Rules for Underground Storage Tank Management.

Name: John H. Spears
Signature: Date:

B. Professional Engineer or Professional Geologist

I hereby certify that I have directed the field work and preparation of this plan, in accordance with State Rules and Regulations. As a registered geologist and/or engineer, I certify that I am a qualified groundwater professional, as defined by the Georgia State Board of Professional Geologists. All of the information and laboratory data in this plan and in all of the attachments are true, accurate, complete, and in accordance with applicable State Rules and Regulations.

Name: Patricia Stoll
Signature:
Date: 3/12/97

22851
P. A. STOLL
Georgia Stamp or Seal

Please complete the following form, check all of the boxes below that apply, and attached supporting documentation (such as narrative, figures, tables, maps, boring/well logs, etc.) where specified and applicable. Supporting documentation should be three-hole punched and prepared in conformity with the attached guidance document "Underground Storage Tank (UST) Release: Corrective Action Plan - Part A (CAP-A) Content", GUST-7A.

II. INITIAL RESPONSE REPORT:

A. Initial Abatement:

☒ No Action Required

☐ Further Release or Migration of Contaminants Prevented

☐ Fire And Safety Hazards From Vapors And/Or Free Product Monitored and Mitigated

☐ Other (specify) ______________________________

____

B. Free Product Removal:

☒ No Free Product Identified As Originating From Release

☐ Free Product (Non-Aqueous Phase Hydrocarbons) Removed by:

- ☐ Manual Bailing
- ☐ Passive Skimming
- ☐ Automated Skimming
- ☐ Automated Total Fluids Pumping, With Treatment System And Approved Wastewater Discharge
- ☐ Other (specify) ______________________________

  ____

C. Tank History

☒ Site Map Attached Identifying Former and/or Existing USTs

☐ Not Applicable

D. Initial Site Characterization:

☒ Site Map: include the following items on an attached site map

- Tank Pit Area
- Sewer Lines (if present)
- Piping Trenches
- Water Lines
- Dispensers
- North Arrow
- Sample Locations (with sample numbers and depths)
- Tanks with ID#s, corresponding to Notification Form 7530-1
- Scale 1 in = 40 ft

1. Regulated Substance Released

☐ Gasoline ☐ Diesel ☐ Kerosene ☒ Waste oil

☐ Other ____________

2. Source of Contamination

Number of USTs: in use 0 ; closed/removed 1

☐ Existing UST System(s): ☐ piping ☐ tank ☐ other

☒ Former UST System(s): ☒ piping ☐ tank ☒ other

3. Impacted Environmental Media

☐ Groundwater

☐ Free product

☐ Dissolved (BTEX and/or PAH) contamination exceeding:

☐ In-stream water quality standards

☐ Drinking water Maximum Contaminant Levels (MCLs)

☒ Soil Exceeding:

☐ Laboratory Detection Limits, but TPH is vertically delineated to Below Detection Limits (BDL) above the groundwater table or a groundwater sample from the worst-case location has BTEX and/or PAHs below applicable Drinking and/or In-stream water quality standards.

☒ Thresholds listed in Table A, Rule 391-3-15-.09

☐ Thresholds listed in Table B, Rule 391-3-15-.09

☐ Alternate Threshold Levels (ATLs) (Reference Appendix I)

D. **Initial Site Characterization** (continued):

☐ Drinking Water Supply Impacted

☐ Surface Water Impacted

☒ Attach Laboratory Analytical Data: the following items must be included

- Laboratory Method
- Date of Analysis
- Signed Chain of Custody
- Date of Sampling
- Detection Limits
- Quality Control Data

4. Local Water Resources

☒ Drinking Water Supplies Located In:

High or average groundwater pollution susceptibility area:*

☒ Public water systems within 2.0 miles

☐ Non-public water systems within 0.5 mile

Low groundwater pollution susceptibility area:*

☐ Public water systems within 1.0 mile

☐ Non-public water systems within 0.25 mile

* As defined by the Groundwater Pollution Susceptibility Map of Georgia.

☒ Surface Water Bodies: Distance (nearest) 2100 feet (regardless of hydraulic gradient)

☒ Attach Documentation of Water Supply Survey and Field Reconnaissance

5. Other Hydrogeologic Data (specify values)

☒ Depth To Groundwater (shallowest) 5.02 feet BGS

☒ Groundwater Flow Direction Northwest to Southeast

☒ Hydraulic Gradient 0.002 feet/feet

6. Corrective Action Completed Or In-Progress

☒ USTs/Source Removed (after confirmed release)

☐ Excavation And Treatment/Disposal Of Contaminated Backfill Materials & Native Soils
  ☐ Attach manifest of proper soil disposal

☐ Other (specify) ______

D. Initial Site Characterization (continued):

7. Conclusions And Recommendations

☐ No Further Action Required, including the preparation or implementation of a Site Investigation Plan

OR

☒ Prepare Corrective Action Plan - Part B, with a schedule for SIP implementation and submittal of CAP-Part B

8. Site Ranking

Environmental Sensitivity Score: 100
(see Appendix II)

III. SITE INVESTIGATION PLAN:

A. Horizontal And Vertical Extent Of Contaminants In:

- ☐ Soil
- ☐ Groundwater
  - ☐ Free product
  - ☐ Dissolved phase
- ☐ Surface Water

B. Vadose Zone and Aquifer Characteristics:

- ☐ Vertical Soil Permeability (Optional)
- ☐ Infiltration Rate (Optional)
- ☐ Saturated Horizontal Hydraulic Conductivity
- ☐ Total Organic Carbon (Optional)
- ☐ Dissolved Iron (Optional)
- ☐ Effective Porosity
- ☐ Seepage Velocity
- ☐ Grain-size Distribution (Optional)
- ☐ Total Petroleum Hydrocarbons (Optional)
- ☐ Pilot Test(s) (Optional)
- ☒ Other (specify) No further investigation required

IV. PUBLIC NOTICE:

- ☐ Certified Letters to Adjacent and Potentially Affected Property Owners and Local Officials
- ☒ Legal Notice in Newspaper, as pre-approved by EPD
- ☐ Other EPD Approved Method (specify): ____

V. CLAIM FOR REIMBURSEMENT: (For GUST Trust Fund sites only)

- ☐ GUST Trust Fund Application (GUST-36), must be attached if applicable
- ☐ Cost Proposal
  - ☐ Non-Reimbursable Costs

    OR
  - ☐ Reimbursable Costs
    - ☐ Invoices and Proofs-of-Payment, per GUST-91
    - ☐ Total Projected Costs to implement the Site Investigation Report (SIR) and prepare data for the Site Investigation Review Meeting, per GUST-91
- ☐ Payment Schedule for Reimbursement

II. INITIAL RESPONSE REPORT

A. Initial Abatement

No actions were required to abate imminent hazards and/or emergency conditions at the UST 14, Facility ID #9-089069, site because contaminant migration and release prevention, fire and vapor mitigation, or emergency free product removal were not required prior to or during the removal of this tank.

B. Free Product Removal

No free product was identified as originating from the release that occurred at the site. Therefore, free product removal at this site was not required.

C. Tank History

UST 14 was previously located within the Building 1811 area in the northwest quadrant of the Fort Stewart garrison area. The location of the tanks within the Building 1811 area is illustrated in Figure II-1. According to operational information maintained by the Fort Stewart Directorate of Public Works (DPW), UST 14 had a capacity of 1,000 gallons and was used for the storage of waste oil. The tank was constructed of asphalt/bare steel and the associated piping was galvanized steel. The tank and piping were installed on or about January 1, 1982 and the system was last used in April 1995. The tank and piping were excavated and removed on June 15, 1995.

D. Initial Site Characterization

Characterization of petroleum-related contamination at the site was initiated during the tank removal activities on June 15, 1995. After removal of the tank and ancillary piping, six soil samples were collected from the tank pit excavation by Anderson Columbia Environmental, Inc. (Anderson Columbia), the contractor responsible for the tank removal. The location where each of these samples was collected is illustrated in Figure II-2. According to the field report prepared by Anderson Columbia for the site, the soil samples were collected two feet below both ends of the excavated tank and from the excavation walls (Anderson Columbia 1995). However, the depth below ground level from which each of the samples was collected was not identified in the field report.

Analytical results reported for these soil samples are presented in Table II-1. The soil results were compared to the applicable soil threshold levels for Facility ID #9-089069. The applicable threshold levels for the site are those listed in Table A (GDNR Rules for Underground Storage Tank Management, Chapter 391-3-15) for the Average or Higher Groundwater Pollution Susceptibility Area, Column 2, greater than 500 feet to a withdrawal point. Documentation supporting the use of this threshold level category is presented in Section D.4 of this report. Based on this comparison, it was determined that benzene was present at concentrations exceeding the applicable soil threshold level of 0.008 milligrams per kilogram (mg/kg). Total petroleum hydrocarbon (TPH) concentrations ranging between 172 mg/kg and 2310 mg/kg were also reported.

Based on these findings, the U.S. Army Corps of Engineers (USACE) - Savannah District and Fort Stewart DPW contracted Science Applications International Corporation (SAIC) to perform a CAP-Part A investigation of the site, and numerous other UST sites located throughout the Fort Stewart garrison area. The scope developed by the USACE-Savannah District and Fort Stewart DPW for the site investigation was as follows:

1. Drill four soil boreholes, one located within the former UST 14 pit and the other three around the perimeter of the pit, down to the local water table using a hollow-stem auger rig.

2. Continuously collect soil samples at 2.5-foot intervals during borehole drilling and perform field headspace gas analysis on each sample to determine organic vapor concentration.

3. Select two soil samples for laboratory chemical analysis from each borehole drilled. Chemical parameters for soil samples submitted for laboratory analysis included benzene, toluene, ethylbenzene, and xylenes (BTEX), polynuclear aromatic hydrocarbons (PAH), and TPH.

   In boreholes where organic vapors were detected, collect one sample from the 2.5-foot interval where the highest vapor concentration was encountered, and the other from the 2.5-foot interval where the lowest concentration was encountered.

   In boreholes where no organic vapors were detected, collect one sample from the 2.5-foot interval located near the mid-depth point between the ground surface and the water table, and the other from the 2.5-foot interval located immediately above or at the water table.

4. Upon reaching the water table, collect one groundwater sample from each borehole using a Hydropunch II, or similar sampling device. Chemical parameters for groundwater samples submitted for laboratory analysis included BTEX and PAH.

5. After completion of all soil and groundwater sampling, install a temporary polyvinyl chloride (PVC) piezometer within each drilled borehole. Measure static groundwater level 24 hours after piezometer installation, remove each piezometer, and abandon each borehole by grouting to the surface.

The rationale for the design of the site investigation was based on the results from the sampling conducted during the tank removal. These results were insufficient to determine the vertical and horizontal extent of contamination in soil and groundwater. The site investigation was designed to fulfill these identified data needs.

The field work for the site investigation was performed by SAIC during September 1996. Four soil boreholes (designated 05-01 through 05-04) were drilled at the site down to the following depths: 05-01 (17.0 feet), 05-02 (13.0 feet), 05-03 (13.0 feet), and 05-04 (18.0 feet). The boreholes were advanced between approximately 3.0 feet to 8.0 feet below the water table to accomplish groundwater sampling using a PowerPunch sampler. Figure II-3 illustrates the locations of the site investigation boreholes, and boring logs recorded during drilling are presented in Appendix A of this report.

Collection of two soil samples for laboratory chemical analysis from each of the site investigation boreholes was accomplished as planned. Collection of one groundwater sample from each borehole and measurement of static water levels were also accomplished as planned.

A summary of the soil and groundwater samples submitted for analytical analysis during the site investigation is presented in Table II-2. Additional information regarding the technical approach used by SAIC for implementation of the site investigation is presented in Appendix B of this report. Details regarding the analytical results for soil and groundwater samples collected during the investigation are discussed in Section D.3 of this report.

D.1 Regulated Substance Released

According to operational records maintained by the Fort Stewart DPW, UST 14 was used for waste oil storage. Therefore, waste oil is the only regulated substance believed to have been released at this site.

D.2 Source of Contamination

The location of former UST 14 are illustrated in Figure II-1. Detailed schematics illustrating the location of the tank and ancillary piping as configured during operation is not available. During removal activities, Fort Stewart DPW personnel observed no holes in the tank and, therefore, the source of contamination is believed to have been piping leakage and/or tank overflows. At the present time, the only remaining source of contamination at the site is contaminated soil located below the former tank pit.

D.3 Impacted Environmental Media

D.3.a Soils

A summary of the analytical results for the soil samples collected during the CAP-Part A site investigation at the site is presented in Table II-3. Laboratory data sheets for these samples and the project Quality Control Summary Report (QCSR) are presented in Appendices C-1 and C-3 of this report. Figure II-3 illustrates the site investigation borehole locations and corresponding analytical results for soil samples collected at each location.

Soil sample analytical results were compared to their applicable soil threshold levels. Soil samples collected from the tank pit after the removal of the tanks indicated concentrations of benzene in the UST 14 tank pit above the soil threshold levels.

The extent of soil contamination appears to be limited to the immediate vicinity of the UST 14 tank pit area. No BTEX or PAH compounds were detected in the soil samples from the four boreholes. TPH concentrations from the site investigation samples ranged from 7 mg/kg to 61 mg/kg.

Evaluation of the nature and extent of the soil contamination at the UST 14 site was accomplished using analytical data from both the site investigation and the tank removal sampling. Although benzene was detected in the tank pit during closure activities at a concentration exceeding its respective threshold level, soil samples collected during the initial site characterization of the CAP-Part A investigation showed nondetectable concentrations of BTEX and PAH compounds. Therefore, it is concluded that the soil contamination is limited to the area of the tank pit.

D.3.b Groundwater

A summary of the analytical results for the groundwater samples collected during the CAP-Part A site investigation at the site is presented in Table II-4. Laboratory data sheets for these samples and the project QCSR are presented in Appendices C-2 and C-3 of this report. Figure II-4 illustrates the site investigation borehole locations and corresponding analytical results for groundwater samples collected at each location.

The site investigation groundwater sample analytical results were compared to Maximum Contaminant Levels (MCLs) for Safe Drinking Water. No BTEX or PAH compounds were detected in the groundwater at the site. Based on an evaluation of the site investigation analytical data, the groundwater is not contaminated.

D.3.c Surface Water Impacted

Based on the fact that petroleum-related groundwater contamination exceeding MCLs was not detected at the site, this finding indicates that surface water bodies located in the vicinity of the site have not been impacted. Therefore, collection and analysis of surface water samples were not conducted as part of the site investigation.

D.3.d Drinking Water Supply Impacted

Based on the fact that petroleum-related groundwater contamination exceeding MCLs was not detected at the site, this finding indicates that groundwater supply wells located in the vicinity of the site have not been impacted. Therefore, collection and analysis of groundwater samples from vicinity supply wells were not conducted as part of the site investigation.

D.4 Local Water Resources

D.4.a Drinking Water Supplies

According to the Groundwater Pollution Susceptibility Map of Georgia (GDNR 1992), Facility ID #9-089069 is located within an average or higher groundwater pollution susceptibility area. A total of seven groundwater supply wells are located within a 2-mile radius of the Fort Stewart garrison area. Fort Stewart does not use any surface water bodies as water supplies. Documentation of the water supply survey is presented in Appendix D of this report.

Six of these wells are located within the confines of the garrison area. The other well is located at Wright Army Airfield, approximately 1.2 miles northeast of the garrison area. All of the groundwater supply wells are classified as public wells that supply water to Fort Stewart for drinking and nondrinking purposes. These wells are approximately 450 feet in depth and draw groundwater from the Principal Artesian (also known as the Floridan) aquifer. Chlorine and fluoride are added into the groundwater at the well heads prior to being pumped into storage tanks and/or water towers, according to Fort Stewart DPW personnel. The location of these wells along with a 500-foot radius is shown in Figure II-5. Based on the location of Facility ID #9-089069 relative to the identified groundwater supply wells, this site is classified as being located greater than 500 feet to a withdrawal point.

D.4.b Surface Water Bodies

Several surface water bodies are located within a 1-mile radius of the Fort Stewart garrison area. These are shown in Figure II-5 and include Mill Creek, Taylors Creek, Peacock Creek, Childpen's Pond, and two unnamed ponds. Mill Creek extends along the western side of the garrison area and flows into Taylors Creek located approximately 0.75 miles northwest of the garrison area. Taylors Creek then flows northward approximately 3.5 miles to its confluence with Canoochee Creek. Peacock Creek originates near the east corner of the garrison area and flows southward from the garrison. Mill Creek, Taylors Creek, and Peacock Creek all have natural streambeds and exhibit perennial flow.

Childpen's Pond is located at the northwest end of the garrison area. The two unnamed ponds are located at the northwest end of the facility golf course in the vicinity of Childpen's Pond. All of the ponds are isolated water bodies that are relatively small in size, measuring less than 500 feet in diameter. Based on the location of Facility ID #9-089069 relative to the area surface water bodies, this site is classified as being located greater than 500 feet to a surface water body.

D.5 Other Hydrogeologic Data

Regional Geology

The Fort Stewart Military Reservation (FSMR) is located within the coastal plain physiographic province. This province is typified by nine southeastward dipping strata that increase in thickness from zero feet at the fall line located approximately 350 miles inland from the Atlantic coast, to approximately 4,200 feet at the coast. State geologic records describe a probable petroleum exploration well (the No. 1 Jelks-Rogers) located in the region as encountering crystalline basement rocks at a depth of 4254 feet below the land surface. This well provides the most complete record for Cretaceous, Tertiary, and Quaternary sedimentary strata in the region.

The Cretaceous section was found to be approximately 1,970 feet in thickness and dominated by clastics. The Tertiary section was found to be approximately 2,170 feet in thickness and dominated by limestone with a 175-foot thick cap of dark green phosphatic clay. This clay is regionally extensive and is known as the Hawthorn Group. The interval from approximately 110 feet to the surface is Quaternary in age and composed primarily of sand with interbeds of clay or silt. This section is undifferentiated into separate formations (Metcalf & Eddy 1996).

Local Geology

State geologic records contain information regarding a well drilled in October 1942, 1.8 miles north of Flemington at Liberty Field of Camp Stewart (now known as Fort Stewart). This well is believed to be an artesian well located approximately one-quarter mile north of the runway at Wright Army Airfield within the FSMR. The log for this well describes a 410-foot section, the lowermost 110 feet of which consisted predominantly of limestone sediments above which 245 feet of dark green phosphatic clay typical of the Hawthorn Group was encountered. The uppermost portion of the section was found to be Quaternary age interbedded sands and clays. The top 15 feet of these sediments were described as sandy clay (Metcalf & Eddy 1996).

The surface soil located throughout the Fort Stewart garrison area consists of Stilson loamy sand. The surface layer of this soil is typically dark grayish brown loamy sand measuring approximately 6 inches in depth. The surface layer is underlain by material consisting of pale yellow loamy sand and extends to a depth of approximately 29 inches. The subsoil is dominantly sandy clay loam and extends to a depth of 72 inches or more (Metcalf & Eddy 1996).

Hydrogeology

The hydrogeology in the vicinity of the FSMR is dominated by two aquifers referred to as the Principal Artesian and the surficial. The Principal Artesian aquifer is the lowermost hydrologic unit and is regionally extensive from South Carolina through Georgia, Alabama, and most of Florida. Known elsewhere as the Floridan, this aquifer is composed primarily of Tertiary age limestone including the Bug Island Formation, the Ocala Group, and the Suwannee Limestone. These formations are approximately 800 feet in thickness, and groundwater from this aquifer is used primarily for drinking water (Arora 1984). The confining layer for the Principal Artesian aquifer is the phosphatic clay of the Hawthorn Group. There are minor occurrences of aquifer material within the Hawthorn Group; however, they have limited utilization (Miller 1990).

The uppermost hydrologic unit is the surficial aquifer, which consists of widely varying amounts of sand and clay ranging from 55 to 150 feet in thickness. This aquifer is primarily used for domestic lawn and agricultural irrigation. The top of the water table ranges from approximately 2 to 10 feet below ground level (Geraghty and Miller 1993). However, soil surveys for Liberty and Long Counties describe the occurrence of a perched water table within the Stilson loamy sands present within the FSMR (Looper 1980).

D.5.a Depth to Groundwater

Determination of the depth to groundwater at the site was accomplished by measuring water levels within temporary piezometers. Each temporary piezometer consisted of 2.0-inch PVC slotted screen and casing that was placed into each soil borehole drilled at the site after completion of soil and groundwater sampling. The piezometers remained in the boreholes for an approximately 24-hour period to allow for stabilization of the water table surface. At the end of the stabilization period, static groundwater levels were measured in each piezometer.

Table II-5 presents a summary of the groundwater depth measurement results for the site investigation. Details regarding the procedures used by SAIC for the installation of temporary piezometers, measurement of static water levels, and surveying of borehole elevations are presented in Appendix B of this report.

D.5.b Groundwater Flow Direction

Based on groundwater elevations calculated from the depth to groundwater measurements recorded during the site investigation, the general direction of groundwater flow at Facility ID #9-089069 is from northwest to southeast.

Equipotential contours illustrating the specific groundwater flow pattern at the site are presented in Figure II-4. However, the groundwater depth measurement recorded at the borehole 05-01 location drilled within the former tank pit (i.e., non-native material) was not included in the interpretation of the groundwater flow pattern at the site. Groundwater elevations, referenced to mean sea level, for each temporary piezometer installed during the site investigation are also presented in Figure II-4.

D.5.c Hydraulic Gradient

The hydraulic gradient at Facility ID #9-089069 was calculated using the groundwater elevations measured in the boreholes located outside of the tank pit, as these boreholes represent native undisturbed soil. The groundwater flow direction was determined and the hydraulic gradient was computed along the direction of flow. The hydraulic gradient at Facility ID #9-089069 is estimated to be 0.002 feet/feet.

D.5.d Total Organic Carbon (Optional)

Alternate Threshold Levels (ATLs) are not planned to be calculated for contaminated soils located at the site. Therefore, analysis of total organic carbon was not conducted as part of the site investigation.

D.5.e Grain-Size Distribution

ATLs are not planned to be calculated for contaminated soils located at the site. Therefore, analysis of grain-size distribution was not conducted as part of the site investigation.

D.5.f Total Petroleum Hydrocarbons (Optional)

ATLs are not planned to be calculated for contaminated soils located at the site. However, analysis of TPH was included as part of the site investigation in order to provide additional data for use in determining the extent of soil contamination.

D.6 Corrective Action Completed or In-Progress

D.6.a USTs Removed

The UST system, tank and ancillary piping, was removed from service in April 1995, and was subsequently excavated and removed on June 15, 1995. According to Fort Stewart DPW personnel, the UST system was closed in accordance with guidance document GUST-9 *So You Want to Close an UST*, revised August 1995.

D.6.b Excavation and Treatment/Disposal of Backfill and Native Soils

The backfill material excavated during the removal of the UST was disposed of at KEDESH, Inc., an asphalt treatment plant, located on Highway 17N in Kingsland, Georgia. No overexcavation of native soil surrounding the tank pit was conducted during the tank removal operation. The excavation was backfilled with clean soil material upon completion of the removal activities.

D.7 Conclusions and Recommendations

Summary of Conclusions

The UST 14 site, Facility ID #9-089069, is located within an average or higher groundwater pollution susceptibility area. Public groundwater supply wells are located within a 2-mile radius of the site; however, the distance between the site and the nearest supply well is greater than 500 feet. Surface water bodies are located within a 1-mile radius of the site; however, the distance between the site and the nearest body is greater than 500 feet. Based on this information, the applicable soil threshold levels for the site are those listed in Table A (GDNR Rules for Underground Storage Tank Management, Chapter 391-3-15) for the Average or Higher Groundwater Pollution Susceptibility Area (Column 2) greater than 500 feet to a withdrawal point category. Regulatory limits (i.e., MCLs) for groundwater contamination at the site are in accordance with the Safe Drinking Water Act.

Characterization of the site was accomplished through soil sampling conducted during removal of the tank, and a subsequent single-phase site investigation that involved both soil and groundwater sampling. Six soil samples were collected from the tank pit excavation during tank removal activities. Four soil boreholes were drilled during the site investigation, one located within the former tank pit and three others around the perimeter of the pit. Two soil samples and one groundwater sample were collected from each of the four boreholes.

Soil analytical data from the tank removal sampling indicated that the soil from the tank pit was contaminated with benzene exceeding the applicable soil threshold level. The initial site characterization of the CAP-Part A investigation indicates that there is no soil contamination in the soil borings around the perimeter of the tank pit or in the soil below the tank pit.

Groundwater analytical data from the initial site characterization of the CAP-Part A investigation indicate that there is no groundwater contamination.

Recommendations

Analytical results for soil and groundwater samples collected during the site investigation at the site are sufficient to define the nature and extent of petroleum-related contamination at the site. Based on these findings, further investigation of the UST 14 site, Facility ID #9-089069, is not required. The rationale for this recommendation is presented in Section III, Site Investigation Plan.

As required by GDNR Underground Storage Tank Management Program, a CAP-Part B report should be prepared to document the remedial actions to be taken at the UST 14 site, Facility ID #9-089069.

D.8 Site Ranking

The Environmental Sensitivity Score for the UST 14 site, Facility ID #9-089069, was determined by completing the Site Ranking Form presented in Appendix II of the GUST-7A CAP-Part A guidance document. The result of the Site Ranking Form calculation indicates that the Environmental Sensitivity Score for the site is 100. A copy of the completed Site Ranking Form is presented in Appendix E of this report.

III. SITE INVESTIGATION PLAN

This Site Investigation Plan (SIP) presents the technical approach used to delineate the full extent of soil and/or groundwater contamination as a result of releases from UST 14, Facility ID #9-089069.

A. Horizontal and Vertical Extent of Contamination

A.1 Soils

Soil contamination was delineated by analyzing soil collected during tank removal, one borehole in the tank pit, and three boreholes around the perimeter of the tank pit. Soil samples that were collected from the tank pit after the tank removal indicated concentrations of benzene and toluene above soil threshold levels. The depth at which the tank removal samples were collected is not known; however, given the fact that the groundwater table is located at a depth of approximately 5 feet below ground surface, it is likely that these samples were taken from a point at or above the groundwater table. Soil samples collected from borehole 05-01 below the tank pit did not indicate the presence of BTEX or PAH compounds. Soil samples collected from boreholes 05-02, 05-03, and 05-04 that were located around the perimeter of the tank pit did not indicate the presence of BTEX or PAH compounds.

The vertical and horizontal extent of the soil contamination was determined during the initial site characterization. Therefore, no additional soil borings are recommended as part of the SIP.

A.2 Groundwater

Groundwater contamination was delineated by analyzing groundwater collected from four temporary piezometers installed in and around the contamination source. Groundwater samples collected from four boreholes did not indicate the presence of BTEX or PAH compounds. There is no groundwater contamination, therefore, no monitoring wells are recommended as part of the SIP.

A.3 Surface Water

There are no surface water bodies near this site, therefore, no surface water sampling is recommended as part of the SIP.

B. Vadose Zone and Aquifer Characteristics

Vadose zone characterization is not recommended since no vadose zone contamination exists. The extent of contamination in the aquifer is limited and typical aquifer parameters can be used during evaluation of remedial alternatives. Presently, no aquifer characterization is planned since no further investigation is being recommended at the site.

IV. PUBLIC NOTICE

Facility ID #9-089069 is located within the confines of the Fort Stewart garrison area, which is part of the FSMR, a federally-owned facility. All of the property contiguous to the site is owned by the U.S. Government. The Fort Stewart DPW will comply with the public notice requirement defined in guidance document GUST-7A for CAP-Part A activity notification by publishing an announcement in the *Coastal Courier* and the *Patriot*, which are both newspapers that are circulated throughout Fort Stewart and the Hinesville, Georgia areas. The announcement will appear in both newspapers over a period of one week.

Publication of this announcement will be completed simultaneously with the submittal of this CAP-Part A report for review by the GDNR Environmental Protection Division. A copy of the newspaper announcement to be used for public notification is presented in Appendix F of this report.

V. CLAIM FOR REIMBURSEMENT: GUST TRUST FUND

The FSMR is a federally-owned facility, and, the owner of Facility ID #9-089069 (i.e., the U.S. Government) is not filing a claim for reimbursement of reasonable cleanup expenses from the GUST Trust Fund.

VI. REFERENCES

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REPORT TABLES

Table II-4. Groundwater Analytical Results for the Facility ID #9-089069 Site Investigation

Investigation: 05					
	Station	05-01	05-02	05-03	05-04
	Sample ID	0501W2	0502W2	0503W2	0504W2
	Date Collected	9/7/96	9/7/96	9/7/96	9/7/96
	Depth	15.0 - 17.0 FT	10.0 - 13.0 FT	10.0 - 13.0 FT	15.0 - 18.0 FT
	EPA MCL				
Polynuclear Aromatic Hydrocarbons	UG/L	UG/L	UG/L	UG/L	UG/L
2-Chloronaphthalene	NA	10 U	10 U	10 U	10 U
Acenaphthene	NA	10 U	10 U	10 U	10 U
Acenaphthylene	NA	10 U	10 U	10 U	10 U
Anthracene	NA	10 U	10 U	10 U	10 U
Benzo(a)anthracene	NA	10 U	10 U	10 U	10 U
Benzo(a)pyrene	0.2	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	NRC	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	NA	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	NRC	10 U	10 U	10 U	10 U
Chrysene	NRC	10 U	10 U	10 U	10 U
Dibenzo(a,h)anthracene	NRC	10 U	10 U	10 U	10 U
Fluoranthene	NA	10 U	10 U	10 U	10 U
Fluorene	NA	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	NRC	10 U	10 U	10 U	10 U
Naphthalene	NA	10 U	10 U	10 U	10 U
Phenanthrene	NA	10 U	10 U	10 U	10 U
Pyrene	NA	10 U	10 U	10 U	10 U
	EPA MCL				
Volatile Organics	UG/L	UG/L	UG/L	UG/L	UG/L
Benzene	5	5 U	5 U	5 U	5 U
Ethylbenzene	700	5 U	5 U	5 U	5 U
Toluene	1000	5 U	5 U	5 U	5 U
Xylenes, Total	10000	5 U	5 U	5 U	5 U

NRC - No Regulatory Criteria
NA - Not Applicable, the health based threshold level would be exceeded only if free product conditions existed

U - Indicates the compound was not detected at the concentration reported.

Table II-3. Soil Analytical Results for the Facility ID #9-089069 Site Investigation

Investigation: 05	Station	05-01	05-01	05-02	05-02	05-03	05-03	05-04	05-04
	Sample ID	0501D1	0501E1	0502B1	0502D1	0503B1	0503D1	0504B1	0504D1
	Date Collected	9/7/96	9/7/96	9/7/96	9/7/96	9/7/96	9/7/96	9/7/96	9/7/96
	Depth	7.5 - 10.0 FT	10.0 - 12.5 FT	2.5 - 5.0 FT	7.5 - 10.0 FT	2.5 - 5.0 FT	7.5 - 10.0 FT	2.5 - 5.0 FT	7.5 - 10.0 FT
Polynuclear Aromatic Hydrocarbons	**GDNR Level MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**
2-Chloronaphthalene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Acenaphthene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Acenaphthylene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Anthracene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Benzo(a)anthracene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Benzo(a)pyrene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Benzo(b)fluoranthene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Benzo(g,h,i)perylene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Benzo(k)fluoranthene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Chrysene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Dibenzo(a,h)anthracene	NA	0.388 U	0.407 UJ	0.357 U	0.416 UJ	0.374 UJ	0.393 U	0.346 U	0.394 UJ
Fluoranthene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Fluorene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Indeno(1,2,3-cd)pyrene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Naphthalene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Phenanthrene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Pyrene	NA	0.388 U	0.407 U	0.357 U	0.416 U	0.374 U	0.393 U	0.346 U	0.394 U
Petroleum Hydrocarbons	**GDNR Level MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**
Total Petroleum Hydrocarbons	NRC	10 U	60.9 =	29 U	12.7 U	13.2 U	10 U	11.1 U	10.6 U
Volatile Organics	**GDNR Level MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**	**MG/KG**
Benzene	0.008	0.0059 U	0.0062 U	0.0055 U	0.0063 U	0.0057 U	0.006 U	0.0053 U	0.006 U
Ethylbenzene	10	0.0059 U	0.0062 U	0.0055 U	0.0063 U	0.0057 U	0.006 U	0.0053 U	0.006 U
Toluene	6	0.0059 U	0.0062 U	0.0055 U	0.0063 U	0.0057 U	0.006 U	0.0053 U	0.006 U
Xylenes, Total	700	0.0059 U	0.0062 U	0.0055 U	0.0063 U	0.0057 U	0.006 U	0.0053 U	0.006 U

NRC - No Regulatory Criteria
NA - Not Applicable, the health based threshold level would be exceeded only if free product conditions existed

U - Indicates the compound was not detected at the concentration reported.
UJ - Indicates the compound was not detected at the reported concentration and the concentration was estimated.
J - Indicates that the value for the compound is an estimated value.
= - Indicates the compound was detected at the concentration reported.

Table II-2. Soil and Groundwater Samples Collected by SAIC During the Facility ID #9-089069 Site Investigation

Tank	Borehole Number	Sample Number & Type	Collection Date	Depth Interval (below ground surface)
14	Borehole 05-01	0501D1 (Soil)	9/7/96	7.5 - 10.0 Feet
		0501E1 (Soil)	9/7/96	10.0 - 12.5 Feet
		0501W2 (Groundwater)	9/7/96	15.0 - 17.0 Feet
	Borehole 05-02	0502B1 (Soil)	9/7/96	2.5 - 5.0 Feet
		0502D1 (Soil)	9/7/96	7.5 - 10.0 Feet
		0502W2 (Groundwater)	9/7/96	10.0 - 13.0 Feet
	Borehole 05-03	0503B1 (Soil)	9/7/96	2.5 - 5.0 Feet
		0503D1 (Soil)	9/7/96	7.5 - 10.0 Feet
		0503W2 (Groundwater)	9/7/96	10.0 - 13.0 Feet
	Borehole 05-04	0504B1 (Soil)	9/7/96	2.5 - 5.0 Feet
		0504D1 (Soil)	9/7/96	7.5 - 10.0 Feet
		0504W2 (Groundwater)	9/7/96	15.0 - 18.0 Feet

Table II-1. Analytical Results for Soil Samples Collected by Anderson Columbia During Removal of UST 14

FACILITY ID # 9-089069 (SOIL)

Tank #	Sample # (Sample Date)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	TPH (mg/kg)
14	T14-T1-S1 (6/15/95)	<0.00116	0.0147	0.0286	0.159	1080.0
	T14-T1-S2 (6/15/95)	<0.00115	0.00393	<0.00115	0.0114	2310.0
	T14-ESW (6/15/95)	**0.0459 ***	0.392	0.135	0.76	701.0
	T14-WSW (6/15/95)	<0.00113	0.115	0.0687	0.486	860.0
	T14-NSW (6/15/95)	<0.00113	0.27	0.146	0.444	172.0
	T14-SSW (6/15/95)	**0.0203 ***	0.157	0.0536	0.332	316.0

TPH Total Petroleum Hydrocarbons
* Indicates that result exceeds applicable GDNR Soil Threshold Level

Applicable Soil Threshold Levels (mg/kg): Benzene = 0.008 Toluene = 6.00 Ethylbenzene = 10.0 Xylenes = 700.0

Table II-5. Groundwater Depth Measurements and Calculated Groundwater Elevations for the Facility ID #9-089069 Site Investigation

Tank	Borehole	Date Measured	Water Level Depth	Screened Interval Depth	Ground Surface Elevation	Water Level Elevation
14	Borehole 05-01	9/8/96	5.18 Feet BGS	12 -17 Feet BGS	69.78 Feet MSL	64.60 Feet MSL
	Borehole 05-02	9/8/96	5.02 Feet BGS	8 - 13 Feet BGS	69.75 Feet MSL	64.73 Feet MSL
	Borehole 05-03	9/8/96	5.02 Feet BGS	8 - 13 Feet BGS	69.74 Feet MSL	64.72 Feet MSL
	Borehole 05-04	9/8/96	5.20 Feet BGS	13 - 18 Feet BGS	69.84 Feet MSL	64.64 Feet MSL

BGS	Below Ground Surface
MSL	Mean Sea Level

REPORT FIGURES

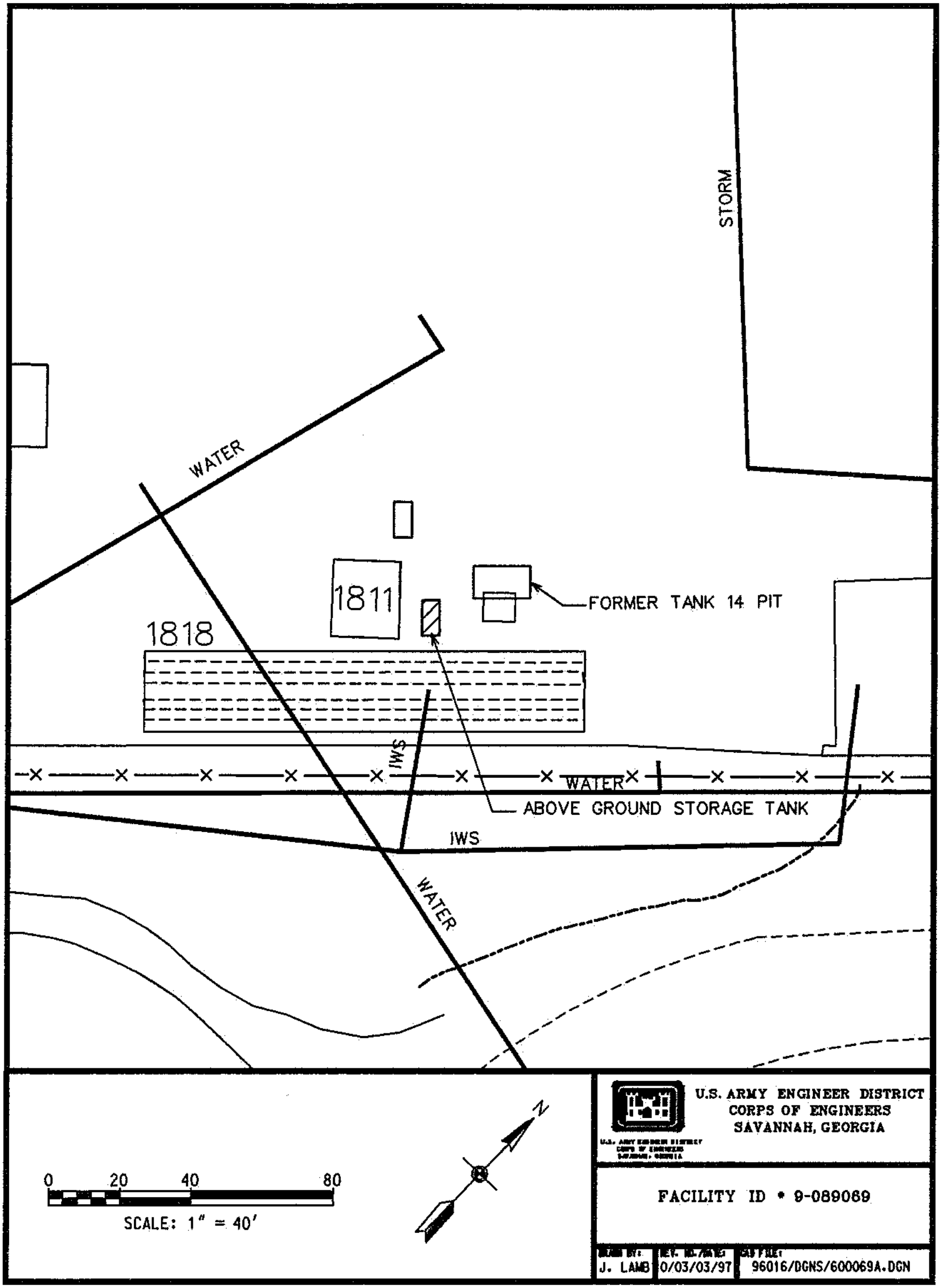


Figure II-1. Facility ID #9-089069, UST 14, Site Map

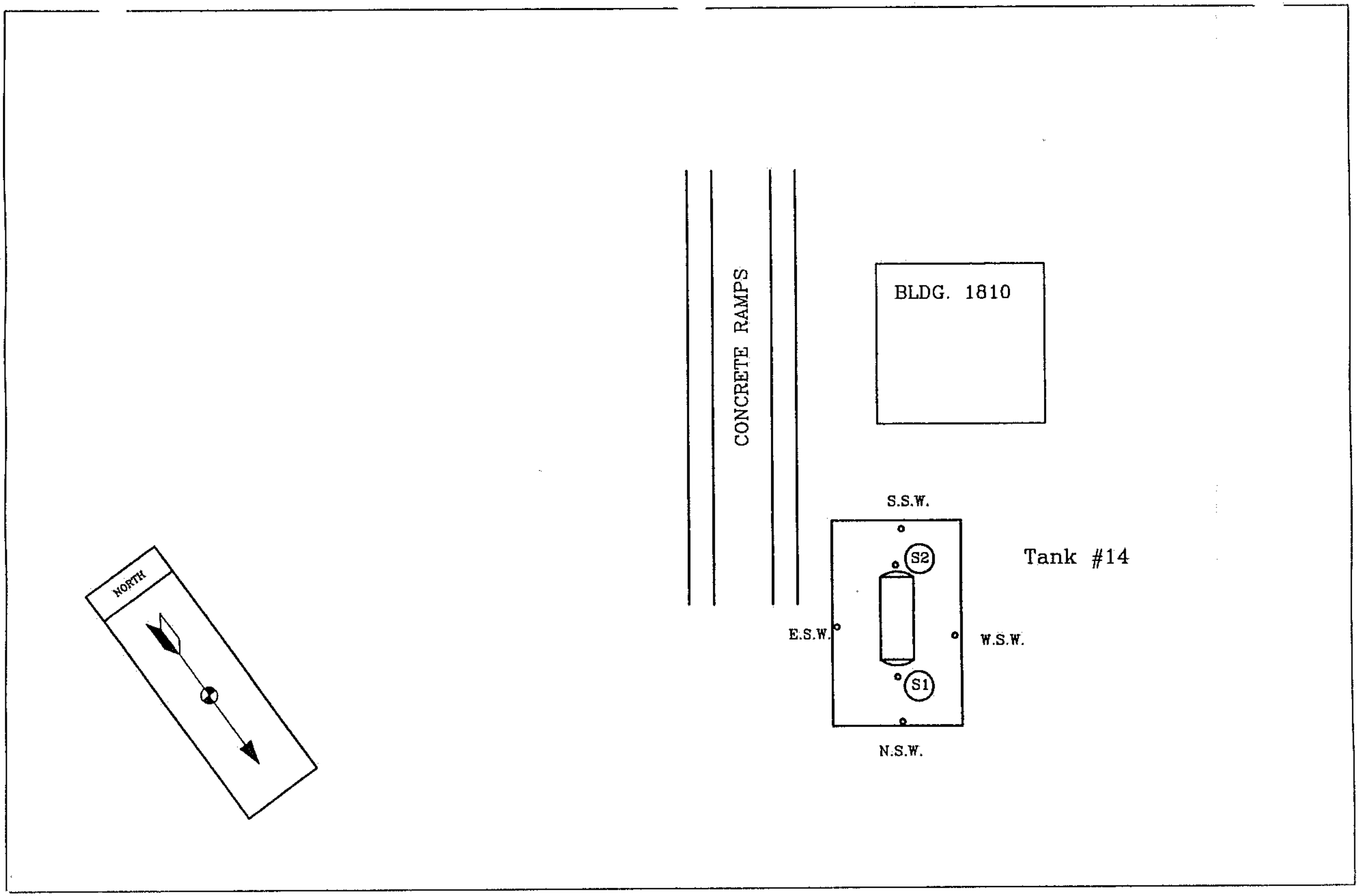


Figure II-2. Site Map of Samplin ocations for the UST 14 Removal

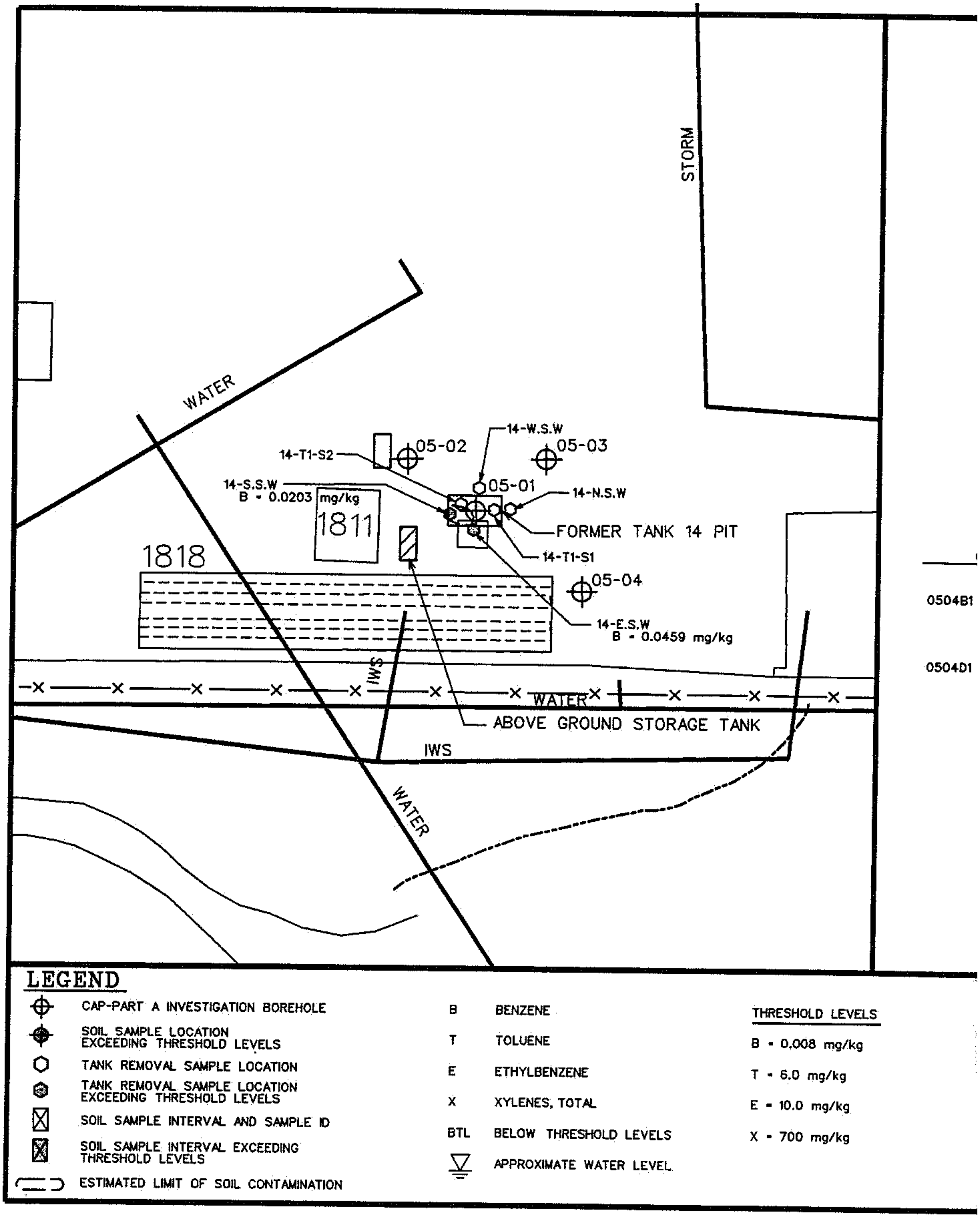


Figure II-3. Site Map of Soil Sampling
for the Facility ID #9-08906

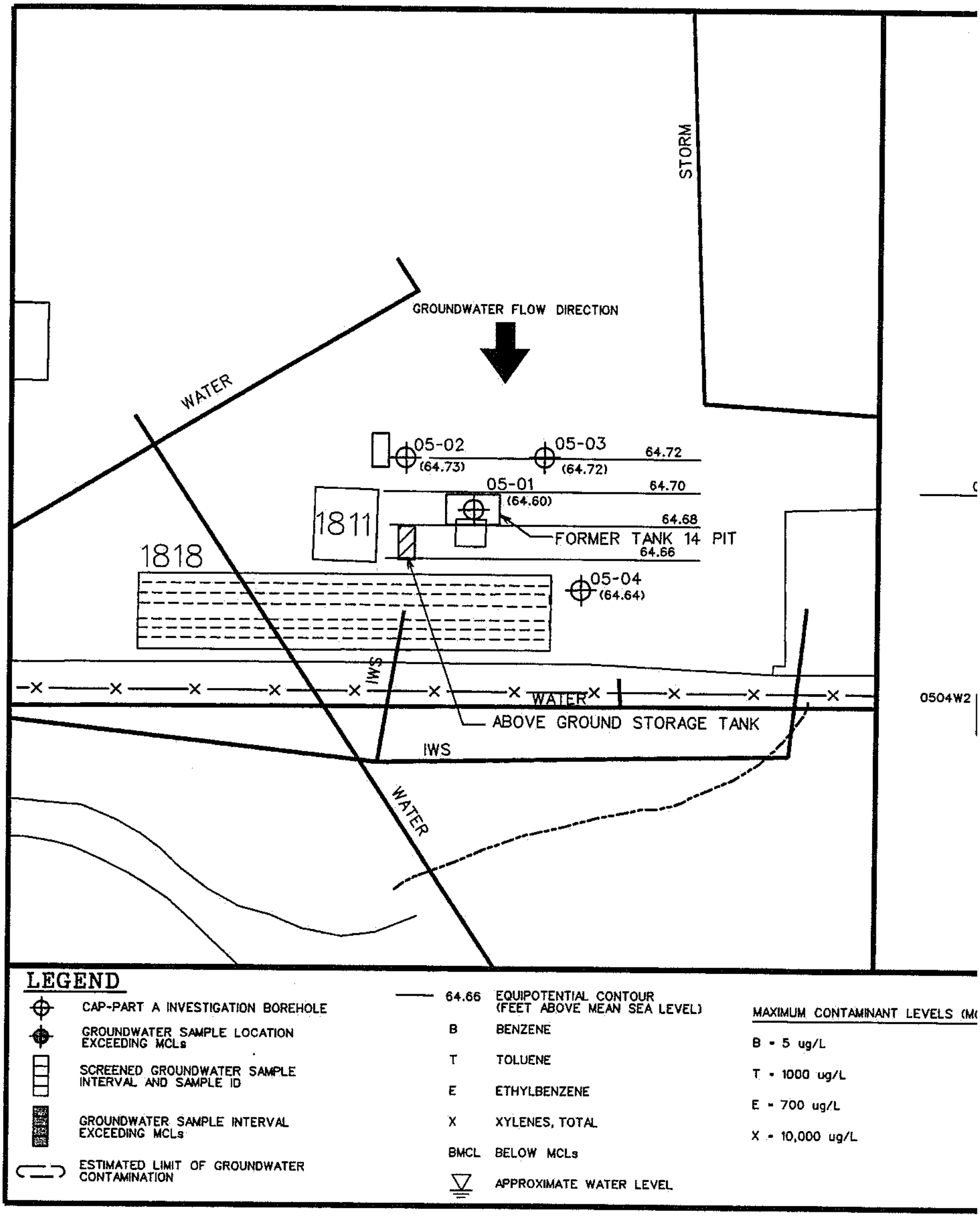


Figure II-4. Site Map of Groundwater
for the Facility ID #9-

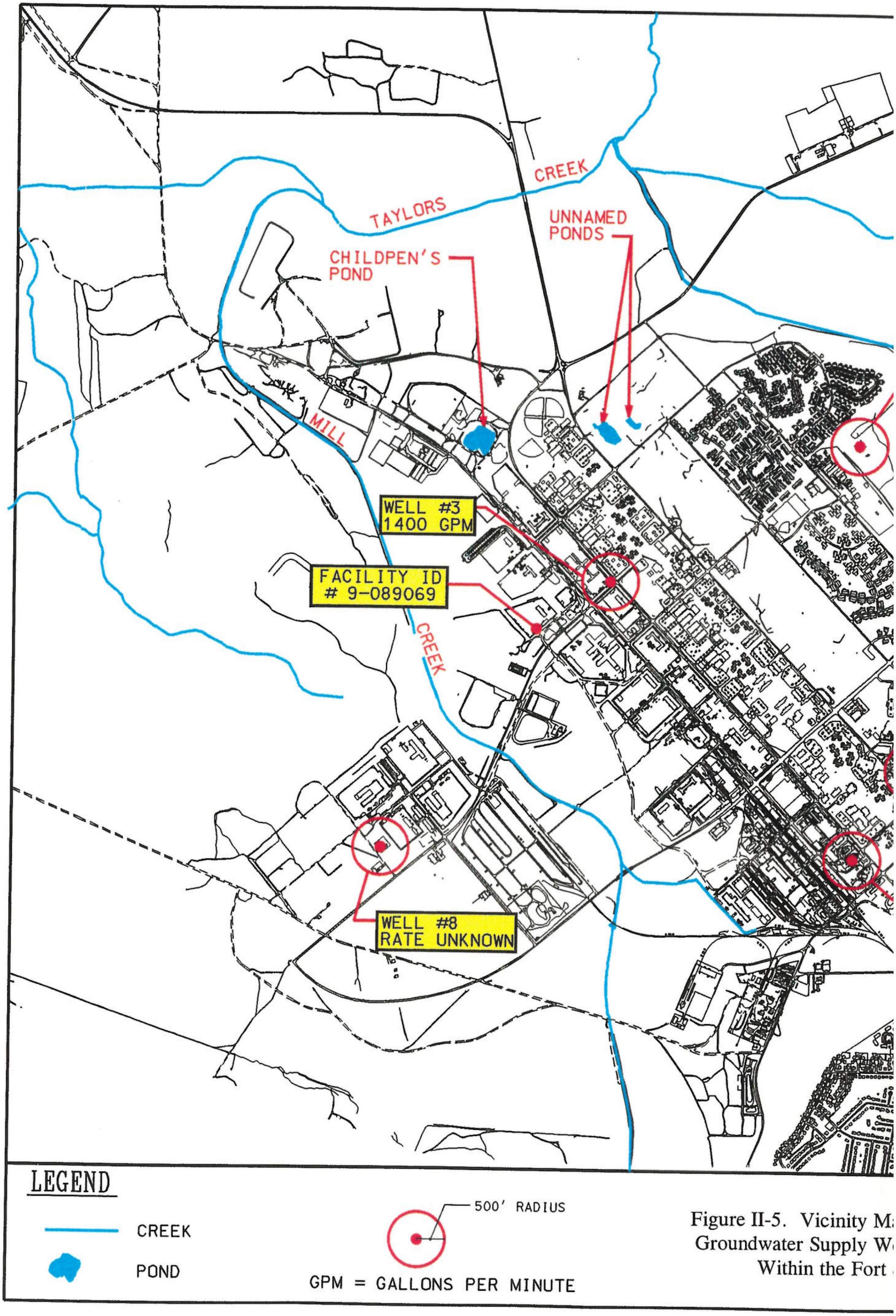


Figure II-5. Vicinity Ma
Groundwater Supply W
Within the Fort

APPENDIX A

SOIL BORING LOGS
FOR THE FACILITY ID #9-089069 SITE INVESTIGATION

HTRW DRILLING LOG

HOLE NUMBER 05-01

PROJECT Ft. Stewart UST

INSPECTOR M. Vest

SHEET 1 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0.0	Concrete Pad				
	1.0	Sand with minor Clay, yellowish brown, fine	40.4 ppm			
	2.0	Sand, brownish yellow, fine				
	3.0					
	4.0		28.7 ppm			Piezometer Casing
	5.0					
	6.0	Sand with minor Clay, brownish yellow, fine to medium	32.9 ppm			
	7.0					
	8.0	Sand with minor Clay, red, fine to medium			Soil Sample 05-01B1	
	9.0		50.5 ppm			▼ Approx.
	10.0					

HTRW DRILLING LOG

HOLE NUMBER 05-01

PROJECT Ft. Stewart UST

INSPECTOR M. Vest

SHEET 2 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10.0	Sand, gray, fine to medium			Soil Sample 0501E1	
	11.0		20.9 ppm			
	12.0					Piezometer Screen
	13.0		27.1 ppm			
	14.0					
	15.0	No Material Collected (Power Punch)			Groundwater Sample 0501W2	
	16.0					
	17.0					

HTRW DRILLING LOG

HOLE NUMBER 05-02

PROJECT Ft. Stewart UST

INSPECTOR M. Vert

SHEET 1 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0.0	Concrete Pad				
	1.0	Sand, gray mottled, fine	28.0 ppm		☒	
	2.0					
	3.0	Sand, black, fine	33.0 ppm		Soil Sample 0502B1	Piezometer Casing
	4.0					
	5.0				☒	▼ Approx.
	6.0		31.5 ppm			
	7.0	Sand, strong brown, fine				
	8.0	Sand + clay, red mottled, fine	22.0 ppm		Soil Sample 0502D1	
	9.0					
	10.0					

HTRW DRILLING LOG

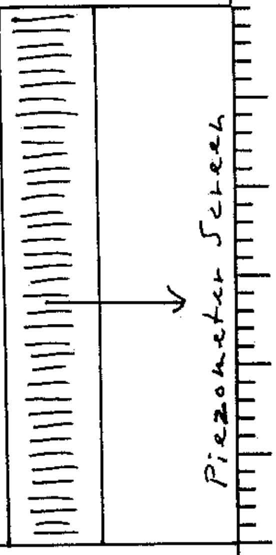
HOLE NUMBER 05-02

PROJECT Ft. Stewart UST

INSPECTOR M. Vest

SHEET 2 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10.0	No Material Collected			Groundwater Sample 0502W2	
	11.0	(Power Punch)				
	12.0					
	13.0					



HTRW DRILLING LOG

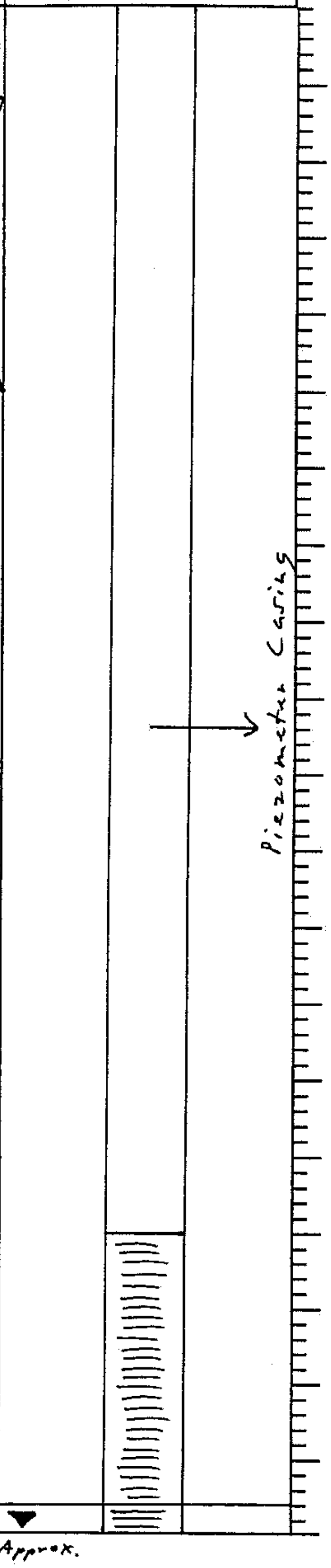
HOLE NUMBER 05-03

PROJECT Ft. Stewart UST

INSPECTOR M. Vert

SHEET 1 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0.0	Concrete Pad				
	1.0	Sand, pale yellow mottled, fine	0.0 ppm		☒	
	2.0	Sand, very dark gray, fine			Soil Sample 0503B1	
	3.0					
	4.0	Sand, dark reddish gray, fine	0.0 ppm			Piezometer Casing
	5.0	Sand & Clay, brownish yellow gray, fine to medium			☒	
	6.0		0.0 ppm			
	7.0					
	8.0	Sand & Clay, gray, fine to medium			Soil Sample 0503D1	
	9.0		0.0 ppm			
	10.0	Sand & Clay, pale yellow mottled, fine to medium				▼ Approx.



HTRW DRILLING LOG

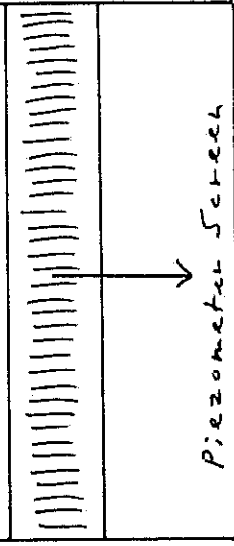
HOLE NUMBER 05-03

PROJECT Ft. Stewart UST

INSPECTOR M. Vert

SHEET 2 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10.0	No Material Collected			Groundwater Sample 0503W2	
	11.0	(PowerPunch)				
	12.0					
	13.0					



HTRW DRILLING LOG

HOLE NUMBER 05-04

PROJECT Ft. Stewart UST

INSPECTOR M. Vert

SHEET 1 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0.0	Concrete Pad				
	1.0	Sand, gray, fine	3.2 ppm		☒	
	2.0					
		Sand, black gray, fine	6.8 ppm		Soil Sample 0504B1	
	3.0					
	4.0					
	5.0	Sand & clay, gray, fine to medium	5.5 ppm		☒	Piezometer Casing
	6.0	Sand & clay, brown, fine to medium				
	7.0	Sand & clay, light gray, fine to medium				
	8.0		2.9 ppm		Soil Sample 0504D1	
	9.0	Sand & clay, red, fine to medium				
	10.0					

HTRW DRILLING LOG

HOLE NUMBER 05-04

PROJECT Ft. Stewart UST

INSPECTOR M. Vest

SHEET 2 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10.0	Sand & Clay, red, fine to medium	3.0 ppm			
	11.0					
	12.0	Sand, bluish gray, fine to medium	3.7 ppm			
	13.0					
	14.0	Sand, light gray, medium				▼ Approx.
	15.0	No Material Collected (Power Punch)			Groundwater Sample 0504W2	Piezometer Screen
	16.0					
	17.0					
	18.0					

APPENDIX B

TECHNICAL APPROACH FOR THE FACILITY ID #9-089069 SITE INVESTIGATION

TECHNICAL APPROACH

1.0 INTRODUCTION

The overall objective of this project is to provide the engineering services required to produce Corrective Action Plans (CAPs) for the subject UST sites. These reports will conform to the site closure requirements of a CAP-Part A for sites in Georgia. The field investigations necessary to support the report preparation included the installation of temporary piezometers, soil borings, and associated sampling of soil and groundwater. Upon completion of the field investigations, a CAP-Part A will be prepared to meet Georgia Environmental Protection Division (EPD), Fort Stewart, and the USACE-Savannah requirements.

2.0 FIELD ACTIVITIES

The following sections detail the methodologies used for drilling, Powerpunch sampling, and piezometer installation. All boreholes were drilled and piezometers installed by Miller Drilling Company, a drilling firm licensed in the state of Georgia. A geologist from SAIC, either registered or working under the direction of a registered professional, was on site at all times during operations. No drilling activities were undertaken until all utility clearances and permits had been obtained from Fort Stewart's utility personnel.

2.1 Subsurface Soil Sampling

2.1.1 Drilling

The hollow-stem auger drilling method was used during the project for drilling of soil boreholes. The augers used for drilling of boreholes for soil sample collection and groundwater collection using a Powerpunch sampler had a 4.25-inch inside diameter. During all borehole drilling, soil samples were collected continuously on 5.0-foot centers from the ground surface to the bottom of the borehole.

Soil drilling using the hollow-stem auger method was accomplished using truck-mounted CME-55 or similar auger rigs. The total depth of each borehole was dictated by the depth where the water table was encountered.

2.1.2 Sample Collection

Soil samples for chemical analyses were collected from boreholes using 5.0-foot split-barrel samplers. Samples were collected using these samplers as part of hollow-stem auger drilling of the boreholes. Each sampler was inserted into the lead hollow-stem auger and filled as the auger was advanced. Upon retrieval of the sampling device, the soil core was split into two 2.5-foot sections using a stainless steel knife. A portion of each 2.5-foot section was collected for possible laboratory analysis. The remaining portion of each 2.5-foot section was used for field measurements.

Samples designated for possible laboratory analysis were collected from the section using a stainless steel spoon. The spoon was run lengthwise down the core to collect a sample representative of the entire core section. The portion of the sample designated for volatile organic analyses was placed into laboratory sample containers first, followed by placement of the remaining portion of the sample into the containers designated for other types of analyses. Sample containers designated for volatile organic analyses were filled so that minimal headspace was present in the containers. Headspace gas concentration measurements were made using a field organic vapor meter (OVM). Initially, soil from each 2.5-foot interval was placed into a glass jar, leaving some air space, and covered with aluminum foil to create an air-tight seal. The sample was allowed to volatilize for a minimum of 15 minutes. The sealed jar was punctured with the OVM probe and headspace gas drawn until the meter reading was stable. The concentration of the headspace gas was recorded to the nearest 0.1 part per million.

Immediately after collection of each sample and completion of bottle label information, each potential analytical sample container was placed into an ice-filled cooler to ensure preservation. A clean split-barrel sampling device was used to collect soil core from each interval of the project boreholes. Information regarding the criteria for selection of soil samples for off-site shipment to a laboratory for chemical analysis is presented in Section 3.1.3 of the project Work Plan. Soil samples, which were not selected for laboratory analysis, were disposed of as investigation-derived waste.

2.2 Groundwater Sampling

2.2.1 Groundwater Collection

Collection of groundwater samples from soil boreholes advanced during Preliminary Groundwater and CAP-Part A investigations was accomplished using a PowerPunch sampler or from temporary piezometers. The PowerPunch is a probe that allows the collection of a groundwater sample from a discrete undisturbed depth interval in a soil boring. The probe consists of a 1.5-inch outside diameter PVC sample screen that is 5 feet long, a retrievable steel outer casing, and a hardened steel drive point. Temporary piezometers were constructed of 2.5-inch ID PVC casing with a 5-foot screened interval. These piezometers were installed in the open borehole following completion of all drilling activities.

Each soil borehole was advanced to the top of the water table using a 4.25-inch ID HSA. For each borehole, the PowerPunch was inserted into the hollow-stem augers, lowered to the bottom of the borehole, and driven through the undistrubed soil underlying the lead auger to a depth of approximately 3.0 feet below the water table. The outer casing of the PowerPunch was retracted to expose the screen and allow groundwater to enter the chamber. In cases where the PowerPunch could not be driven or where groundwater recovery through the PowerPunch was poor, the groundwater sample was collected through the temporary piezometer.

Groundwater samples were collected using a bailer lowered into the PowerPunch (0.75-inch stainless steel mini bailer) or temporary piezometer (1.0-inch Teflon bailer). The portion of the sample designated for volatile organic analysis was poured into laboratory sample containers first, followed by pouring of the remaining sample portion into containers designated for other types of chemical analyses. Sample containers designated for volatile organic analysis were filled so that no headspace was present in the containers. Samples were poured directly into all containers from the mini or Teflon bailer used for sample retrieval.

2.2.2 Field Measurements

Groundwater field measurements performed during the project included measurement of static groundwater level, pH, specific conductance, and temperature. Measurement of groundwater levels in soil boreholes was accomplished through the installation of temporary PVC piezometers. A summary of the procedures and criteria to be used for groundwater sample field measurements is presented in the following sections.

Static Groundwater Level

Static groundwater level measurements were made using an electronic water level indicator. Initially, the indicator probe was lowered into each temporary piezometer casing until the alarm sounded and/or the indicator light illuminated. The probe was withdrawn several feet and slowly lowered again until the groundwater surface was contacted as noted by the alarm and/or indicator light. Water level measurements were estimated to the nearest 0.01 foot based on the difference between the nearest probe cord mark to the top of the piezometer casing.

The distance between the top of casing and the surrounding ground surface was taken into account in measuring the water level to within 0.01 foot. The static water level measurement procedure was repeated two or three times to ensure that the water level measurements were consistent (plus or minus 0.01 foot). If this was the case, then the first measured level was recorded as the depth to groundwater. If this was not the case, the procedure was repeated until consistent readings were obtained from three consecutive measurements.

pH, Specific Conductance, and Temperature

The pH, specific conductance, and temperature measurements were recorded for groundwater during groundwater sampling. The pH, temperature, and conductivity measurements were made using a combination meter designed to measure these parameters. A portion of each groundwater sample was retrieved from the PowerPunch sampler and poured into the collection cup. With the combination meter set in the pH mode, the meter electrode was swirled at a slow constant rate within the sample until the meter reading reached equilibrium. The sample pH was recorded to the nearest 0.1 pH unit. The pH measurement procedure was repeated, using a new sample each time, until the pH measurements were consistent (less than 0.2 pH units variation).

Upon completion of the pH measurement, conductivity and temperature measurements were made on a groundwater sample collected in the same manner as described above. With the combination meter set in the conductivity mode, the meter electrode was swirled at a slow constant rate within the sample until the meter reading reached equilibrium. Concurrently, a temperature probe was placed into the sample and allowed to reach equilibrium. The sample conductivity was recorded to the nearest 10 mmhos/cm and the temperature to the nearest 0.1° C. All recorded conductivity values were converted to conductance at 25° C. The conductivity and temperature measurement procedure was repeated a minimum of three times using a new sample each time, until the measurements are consistent (less than 10 percent variation for conductance and less than 0.5° C variation for temperatures).

2.3 Temporary Piezometer Installation

Following the collection of the groundwater sample, the borehole was over drilled down to the bottom of the PowerPunch. A 2-inch PVC piezometer, with a 5-foot screened section, was installed in the borehole to prevent the borehole from collapsing. These piezometers remained in the boreholes approximately 24-hours, after which time the static water level was measured.

2.4 Borehole Abandonment

Once the static water level was measured, the temporary piezometers were removed and the boreholes were abandoned. Abandonment was conducted in a manner precluding any current or subsequent fluid media from entering or migrating within the subsurface environment along the axis or from the endpoint of the borehole. Abandonment was accomplished by filling the entire volume of the borehole with grout.

For each borehole located in grass/gravel-covered areas, the borehole was sealed by grouting from the bottom of the borehole to the ground surface. For boreholes located in concrete-covered areas, grout was poured to the interface between the overlying concrete pad and the underlying gravel/soil base. All grouting was accomplished by placing a tremie pipe to the bottom of the borehole and pumping grout through this pipe until undiluted grout was present at the ground surface or the base of the concrete cover. After a 24-hour period, the abandoned borehole was checked for grout settlement. At that time, any settlement depression was filled with grout. Additional grout was added using a tremie pipe. This process was repeated until firm grout remained at the surface.

2.5 Surveying

A topographic survey of the horizontal and vertical locations of all soil boreholes was conducted after completion of all field activities. The topographic survey was conducted by a surveyor registered in the state of Georgia.

The horizontal coordinates for each soil borehole were surveyed to the closest 1.0 foot and referenced to the State Plane Coordinate System. Ground elevations were surveyed to the closest 0.1 foot. Elevations were referenced to the National Geodetic Vertical Datum of 1983.

2.6 Decontamination Procedures

2.6.1 Drilling Equipment

Decontamination of equipment used for the drilling of boreholes was conducted within the temporary decontamination pad constructed at the central staging area. The decontamination pad was constructed so that all decontamination liquids were contained from the surrounding environment and were recovered for disposal as investigation-derived waste (IDW). The entire drill rig and equipment was decontaminated once it arrived on site and the hollow-stem auger drilling equipment was decontaminated after completion of each soil borehole. The drilling equipment was decontaminated by removing the caked soil material from the exterior of equipment using a rod and/or brush, steam cleaning the interior and exterior of equipment, allowing the equipment to air dry as long as possible, and wrapping or covering the equipment in plastic.

2.6.2 Sampling Equipment

Decontamination of equipment used for soil sampling and collection of groundwater samples was conducted at the temporary decontamination area. Nondedicated equipment was decontaminated after each use. The sampling equipment was washed with potable water and phosphate-free detergent using various types of brushes required to remove particulate matter and surface films, followed by a potable water rinse, ASTM Type I or equivalent water rinse, isopropyl alcohol rinse, ASTM Type I or equivalent water rinse, allowed to air dry, and wrapped in plastic or aluminum foil.

In addition to the sampling equipment, field measurement instruments were also decontaminated between uses. Only those portions of each instrument that come into contact with potentially contaminated environmental media were decontaminated. Because of the delicate nature of these instruments, the decontamination procedure only involved initial rinsing of the instrument probes with ASTM Type I or equivalent water.

2.7 Investigation Derived Waste (IDW) Management

Indigenous IDW generated during the project was soil cuttings from boreholes. Nonindigenous generated IDW included solid compactible trash, decontamination solutions, and sludges.

2.7.1 Waste Collection and Containment

All soil and sludge wastes were segregated by borehole and drummed in 55-gallon DOT Specification 17C drums at the point of generation. Drummed wastes were transported to the

Central Staging Area (CSA) and stored pending final disposal. Sanitary waste was placed in trash bags at the point of generation. Water derived from decontamination activities was collected in polyethylene tanks and stored at the CSA. All containers were appropriately labeled with generation point information completed on each container.

2.7.2 Waste Characterization

Analytical data gathered from investigation field samples was used to characterize the indigenous soil IDW generated during the project. Where investigation sample analytical data were insufficient for characterization of the wastes, the wastes were sampled and analyzed for RCRA toxicity characteristic contaminants using the Toxicity Characteristic Leaching Procedure (TCLP). Soil from a specific source location was considered noncontaminated if the analytical results for the associated field samples indicated all of the following:

- BTEX and PAH concentrations below applicable Table A or B Threshold Levels as defined in Rules of Georgia Department of Natural Resources, Environmental Protection Division, rule 391-3-15-.09;
- TPH concentrations below 100 ppm; and
- total lead concentrations below 100 ppm.

Soil from a specific source location was considered contaminated nonhazardous if the analytical results for the associated field samples indicated all of the following:

- BTEX and PAH concentrations exceed applicable Table A or B Threshold Levels;
- TPH concentrations exceed 10,000 ppm; and
- total lead concentrations are below 100 ppm.

Soil from a specific source location was considered potentially hazardous, and would be sampled for full TCLP analysis and waste characterization, if one of the following conditions was encountered:

- soil collected from the source location was found to contain free petroleum product or
- total lead concentrations in soil samples collected from the source location exceeded 100 ppm.

Soil/sludge generated from decontamination activities was characterized by collecting one composite sample from each drum of sludge waste. Each composite sample was analyzed for BTEX, PAH, TPH, and total lead. The contents of each drum will be classified based on the analytical results and the categories outlined above.

Decontamination fluid generated from decontamination activities was characterized by collecting one sample from each filled poly tank. Each sample was analyzed for BTEX, pH, oil and grease, and phenols.

2.7.3 Waste Disposal

Soil and soil/sludge waste characterized as being noncontaminated was spread at an area designated by Fort Stewart DPW personnel. Soil and soil/sludge waste characterized as being contaminated nonhazardous or hazardous will be disposed of off-site in accordance with all applicable EPA, DOT, and state of Georgia regulations. Hazardous waste will be transported off-site within 90 days of receipt of characterization data indicating that the waste is hazardous.

Decontamination fluids characterized as meeting the acceptance criteria of the Fort Stewart Industrial Waste Treatment Plant (IWTP) will be transported to and disposed of at the plant. Decontamination fluids exceeding the IWTP waste acceptance criteria will be transferred to 55-gallon DOT Specification 17E closed-top drums and disposed of off-site in accordance with all applicable EPA, DOT, and state of Georgia regulations.

2.8 Documentation of field activities

All information pertinent to drilling and sampling activities, including instrument calibration data, was recorded in field logbooks. The logbooks were bound and the pages consecutively numbered. Entries in the logbooks were made in black permanent ink and included, at a minimum, a description of all activities, individuals involved in drilling and sampling activities, date and time of drilling and sampling, weather conditions, any problems encountered, and all field measurements. Lot numbers, manufacturers name, and expiration dates of standard solutions used for field instrument calibration were also recorded in the field logbooks.

Sufficient information was recorded in the logbooks to permit reconstruction of all drilling and sampling activities. For a detailed description of all field documentation, see section 4.5 of Attachment IV of the Work Plan.

3.0 SAMPLE HANDLING AND ANALYSIS

3.1 Analytical Program

Soil samples were screened for the presence of volatile vapors using a MiniRae organic vapor analyzer (PID). The MiniRae was calibrated daily using 100 parts per million (ppm) isobutylene. The headspace of each sample was measured approximately 15 minutes after collection.

For sites where the UST had contained waste oil, soil samples were analyzed for BTEX by method SW846- 8020, PAH by method SW846-8270, and TPH by method SW846-9073. Groundwater samples were analyzed for BTEX by method SW 846-8240 and PAH by method SW 846-8270. All samples were sent to General Engineering Laboratories, Charleston, South Carolina.

For sites where the UST had contained gasoline or diesel, soil samples were analyzed for BTEX by method SW 846-8020, PAH by method SW 846-8270, and TPH by method SW 846-8015 (modified). Groundwater samples were analyzed for BTEX by method SW 846-8240 and PAH by method SW 846-8270. TPH analysis included both gasoline range organics (GRO) and diesel range organics (DRO). All samples were sent to General Engineering Laboratories, Charleston, South Carolina.

Duplicate samples of soil and groundwater were collected throughout the project and represented approximately 10 percent of the total sample population. Rinsate blanks were collected to determine whether the sampling equipment was causing cross-contamination of the samples and represented approximately 5 percent of the total sample population. Duplicates and rinsates were submitted to General Engineering Laboratories, Charleston, South Carolina.

Split samples were collected in addition to the other quality control samples but were sent to the USACE QA laboratory in Marietta, Georgia as an independent quality check.

3.2 Sample Containers, Preservation, and Holding Times

The soil sample containers, preservatives, and holding times are summarized in Table B-1. The groundwater sample containers, preservatives, and holding times are summarized in Table B-2.

3.3 Sampling Packaging and Shipment

Each sample container was labeled, taped shut with electrical tape (except those containing samples designated for volatile organic analysis), and a initialed/dated custody seal was placed over the lid. Each sample bottle was placed into a separate plastic bag and sealed. The samples were placed upright in thermally insulated rigid-body coolers and surrounded by vermiculite to prevent breakage during shipment. In addition, samples were cooled to approximately 4° C with wet ice. These measures were taken to slow the decomposition and volatilization of contaminants during shipping and handling. The sample coolers were shipped to the analytical laboratory via courier service provided by the laboratory.

Table B-1. Summary of Sample Containers, Preservation Techniques, and Holding Times for Soil Samples Collected During the Site Investigation

Analyte Group	Container[1]	Minimum Sample Size	Preservative	Holding Time
Benzene, Toluene, Ethylbenzene, Xylene (BTEX)	1 - 4 oz glass jar with Teflon®-lined cap (no headspace)	20 g	Cool, 4°C	14 d
TPH - GRO	use same container as BTEX	20 g	Cool, 4°C	14 d
Polyaromatic Hydrocarbons (PAHs)	1 - 8 oz glass jar with Teflon®-lined cap	90 g	Cool, 4°C	14 d (extraction) 40 d (analysis)
TPH - DRO	use same container as PAHs	90 g	Cool, 4°C	14 d (extraction) 40 d (analysis)
TPH (9073)	use same container as PAHs	90 g	Cool, 4°C	14 d (extraction) 40 d (analysis)
Metals (lead)	use same container as PAHs	20 g	Cool, 4°C	180 d
Waste Samples for TCLP analysis	1 - 16 oz wide mouth glass jar with Teflon®-lined cap	200 g	Cool, 4°C	14 d (extraction)

---

[1] Container and preservation specifications shall meet all appropriate requirements (See Appendix F to ER 1110-1-263 [31 Mar 95] and in EM200-1-3, Table I-1 [1 Sept 94]).

Table B-2. Summary of Sample Containers, Preservation Techniques, and Holding Times for Groundwater Samples Collected During the Site Investigation

Analyte Group	Container[1]	Minimum Sample Size	Preservative	Holding Time
Benzene, Toluene, Eethylbenzene, Xylene (BTEX)	2 - 40 mL glass vials with Teflon®-lined septum (no headspace)	40 mL	Cool, 4°C 0.008% $Na_2S_2O_3$ pH 4.5	14 d
Polyaromatic Hydrocarbons (PAHs)	2 - 1L amber glass bottle with Teflon®-lined lid[2]	1000 mL	Cool, 4°C 0.008% $Na_2S_2O_3$ pH 4.5	7 d (extraction) 40 d (analysis)
Metals (Lead only)	1 - 250 mL polybottle	100 mL	HNO_3 to pH <2 Cool, 4°C	180 d

[1] Container and preservation specifications shall meet all appropriate requirements (See Appendix F to ER 1110-1-263 [31 Mar 95] and in EM200-1-3, Table I-1 [1 Sept 94]).

[2] One investigative water sample in twenty will require an additional 2 liters volume for the laboratory to perform appropriate laboratory QC analysis.

APPENDIX C

ANALYTICAL DATA SHEETS
AND
QUALITY CONTROL SUMMARY REPORT
FOR THE FACILITY ID #9-089069 SITE INVESTIGATION

APPENDIX C-1

ANALYTICAL DATA SHEETS FOR SOIL SAMPLES

Definition of Data Qualifiers (Flags)

During the data validation process, all laboratory data were assigned appropriate data validation flags and flagging codes. Validation flags are defined as follows:

"U"	When the material was analyzed for, but not detected above the level of the associated value.
"J"	When the associated value is an estimated quantity. Indicating there is cause to question accuracy or precision of the reported value.
"UJ"	When the analyte was analyzed for, but not detected, above the associated value, however, the reported value is an estimate and demonstrates an decreased knowledge of its accuracy or precision.
"R"	When the analyte value reported is unusable. The integrity of the analyte's identification, accuracy, precision, or sensitivity have raised significant question as to the reality of the information presented.

SAIC validation flagging codes have been provided on the next page.

DATA VALIDATION FLAGGING CODES

Blanks

F01 Sample data were qualified as a result of the method blank.
F02 Sample data were qualified as a result of the field blank.
F03 Sample data were qualified as a result of the equipment rinsate.
F04 Sample data were qualified as a result of the trip blank.
F05 Gross contamination exists.
F06 Concentration of the contaminant was detected at a level below the CRQL.
F07 Concentration of the contaminant was detected at a level less than the action limit, but greater than the CRQL.
F08 Concentration of the contaminant was detected at a level that exceeds the action level.
F09 No laboratory blanks were analyzed.
F10 Blank had a negative value >5×'s the IDL.
F11 Blanks were not analyzed at required frequency.
F12 Professional judgement was used to qualify the data.

Surrogate Recovery

G01 Surrogate recovery was above the upper control limit.
G02 Surrogate recovery was below the lower control limit.
G03 Surrogate recovery was <10%.
G04 Surrogate recovery was zero.
G05 Surrogate was not present.
G06 Professional judgement was used to qualify the data.

Matrix Spike/Matrix Spike Duplicate

H01 MS/MSD recovery was above the upper control limit.
H02 MS/MSD recovery was below the lower control limit.
H03 MS/MSD recovery was <10%.
H04 MS/MSD pairs exceed the RPD limit.
H05 No action was taken on MS/MSD results.
H06 Professional judgement was used to qualify the data.

Matrix Spike

I01 MS recovery was above the upper control limit.
I02 MS recovery was below the lower control limit.
I03 MS recovery was <30%.
I04 No action was taken on MS data.
I05 Professional judgement was used to qualify the data.

Laboratory Duplicate

J01 Duplicate RPD was outside the control limit.
J02 Duplicate sample results were >5× the CRDL.
J03 Duplicate sample results were <5× the CRDL.
J04 Professional judgement was used to qualify the data.

Internal Area Summary

K01 Area counts were outside the control limits.
K02 Extremely low area counts or performance was exhibited by a major drop off.
K03 IS retention time varied by more than 30 seconds.
K04 Professional judgement was used to qualify the data.

Laboratory Control Samples (LCSs)

P01 LCS recovery was above upper control limit.
P02 LCS recovery was below lower control limit.
P03 LCS recovery was <50%.
P04 No action was taken on the LCS data.
P05 LCS was not analyzed at required frequency.

Target Compound Identification

M01 Incorrect identifications were made.
M02 Qualitative criteria were not met.
M03 Cross contamination occurred.
M04 Confirmatory analysis was not performed.
M05 No results were provided.
M06 Analysis occurred outside 12 hr GC/MS window.
M07 Professional judgement was used to qualify the data.
M08 The %D between the two pesticide/PCB column checks was >25%.

Initial/Continuing Calibration - Organics

C01 Initial calibration RRF was <0.05.
C02 Initial calibration RSD was >30%.
C03 Initial calibration sequence was not followed as required.
C04 Continuing calibration RRF was <0.05.
C05 Continuing calibration %D was >25%.
C06 Continuing calibration was not performed at the required frequency.
C07 Resolution criteria were not met.
C08 RPD criteria were not met.
C09 RSD criteria were not met.
C10 Retention time of compounds was outside windows.
C11 Compounds were not adequately resolved.
C12 Breakdown of endrin or DDT was >20%.
C13 Combined breakdown of endrin/DDT was >30%.
C14 Professional judgement was used to qualify the data.

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800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423) 481-4600

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CHAIN OF CUSTODY RECORD

COC NO.: G0005

PROJECT NAME: Fort Stewart UST Sites	**LABORATORY NAME:** GEL
PROJECT NUMBER: 0003	**LABORATORY ADDRESS:** 2040 Savage Road Charleston, SC 29417
PROJECT MANAGER: Chris Potter	**PHONE NO:**(803) 556-8171
Sampler (Signature) (Printed Name) Sharon Stoller	

Sample ID	Date Collected	Time Collected	Matrix	BTEX, GRO	BTEX	PAH, Lead, DRO	PAH	Lead	DRO	PAH, LEAD, TPH	PAH, TPH	PAH, DRO					No. of Bottles/Vials	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
0501D1	9/7/96	1245	SOIL		1					1							2	50.5 ppm	
0501E1	9/7/96	1300	SOIL		1						1						2	20.9 ppm	
0501D3	9/7/96	1245	SOIL		1					1							2	50.5 ppm	
0501E3	9/7/96	1300	SOIL		1						1						2	20.9 ppm	
5302D1	9/7/96	1715	SOIL		1						1						2	7.1 ppm	
5302B1	9/7/96	1705	SOIL		1					1							2	20.8 ppm	
0502D1	9/7/96	1455	SOIL		1						1						2	220 ppm	
0502~~D~~B1	9/7/96	1420	SOIL		1					1							2	33.0 ppm	
0304B3	9/7/96	1615	SOIL	1								1					2	41.2 ppm	
0304A3	9/7/96	1615	SOIL	1		1											2	57.8 ppm	
0304B1	9/7/96	1615	SOIL	1								1					2	41.2 ppm	
0304A1	9/7/96	1615	SOIL	1		1											2	57.8 ppm	
0301A1	9/7/96	1450	SOIL	1								1					2	15.8 ppm	

RELINQUISHED BY:	Date/Time 9/8/96 13/0	RECEIVED BY:	Date/Time	TOTAL NUMBER OF CONTAINERS: 46	Cooler Temperature: 5°
COMPANY NAME: SAIC		COMPANY NAME:		Cooler ID: #151	
RECEIVED BY: Raymond E Reed	Date/Time 9/8/96 13:10	RELINQUISHED BY:	Date/Time	Chain says 0502D1 bottle says 0502B1 used what was on bottle.	
COMPANY NAME: GEL		COMPANY NAME:			
RELINQUISHED BY: Raymond E Reed	Date/Time 9/8/96 16:30	RECEIVED BY:	Date/Time 09-09-96 16:30		
COMPANY NAME: GEL		COMPANY NAME: GEL			

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800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423) 481-4600

PAGE 1 OF 2

CHAIN OF CUSTODY RECORD

COC NO.: G0007

PROJECT NAME: Fort Stewart UST Sites

PROJECT NUMBER: 0003

PROJECT MANAGER: Chris Potter

Sampler (Signature) **(Printed Name)** SHARON STOLLER

LABORATORY NAME: GEL

LABORATORY ADDRESS:
2040 Savage Road
Charleston, SC 29417

PHONE NO: (803) 556-8171

Sample ID	Date Collected	Time Collected	Matrix	BTEX, GRO	BTEX	PAH, Lead, DRO	PAH	Lead	DRO	PAH, LEAD, TPH	PAH, TPH	PAH, DRO					No. of Bottles/Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
1504B1	9/7/96	0902	SOIL	1								1					2	0 ppm	
1507B1	9/7/96	1015	SOIL	1								1					2	0 ppm	
1504A1	9/7/96	0900	SOIL	1		1											2	17.4 ppm	
1508A1	9/7/96	1133	SOIL	1		1											2	22.7 ppm	
1508B1	9/7/96	1137	SOIL	1								1					2	23.5 ppm	
0504B1	9/7/96	0845	SOIL		1					1							2	6.8 ppm	
0503B1	9/7/96	1040	SOIL		1						1						2	0 ppm	
0503D1	9/7/96	1100	SOIL		1					1							2	0 ppm	
0504D1	9/7/96	0855	SOIL		1						1						2	2.9 ppm	
1505A1	9/6/96	1109	SOIL	1								1					2	0 ppm	
1602A1	9/6/96	1625	SOIL	1								1					2	3.4 ppm	
3904E1	9/6/96	0920	SOIL	1		1											2	1999 ppm	OVA readings were questionable
1502A1	9/6/96	1522	SOIL	1								1					2	1.5 ppm	

RELINQUISHED BY: **COMPANY NAME:** SAIC	**Date/Time** 9/9/94 1310	**RECEIVED BY:** **COMPANY NAME:**	**Date/Time**
RECEIVED BY: Raymd E Reed **COMPANY NAME:** GEL	**Date/Time** 9/8/96 1310	**RELINQUISHED BY:** **COMPANY NAME:**	**Date/Time**
RELINQUISHED BY: Raymd E Reed **COMPANY NAME:** G	**Date/Time** 9/8/96 16:30	**RECEIVED BY:** **COMPANY NAME:** GEL	**Date/Time** 09-09-96 16:30

TOTAL NUMBER OF CONTAINERS: 52

Cooler ID: #125

Cooler Temperature: 3°C

1D

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0501D1

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: 69088S

Matrix: (soil/water) SOIL Lab Sample ID: 9609088-07

Sample wt/vol: 5.0 (g/mL) g Lab File ID: B2Z314

% Moisture: 15 decanted: (Y/N) N Date Received: 09/08/96

Extraction: (SepF/Cont/Sonc) PURGETRAP Date Extracted:N/A

Concentrated Extract Volume: 10(ml) Date Analyzed: 09/11/96

Injection Volume: _______(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
71-43-2	Benzene	5.9	U	U
108-88-3	Toluene	5.9	U	
100-41-4	Ethylbenzene	5.9	U	
1330-20-7	Xylenes (total)	5.9	U	

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0501D1

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: 69088S

Matrix: (soil/water) SOIL Lab Sample ID: 9609088-07

Sample wt/vol: 30.3 (g/mL) g Lab File ID: 1L314

Level: (low/med) LOW Date Received: 09/08/96

% Moisture: 15 decanted: (Y/N) N Date Extracted: 09/11/96

Concentrated Extract Volume: 1(mL) Date Analyzed: 09/18/96

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
91-20-3	naphthalene	388	U	U
91-58-7	2-chloronaphthalene	388	U	
209-96-8	acenaphthylene	388	U	
83-32-9	acenaphthene	388	U	
86-73-7	fluorene	388	U	
85-01-8	phenanthrene	388	U	
120-12-7	anthracene	388	U	
206-44-0	fluoranthene	388	U	
129-00-0	pyrene	388	U	
56-55-3	benzo(a)anthracene	388	U	
218-01-9	chrysene	388	U	
205-99-2	benzo(b)fluoranthene	388	U	
207-08-9	benzo(k)fluoranthene	388	U	
50-32-8	benzo(a)pyrene	388	U	
193-39-5	indeno(1,2,3-cd)pyrene	388	U	
53-70-3	dibenz(a,h)anthracene	388	U	
191-24-2	benzo(g,h,i)perylene	388	U	↓

[illegible] COPY

FORM I SV-1 3/90

Client:

Science Applications International Corporation
P.O. Box 2502
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37831

Date: 10/10/96

Contact: Mr. Chris Potter
ProjectDescription: Ft. Stewart UST Sites

Client Code: SAIC00396

Project Manager: Linda Darrington

Page: 1

Sample I.D.:	0501D1
Lab I.D.:	9609088-07
Sample Matrix:	Soil
Date Collected:	09/07/96
Date Received:	09/08/96
Priority:	Routine
Parameter Collected by:	Client

Analyte:	**Qualifier**	**Result**	**Units**	**Method**	**Analyst**	**DateTime**
Total Rec. Petro.Hydrocarbons	JB	~~6.58~~	mg/kg	EPA 418.1 Mod.	EAN	09/09/961100
Evaporative Loss		15	%			

10 U F01, F06

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1D

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0501E1

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: 69089S

Matrix: (soil/water) SOIL Lab Sample ID: 9609089-04

Sample wt/vol: 5.0 (g/mL) g Lab File ID: B2Z330

% Moisture: 20 decanted: (Y/N) N Date Received: 09/08/96

Extraction: (SepF/Cont/Sonc) PURGETRAP Date Extracted:N/A

Concentrated Extract Volume: 10(ml) Date Analyzed: 09/12/96

Injection Volume: ________(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
71-43-2	Benzene	6.2	U	U
108-88-3	Toluene	6.2	U	↓
100-41-4	Ethylbenzene	6.2	U	↓
1330-20-7	Xylenes (total)	6.2	U	↓

DATA VALIDATION COPY

FORM I PEST

OLM03

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0501E1

.b Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: 69089S

Matrix: (soil/water) SOIL Lab Sample ID: 9609089-04

Sample wt/vol: 30.7 (g/mL) g Lab File ID: 1L233

Level: (low/med) LOW Date Received: 09/08/96

% Moisture: 20 decanted: (Y/N) N Date Extracted:09/11/96

Concentrated Extract Volume: 1(mL) Date Analyzed: 09/18/96

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
91-20-3	naphthalene	407	U	U
91-58-7	2-chloronaphthalene	407	U	
209-96-8	acenaphthylene	407	U	
83-32-9	acenaphthene	407	U	
86-73-7	fluorene	407	U	
85-01-8	phenanthrene	407	U	
120-12-7	anthracene	407	U	
206-44-0	fluoranthene	407	U	
129-00-0	pyrene	407	U	
56-55-3	benzo(a)anthracene	407	U	
218-01-9	chrysene	407	U	
205-99-2	benzo(b)fluoranthene	407	U	
207-08-9	benzo(k)fluoranthene	407	U	
50-32-8	benzo(a)pyrene	407	U	
193-39-5	indeno(1,2,3-cd)pyrene	407	U	
53-70-3	dibenz(a,h)anthracene	407	U	UJ CPS
191-24-2	benzo(g,h,i)perylene	407	U	U

NMF 1/6/97

Client: Science Applications International Corporation
P.O. Box 2502
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37831

Date: 10/10/96

Contact: Mr. Chris Potter
ProjectDescription: Ft. Stewart UST Sites

Client Code: SAIC00396 Project Manager: Linda Darrington Page: 1

Parameter	
Sample I.D.:	0501E1
Lab I.D.:	9609089-04
Sample Matrix:	Soil
Date Collected:	09/07/96
Date Received:	09/08/96
Priority:	Routine
Collected by:	Client

Analyte:	Qualifier	Result	Units	Method	Analyst	DateTime
Total Rec. Petro.Hydrocarbons	B	60.9 = ~~F01~~ F08	mg/kg	EPA 418.1 Mod.	EAN	09/09/961100
Evaporative Loss		20	%			

1/7/97

1D
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

~~0502D1~~
0502B1

1/7/96

ab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: 69088S

Matrix: (soil/water) SOIL Lab Sample ID: 9609088-10

Sample wt/vol: 5.0 (g/mL) g Lab File ID: B2Z317

% Moisture: 9 decanted: (Y/N) N Date Received: 09/08/96

Extraction: (SepF/Cont/Sonc) PURGETRAP Date Extracted:N/A

Concentrated Extract Volume: 10(ml) Date Analyzed: 09/11/96

Injection Volume: _______(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
71-43-2	Benzene	5.5	U	U
108-88-3	Toluene	5.5	U	↓
100-41-4	Ethylbenzene	5.5	U	↓
1330-20-7	Xylenes (total)	5.5	U	↓

DATA VALIDATION COPY

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

~~0502D1~~
C502B1 TKY 1/7/97

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: 69088S

Matrix: (soil/water) SOIL Lab Sample ID: 9609088-10

Sample wt/vol: 30.8 (g/mL) g Lab File ID: 1L317

Level: (low/med) LOW Date Received: 09/08/96

% Moisture: 9 decanted: (Y/N) N Date Extracted: 09/11/96

Concentrated Extract Volume: 1 (mL) Date Analyzed: 09/18/96

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
91-20-3	naphthalene	357	U	U
91-58-7	2-chloronaphthalene	357	U	
209-96-8	acenaphthylene	357	U	
83-32-9	acenaphthene	357	U	
86-73-7	fluorene	357	U	
85-01-8	phenanthrene	357	U	
120-12-7	anthracene	357	U	
206-44-0	fluoranthene	357	U	
129-00-0	pyrene	357	U	
56-55-3	benzo(a)anthracene	357	U	
218-01-9	chrysene	357	U	
205-99-2	benzo(b)fluoranthene	357	U	
207-08-9	benzo(k)fluoranthene	357	U	
50-32-8	benzo(a)pyrene	357	U	
193-39-5	indeno(1,2,3-cd)pyrene	357	U	
53-70-3	dibenz(a,h)anthracene	357	U	
191-24-2	benzo(g,h,i)perylene	357	U	

FORM I SV-1 3/90

Client: Science Applications International Corporation
P.O. Box 2502
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37831

Date: 10/10/96

Contact: Mr. Chris Potter
ProjectDescription: Ft. Stewart UST Sites

Client Code: SAIC00396

Project Manager: Linda Darrington

Page: 1

Sample I.D.: ~~0502D1C~~ 05 02 B1 2B
Lab I.D.: 9609088-10
Sample Matrix: Soil
Date Collected: 09/07/96
Date Received: 09/08/96
Priority: Routine
Parameter Collected by: Client

Analyte:	Qualifier	Result	Units	Method	Analyst	DateTime
Total Rec. Petro.Hydrocarbons	B	29.0 U	F01 F07 mg/kg	EPA 418.1 Mod.	EAN	09/09/961100
Evaporative Loss		9	%			

1D
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0502D1

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: 69089S

Matrix: (soil/water) SOIL Lab Sample ID: 9609089-07

Sample wt/vol: 5.0 (g/mL) g Lab File ID: B2Z333

% Moisture: 21 decanted: (Y/N) N Date Received: 09/08/96

Extraction: (SepF/Cont/Sonc) PURGETRAP Date Extracted:N/A

Concentrated Extract Volume: 10(ml) Date Analyzed: 09/12/96

Injection Volume: _______(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
71-43-2	Benzene	6.3	U	U
108-88-3	Toluene	6.3	U	↓
100-41-4	Ethylbenzene	6.3	U	↓
1330-20-7	Xylenes (total)	6.3	U	↓

DATA VALIDATION COPY

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0502D1

ab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: 69089S

Matrix: (soil/water) SOIL Lab Sample ID: 9609089-07

Sample wt/vol: 30.4 (g/mL) g Lab File ID: 1L236

Level: (low/med) LOW Date Received: 09/08/96

% Moisture: 21 decanted: (Y/N) N Date Extracted: 09/11/96

Concentrated Extract Volume: 1(mL) Date Analyzed: 09/18/96

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
91-20-3	naphthalene	416	U	U
91-58-7	2-chloronaphthalene	416	U	
209-96-8	acenaphthylene	416	U	
83-32-9	acenaphthene	416	U	
86-73-7	fluorene	416	U	
85-01-8	phenanthrene	416	U	
120-12-7	anthracene	416	U	
206-44-0	fluoranthene	416	U	
129-00-0	pyrene	416	U	
56-55-3	benzo(a)anthracene	416	U	
218-01-9	chrysene	416	U	
205-99-2	benzo(b)fluoranthene	416	U	
207-08-9	benzo(k)fluoranthene	416	U	
50-32-8	benzo(a)pyrene	416	U	
193-39-5	indeno(1,2,3-cd)pyrene	416	U	
53-70-3	dibenz(a,h)anthracene	416	U	UJCPS
191-24-2	benzo(g,h,i)perylene	416	U	U

MAF 1/6/97

FORM I SV-1 3/90

Client:
Science Applications International Corporation
P.O. Box 2502
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37831

Date: 10/10/96

Contact: Mr. Chris Potter
ProjectDescription: Ft. Stewart UST Sites

Client Code: SAIC00396
Project Manager: Linda Darrington
Page: 1

Sample I.D.: 0502D1
Lab I.D.: 9609089-07
Sample Matrix: Soil
Date Collected: 09/07/96
Date Received: 09/08/96
Priority: Routine
Parameter
Collected by: Client

Analyte:	Qualifier	Result	Units	Method	Analyst	DateTime
Total Rec. Petro.Hydrocarbons	JB	12.7 U F01, F07	mg/kg	EPA 418.1 Mod.	EAN	09/09/961100
Evaporative Loss		21	%			

1D
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0503B1

ab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: 69089S

Matrix: (soil/water) SOIL Lab Sample ID: 9609089-01

Sample wt/vol: 5.0 (g/mL) g Lab File ID: B2Z325

% Moisture: 13 decanted: (Y/N) N Date Received: 09/08/96

Extraction: (SepF/Cont/Sonc) PURGETRAP Date Extracted:N/A

Concentrated Extract Volume: 10(ml) Date Analyzed: 09/11/96

Injection Volume: ________(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
71-43-2	Benzene	5.7	U	U
108-88-3	Toluene	5.7	U	↓
100-41-4	Ethylbenzene	5.7	U	
1330-20-7	Xylenes (total)	5.7	U	

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.
0503B1

Lab Name: Contract:
Lab Code: Case No.: SAS No.: SDG No.: 69089S
Matrix: (soil/water) SOIL Lab Sample ID: 9609089-01
Sample wt/vol: 30.7 (g/mL) g Lab File ID: 1L230
Level: (low/med) LOW Date Received: 09/08/96
% Moisture: 13 decanted: (Y/N) N Date Extracted: 09/11/96
Concentrated Extract Volume: 1 (mL) Date Analyzed: 09/18/96
Injection Volume: 1.0 (uL) Dilution Factor: 1.0
GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
91-20-3	naphthalene	374	U	U
91-58-7	2-chloronaphthalene	374	U	
209-96-8	acenaphthylene	374	U	
83-32-9	acenaphthene	374	U	
86-73-7	fluorene	374	U	
85-01-8	phenanthrene	374	U	
120-12-7	anthracene	374	U	
206-44-0	fluoranthene	374	U	
129-00-0	pyrene	374	U	
56-55-3	benzo(a)anthracene	374	U	
218-01-9	chrysene	374	U	
205-99-2	benzo(b)fluoranthene	374	U	
207-08-9	benzo(k)fluoranthene	374	U	
50-32-8	benzo(a)pyrene	374	U	
193-39-5	indeno(1,2,3-cd)pyrene	374	U	UJ CPS
53-70-3	dibenz(a,h)anthracene	374	U	U
191-24-2	benzo(g,h,i)perylene	374	U	

MAB
1/6/97

Client: Science Applications International Corporation
P.O. Box 2502
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37831

Date: 10/10/96

Contact: Mr. Chris Potter
ProjectDescription: Ft. Stewart UST Sites

Client Code: SAIC00396

Project Manager: Linda Darrington

Page: 1

Sample I.D.: 0503B1
Lab I.D.: 9609089-01
Sample Matrix: Soil
Date Collected: 09/07/96
Date Received: 09/08/96
Priority: Routine
Collected by: Client

Parameter

Analyte:	Qualifier	Result	Units	Method	Analyst	DateTime
Total Rec. Petro.Hydrocarbons	B	13.2 U, F01, F07	mg/kg	EPA 418.1 Mod.	EAN	09/09/961100
Evaporative Loss		13 /	%			

DATA VALIDATION
COPY

1D
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0503D1

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: 69088S

Matrix: (soil/water) SOIL Lab Sample ID: 9609088-02

Sample wt/vol: 5.0 (g/mL) g Lab File ID: B2Z39

% Moisture: 17 decanted: (Y/N) N Date Received: 09/08/96

Extraction: (SepF/Cont/Sonc) PURGETRAP Date Extracted:N/A

Concentrated Extract Volume: 10(ml) Date Analyzed: 09/11/96

Injection Volume: ________(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
71-43-2	Benzene	6.0	U	U ↓
108-88-3	Toluene	6.0	U	
100-41-4	Ethylbenzene	6.0	U	
1330-20-7	Xylenes (total)	6.0	U	

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0503D1

ab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: 69088S

Matrix: (soil/water) SOIL Lab Sample ID: 9609088-02

Sample wt/vol: 30.6 (g/mL) g Lab File ID: 1L309

Level: (low/med) LOW Date Received: 09/08/96

% Moisture: 17 decanted: (Y/N) N Date Extracted: 09/11/96

Concentrated Extract Volume: 1 (mL) Date Analyzed: 09/18/96

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
91-20-3	naphthalene	393	U	U
91-58-7	2-chloronaphthalene	393	U	
209-96-8	acenaphthylene	393	U	
83-32-9	acenaphthene	393	U	
86-73-7	fluorene	393	U	
85-01-8	phenanthrene	393	U	
120-12-7	anthracene	393	U	
206-44-0	fluoranthene	393	U	
129-00-0	pyrene	393	U	
56-55-3	benzo(a)anthracene	393	U	
218-01-9	chrysene	393	U	
205-99-2	benzo(b)fluoranthene	393	U	
207-08-9	benzo(k)fluoranthene	393	U	
50-32-8	benzo(a)pyrene	393	U	
193-39-5	indeno(1,2,3-cd)pyrene	393	U	
53-70-3	dibenz(a,h)anthracene	393	U	
191-24-2	benzo(g,h,i)perylene	393	U	

Client: Science Applications International Corporation
P.O. Box 2502
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37831

Date: 10/10/96

Contact: Mr. Chris Potter
ProjectDescription: Ft. Stewart UST Sites

Client Code: SAIC00396

Project Manager: Linda Darrington

Page: 1

Sample I.D.: 0503D1
Lab I.D.: 9609088-02
Sample Matrix: Soil
Date Collected: 09/07/96
Date Received: 09/08/96
Priority: Routine
Collected by: Client

Parameter

Analyte:	Qualifier	Result	Units	Method	Analyst	DateTime
Total Rec. Petro.Hydrocarbons	JB	~~8.23~~	mg/kg	EPA 418.1 Mod.	EAN	09/09/961100
Evaporative Loss		17	%			

10 U F01,F06

1D
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0504B1

ab Name: GENERAL ENGINEERING LABOR   Contract: NA

Lab Code: NA   Case No.: NA   SAS No.: NA   SDG No.: 69088S

Matrix: (soil/water) SOIL   Lab Sample ID: 9609088-01

Sample wt/vol: 5.0 (g/mL) g   Lab File ID: B2Z324

% Moisture: 6   decanted: (Y/N) N   Date Received: 10/20/96

Extraction: (SepF/Cont/Sonc) PURGETRAP   Date Extracted:N/A

Concentrated Extract Volume: 10(ml)   Date Analyzed: 09/11/96

Injection Volume: _______(uL)   Dilution Factor: 1.0

GPC Cleanup: (Y/N) N   pH: 7.0   Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
71-43-2	---------Benzene	5.3	U
108-88-3	--------Toluene	5.3	U
100-41-4	--------Ethylbenzene	5.3	U
1330-20-7	-------Xylenes (total)	5.3	U

U ↓

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1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0504B1

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: 69088S

Matrix: (soil/water) SOIL Lab Sample ID: 9609088-01

Sample wt/vol: 30.8 (g/mL) g Lab File ID: 1L308

Level: (low/med) LOW Date Received: 09/08/96

% Moisture: 6 decanted: (Y/N) N Date Extracted: 09/11/96

Concentrated Extract Volume: 1 (mL) Date Analyzed: 09/18/96

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
91-20-3	naphthalene	346	U	U
91-58-7	2-chloronaphthalene	346	U	
209-96-8	acenaphthylene	346	U	
83-32-9	acenaphthene	346	U	
86-73-7	fluorene	346	U	
85-01-8	phenanthrene	346	U	
120-12-7	anthracene	346	U	
206-44-0	fluoranthene	346	U	
129-00-0	pyrene	346	U	
56-55-3	benzo(a)anthracene	346	U	
218-01-9	chrysene	346	U	
205-99-2	benzo(b)fluoranthene	346	U	
207-08-9	benzo(k)fluoranthene	346	U	
50-32-8	benzo(a)pyrene	346	U	
193-39-5	indeno(1,2,3-cd)pyrene	346	U	
53-70-3	dibenz(a,h)anthracene	346	U	
191-24-2	benzo(g,h,i)perylene	346	U	↓

Client: Science Applications International Corporation
P.O. Box 2502
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37831

Date: 10/10/96

Contact: Mr. Chris Potter
ProjectDescription: Ft. Stewart UST Sites

Client Code: SAIC00396

Project Manager: Linda Darrington

Page: 1

Sample I.D.: 0504B1
Lab I.D.: 9609088-01
Sample Matrix: Soil
Date Collected: 09/07/96
Date Received: 09/08/96
Priority: Routine
Collected by: Client

Parameter

Analyte:	Qualifier	Result	Units	Method	Analyst	DateTime
Total Rec. Petro.Hydrocarbons	B	11.1 U, F01, F07	mg/kg	EPA 418.1 Mod.	EAN	09/09/961100
Evaporative Loss		6	%			

DATA VALIDATION COPY

1D
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0504D1

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: 69089S

Matrix: (soil/water) SOIL Lab Sample ID: 9609089-02

Sample wt/vol: 5.0 (g/mL) g Lab File ID: B2Z328

% Moisture: 16 decanted: (Y/N) N Date Received: 09/08/96

Extraction: (SepF/Cont/Sonc) PURGETRAP Date Extracted:N/A

Concentrated Extract Volume: 10(ml) Date Analyzed: 09/11/96

Injection Volume: _______(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
71-43-2	Benzene	6.0	U	U ↓
108-88-3	Toluene	6.0	U	
100-41-4	Ethylbenzene	6.0	U	
1330-20-7	Xylenes (total)	6.0	U	

DATA VALIDATION COPY

FORM I PEST OLM03.

42

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0504D1

b Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: 69089S

Matrix: (soil/water) SOIL Lab Sample ID: 9609089-02

Sample wt/vol: 30.2 (g/mL) g Lab File ID: 1L231

Level: (low/med) LOW Date Received: 09/08/96

% Moisture: 16 decanted: (Y/N) N Date Extracted: 09/11/96

Concentrated Extract Volume: 1(mL) Date Analyzed: 09/18/96

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q	
91-20-3	naphthalene	394	U	U
91-58-7	2-chloronaphthalene	394	U	
209-96-8	acenaphthylene	394	U	
83-32-9	acenaphthene	394	U	
86-73-7	fluorene	394	U	
85-01-8	phenanthrene	394	U	
120-12-7	anthracene	394	U	
206-44-0	fluoranthene	394	U	
129-00-0	pyrene	394	U	
56-55-3	benzo(a)anthracene	394	U	
218-01-9	chrysene	394	U	
205-99-2	benzo(b)fluoranthene	394	U	
207-08-9	benzo(k)fluoranthene	394	U	
50-32-8	benzo(a)pyrene	394	U	
193-39-5	indeno(1,2,3-cd)pyrene	394	U	
53-70-3	dibenz(a,h)anthracene	394	U	UJ C05
191-24-2	benzo(g,h,i)perylene	394	U	U

MAP
1/6/97

DATA VALIDATION COPY

FORM I SV-1 3/90

Client: Science Applications International Corporation
P.O. Box 2502
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37831

Date: 10/10/96

Contact: Mr. Chris Potter
ProjectDescription: Ft. Stewart UST Sites

Client Code: SAIC00396

Project Manager: Linda Darrington

Page: 1

Sample I.D.: 0504D1
Lab I.D.: 9609089-02
Sample Matrix: Soil
Date Collected: 09/07/96
Date Received: 09/08/96
Priority: Routine
Collected by: Client

Parameter

Analyte:	Qualifier	Result	Units	Method	Analyst	DateTime
Total Rec. Petro.Hydrocarbons	JB	10.6 U, F01, F07	mg/kg	EPA 418.1 Mod.	EAN	09/09/961100
Evaporative Loss		16	%			

APPENDIX C-2

ANALYTICAL DATA SHEETS FOR GROUNDWATER SAMPLES

Definition of Data Qualifiers (Flags)

During the data validation process, all laboratory data were assigned appropriate data validation flags and flagging codes. Validation flags are defined as follows:

"U"	When the material was analyzed for, but not detected above the level of the associated value.
"J"	When the associated value is an estimated quantity. Indicating there is cause to question accuracy or precision of the reported value.
"UJ"	When the analyte was analyzed for, but not detected, above the associated value, however, the reported value is an estimate and demonstrates an decreased knowledge of its accuracy or precision.
"R"	When the analyte value reported is unusable. The integrity of the analyte's identification, accuracy, precision, or sensitivity have raised significant question as to the reality of the information presented.

SAIC validation flagging codes have been provided on the next page.

DATA VALIDATION FLAGGING CODES

Blanks

F01	Sample data were qualified as a result of the method blank.
F02	Sample data were qualified as a result of the field blank.
F03	Sample data were qualified as a result of the equipment rinsate.
F04	Sample data were qualified as a result of the trip blank.
F05	Gross contamination exists.
F06	Concentration of the contaminant was detected at a level below the CRQL.
F07	Concentration of the contaminant was detected at a level less than the action limit, but greater than the CRQL.
F08	Concentration of the contaminant was detected at a level that exceeds the action level.
F09	No laboratory blanks were analyzed.
F10	Blank had a negative value >5×'s the IDL.
F11	Blanks were not analyzed at required frequency.
F12	Professional judgement was used to qualify the data.

Surrogate Recovery

G01	Surrogate recovery was above the upper control limit.
G02	Surrogate recovery was below the lower control limit.
G03	Surrogate recovery was <10%.
G04	Surrogate recovery was zero.
G05	Surrogate was not present.
G06	Professional judgement was used to qualify the data.

Matrix Spike/Matrix Spike Duplicate

H01	MS/MSD recovery was above the upper control limit.
H02	MS/MSD recovery was below the lower control limit.
H03	MS/MSD recovery was <10%.
H04	MS/MSD pairs exceed the RPD limit.
H05	No action was taken on MS/MSD results.
H06	Professional judgement was used to qualify the data.

Matrix Spike

I01	MS recovery was above the upper control limit.
I02	MS recovery was below the lower control limit.
I03	MS recovery was <30%.
I04	No action was taken on MS data.
I05	Professional judgement was used to qualify the data.

Laboratory Duplicate

J01	Duplicate RPD was outside the control limit.
J02	Duplicate sample results were >5× the CRDL.
J03	Duplicate sample results were <5× the CRDL.
J04	Professional judgement was used to qualify the data.

Internal Area Summary

K01	Area counts were outside the control limits.
K02	Extremely low area counts or performance was exhibited by a major drop off.
K03	IS retention time varied by more than 30 seconds.
K04	Professional judgement was used to qualify the data.

Laboratory Control Samples (LCSs)

P01	LCS recovery was above upper control limit.
P02	LCS recovery was below lower control limit.
P03	LCS recovery was <50%.
P04	No action was taken on the LCS data.
P05	LCS was not analyzed at required frequency.

Target Compound Identification

M01	Incorrect identifications were made.
M02	Qualitative criteria were not met.
M03	Cross contamination occurred.
M04	Confirmatory analysis was not performed.
M05	No results were provided.
M06	Analysis occurred outside 12 hr GC/MS window.
M07	Professional judgement was used to qualify the data.
M08	The %D between the two pesticide/PCB column checks was >25%.

Initial/Continuing Calibration - Organics

C01	Initial calibration RRF was <0.05.
C02	Initial calibration RSD was >30%.
C03	Initial calibration sequence was not followed as required.
C04	Continuing calibration RRF was <0.05.
C05	Continuing calibration %D was >25%.
C06	Continuing calibration was not performed at the required frequency.
C07	Resolution criteria were not met.
C08	RPD criteria were not met.
C09	RSD criteria were not met.
C10	Retention time of compounds was outside windows.
C11	Compounds were not adequately resolved.
C12	Breakdown of endrin or DDT was >20%.
C13	Combined breakdown of endrin/DDT was >30%.
C14	Professional judgement was used to qualify the data.

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CHAIN OF CUSTODY RECORD

COC NO.: G0009

PROJECT NAME: Fort Stewart UST Sites	**LABORATORY NAME:** GEL
PROJECT NUMBER: 0003	**LABORATORY ADDRESS:** 2040 Savage Road Charleston, SC 29417
PROJECT MANAGER: Chris Potter	**PHONE NO:** (803) 556-8171
Sampler (Signature) **(Printed Name)** SHARON STOLLER	

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	BTEX, GRO	BTEX	PAH, Lead, DRO	PAH	Lead	DRO	PAH, LEAD, TPH	PAH, TPH	PAH, DRO					No. of Bottles/Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
0502W2	9/7/96	1515	WATER				2	1									3	0 ppm	
5302W2	9/7/96	1725	WATER				2										2	not recorded	
0502W4	9/7/96	1515	WATER				2	1									3	0 ppm	
0501W2	9/7/96	1330	WATER				2	1									3	0 ppm	
0102B1	9/~~7~~6/96 SLS 9/8/96	0934 ~~1115~~ SLS 9/8/96	SOIL		X					1							2	61.2 ~~3.6~~ ppm SLS 9/8/96	
4001C1	9/6/96	1115	SOIL		1					1							2	61.6 ppm	

SLS 9/8/96

RELINQUISHED BY:	Date/Time 9/8/96 1310	RECEIVED BY:	Date/Time	TOTAL NUMBER OF CONTAINERS: 15	Cooler Temperature: 2°C
COMPANY NAME: SAIC		COMPANY NAME:		Cooler ID: #215	
RECEIVED BY: Raymond E Reed	Date/Time 9/8/96 1310	RELINQUISHED BY:	Date/Time		
COMPANY NAME: GEL		COMPANY NAME:			
RELINQUISHED BY: Raymond E Reed	Date/Time 9/9/96 1630	RECEIVED BY:	Date/Time 09-09-96 16:30		
COMPANY NAME: GEL		COMPANY NAME: GEL			

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CHAIN OF CUSTODY RECORD

COC NO.: G0010

PROJECT NAME: Fort Stewart UST Sites	LABORATORY NAME: GEL
PROJECT NUMBER: 0003	LABORATORY ADDRESS: 2040 Savage Road Charleston, SC 29417
PROJECT MANAGER: Chris Potter	PHONE NO:(803) 556-8171
Sampler (Signature)	(Printed Name) SHARON STOLLER

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	BTEX, GRO	BTEX	PAH, Lead, DRO	PAH	Lead	DRO	PAH, LEAD, TPH	PAH, TPH	PAH, DRO				No. of Bottles/Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
2002W2	9/7/96	1525	WATER				2									2	2.9 ppm	
1507W2	9/7/96	1025	WATER				2	1								3	not recorded	
1508W2	9/7/96	1200	WATER				2	1								3	6.7 ppm	
0503W2	9/7/96	1110	WATER				2	1								3	not recorded	
0201C1	9/6/96	1515	SOIL		1						1					2	1999 ppm	
0101A3	9/6/96	1145	SOIL		1					1						2	59.9 ppm	

SCS 9/8/96

RELINQUISHED BY:	Date/Time 9/8/96 1310	RECEIVED BY:	Date/Time	TOTAL NUMBER OF CONTAINERS: 15
COMPANY NAME: SAIC		COMPANY NAME:		Cooler ID: #208
RECEIVED BY: Raymond E Reed	Date/Time 9/8/96 1310	RELINQUISHED BY:	Date/Time	Cooler Temperature: 2°
COMPANY NAME: GEL		COMPANY NAME:		
RELINQUISHED BY: Raymond E Reed	Date/Time 9/8/96 1630	RECEIVED BY:	Date/Time 09-09-96 16:?	
COMPANY NAME:		COMPANY NAME:		

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CHAIN OF CUSTODY RECORD

COC NO.: G0011

PROJECT NAME: Fort Stewart UST Sites

PROJECT NUMBER: 0003

PROJECT MANAGER: Chris Potter

Sampler (Signature) (Printed Name) SHARON STOLLER

LABORATORY NAME: GEL

LABORATORY ADDRESS:
2040 Savage Road
Charleston, SC 29417

PHONE NO: (803) 556-8171

Sample ID	Date Collected	Time Collected	Matrix	BTEX, GRO	BTEX	PAH, Lead, DRO	PAH	Lead	DRO								No. of Bottles/Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
1504W2	9/7/96	0910	WATER				2	1									3	not recorded	
0504W2	9/7/96	0930	WATER				2	1									3	↓	
0301R5	9/7/96	1440	WATER				2	1	2								5		
0302W2	9/7/96	1600	WATER				2	1									3	13.7 ppm	
		g.s	9/8/94																

RELINQUISHED BY:	Date/Time 9/8/96 1310	RECEIVED BY:	Date/Time
COMPANY NAME: SAIC		COMPANY NAME:	
RECEIVED BY: Raymond E Reed	Date/Time 9/8/96 13:10	RELINQUISHED BY:	Date/Time
COMPANY NAME: G.E.L		COMPANY NAME:	
RELINQUISHED BY: Raymond E Reed	Date/Time 9/8/96 16:30	RECEIVED BY:	Date/Time 9.9.96 16:30
COMPANY NAME: G.E.L		COMPANY NAME: GEL	

TOTAL NUMBER OF CONTAINERS: 14

Cooler ID: #36

Cooler Temperature: 2°

PAGE 2 OF 4

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CHAIN OF CUSTODY RECORD

COC NO.: G0019

PROJECT NAME: Fort Stewart UST Sites

PROJECT NUMBER: 0003

PROJECT MANAGER: Chris Potter

Sampler (Signature)

(Printed Name) SHARON STOLLER

LABORATORY NAME:
GEL

LABORATORY ADDRESS:
2040 Savage Road
Charleston, SC 29417

PHONE NO:(803) 556-8171

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	BTEX, GRO	BTEX	PAH, Lead, DRO	PAH	Lead	DRO							No. of Bottles/Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
1505W2	9/6/96	1125	WATER		2											2		
0201W4	9/6/96	1550			2											2		
1506W2	9/6/96	1330			2											2		
0101W2	9/6/96	1205			2											2		
TB0005	9/6/96	0759			2											2		
TB0006	9/6/96	0759			2											2		
1602R6	9/6/96	1550			2											2		
0301W2	9/7/96	1500			2											2		
0502W2	9/7/96	1515			2											2		
5302W2	9/7/96	1725			2											2		
0502W4	9/7/96	1515			2											2		
2002W2	9/7/96	1525			2											2		
1507W2	9/7/96	1025			2											2		

RELINQUISHED BY:	Date/Time 9/8/96 1310	RECEIVED BY:	Date/Time
COMPANY NAME: SAIC		COMPANY NAME:	
RECEIVED BY: Raymd E Reed	Date/Time 9/8/96 13:10	RELINQUISHED BY:	Date/Time
COMPANY NAME: G.E.L.		COMPANY NAME:	
RELINQUISHED BY: Raymd E Reed	Date/Time 9/8/96 1630	RECEIVED BY:	Date/Time 09-09-96 16
COMPANY NAME: G		COMPANY NAME: GEL	

TOTAL NUMBER OF CONTAINERS: 84

Cooler ID: #237

Cooler Temperature: 5°

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PAGE 3 of 4

CHAIN OF CUSTODY RECORD

COC NO.: G00.

PROJECT NAME: Fort Stewart UST Sites

PROJECT NUMBER: 0003

PROJECT MANAGER: Chris Potter

Sampler (Signature)

(Printed Name) SHARON STOLLER

LABORATORY NAME: GEL

LABORATORY ADDRESS:
2040 Savage Road
Charleston, SC 29417

PHONE NO:(803) 556-8171

Sample ID	Date Collected	Time Collected	Matrix	BTEX, GRO	BTEX	PAH, Lead, DRO	PAH	Lead	DRO								No. of Bottles/Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
1508W2	9/7/96	1200	WATER		2												2		
0503W2	9/7/96	1110			2												2		
1504W2	9/7/96	0910			2												2		
0504W2	9/7/96	0930			2												2		
0301RS	9/7/96	1440		2													2		
0302W2	9/7/96	1600			2												2		
0402W2	9/7/96	1015			2												2		
0302RG	9/7/96	1510			2												2		
2001W2	9/7/96	1230			2												2		
0304W2	9/7/96	1630			2												2		
0401W2	9/7/96	0925			2												2		
0401RS	9/7/96	0840			2												2		
TB0410	9/7/96	0730			2												2		

RELINQUISHED BY:	Date/Time 9/9/96	RECEIVED BY:	Date/Time
COMPANY NAME: SAIC	SAIC	COMPANY NAME:	
RECEIVED BY: Raymond E Reed	Date/Time 9/8/96 1310	RELINQUISHED BY:	Date/Time
COMPANY NAME: G.E.L.		COMPANY NAME:	
RELINQUISHED BY: Raymond E Reed	Date/Time 9/8/96 1630	RECEIVED BY:	Date/Time 09.09.96 14.30
COMPANY NAME: GEL		COMPANY NAME: GEL	

TOTAL NUMBER OF CONTAINERS: 84

Cooler ID: #237

Cooler Temperature: 5°

Page 4 of 4

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800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423) 481-4600

CHAIN OF CUSTODY RECORD

COC NO.: G0021

PROJECT NAME: Fort Stewart UST Sites

PROJECT NUMBER: 0003

PROJECT MANAGER: Chris Potter

Sampler (Signature) **(Printed Name)** Sharon Stoller

LABORATORY NAME: GEL

LABORATORY ADDRESS:
2040 Savage Road
Charleston, SC 29417

PHONE NO: (803) 556-8171

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	BTEX, GRO	BTEX	PAH, Lead, DRO	PAH	Lead	DRO								No. of Bottles/Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
TB0012	9/7/96	0730			2												2		
1602R5	9/6/96	1557		2													2		
3904W4	9/6/96	0945			2												2		
TB0011	9/7/96	0730			2												2		
0501W2	9/7/96	1330			2												2		

SLS 9/8/96

RELINQUISHED BY:	**Date/Time** 1310 9/8/96	**RECEIVED BY:**	**Date/Time**
COMPANY NAME: SAIC		**COMPANY NAME:**	
RECEIVED BY: Raymond E. Reed	**Date/Time** 9/8/96 13:20	**RELINQUISHED BY:**	**Date/Time**
COMPANY NAME: GEL		**COMPANY NAME:**	
RELINQUISHED BY: Raymond E Reed	**Date/Time** 9/8/96 16:30	**RECEIVED BY:**	**Date/Time** 09-08-96 16:30
COMPANY NAME: GEL		**COMPANY NAME:** GEL	

TOTAL NUMBER OF CONTAINERS: 84

Cooler ID: #237

Cooler Temperature: 5°

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0501W2

ab Name: GENERAL ENGINEERING LABOR   Contract: NA

Lab Code: NA   Case No.: NA   SAS No.: NA   SDG No.: 69093W

Matrix: (soil/water) WATER   Lab Sample ID: 9609093-20

Sample wt/vol: 20 (g/ml) ml   Lab File ID: 1Z506

Level: (low/med) LOW   Date Received: 09/08/96

% Moisture: not dec. ________   Date Analyzed: 09/13/96

GC Column: DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume:________(uL)   Soil Aliquot Volume: ______(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/l	Q	
71-43-2	benzene	5.0	U	U
108-88-3	toluene	5 ~~0.27~~	JB	U F01, F06
100-41-4	ethylbenzene	5.0	U	U
1330-20-7	xylenes (total)	5.0	U	U

12/17/96

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1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0501W2

Lab Name:
Contract:

Lab Code:
Case No.:
SAS No.:
SDG No.: 69091W

Matrix: (soil/water) GROUNDH2O
Lab Sample ID: 9609091-16

Sample wt/vol: 500 (g/mL) mL
Lab File ID: 4L322

Level: (low/med) LOW
Date Received: 09/08/96

% Moisture: ______ decanted: (Y/N)___
Date Extracted: 09/13/96

Concentrated Extract Volume: 0.5(mL)
Date Analyzed: 09/19/96

Injection Volume: 1.0(uL)
Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q	
91-20-3	naphthalene	10.0	U	U
91-58-7	2-chloronaphthalene	10.0	U	↓
209-96-8	acenaphthylene	10.0	U	
83-32-9	acenaphthene	10.0	U	
86-73-7	fluorene	10.0	U	
85-01-8	phenanthrene	10.0	U	
120-12-7	anthracene	10.0	U	
206-44-0	fluoranthene	10.0	U	
129-00-0	pyrene	10.0	U	
56-55-3	benzo(a)anthracene	10.0	U	
218-01-9	chrysene	10.0	U	
205-99-2	benzo(b)fluoranthene	10.0	U	
207-08-9	benzo(k)fluoranthene	10.0	U	
50-32-8	benzo(a)pyrene	10.0	U	
193-39-5	indeno(1,2,3-cd)pyrene	10.0	U	
53-70-3	dibenz(a,h)anthracene	10.0	U	
191-24-2	benzo(g,h,i)perylene	10.0	U	

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0502W2

ıb Name: GENERAL ENGINEERING LABOR Contract:

Lab Code: Case No.: SAS No.: SDG No.: 69092W

Matrix: (soil/water) WATER Lab Sample ID: 9609092-20

Sample wt/vol: 20 (g/ml) ml Lab File ID: 1Z323

Level: (low/med) LOW Date Received: 09/08/96

% Moisture: not dec. ________ Date Analyzed: 09/11/96

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume:________(uL) Soil Aliquot Volume: ______(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/l	Q	
71-43-2	benzene	5.0	U	U
108-88-3	toluene	5.0	U	↓
100-41-4	ethylbenzene	5.0	U	
1330-20-7	xylenes (total)	5.0	U	

FORM I VOA OLM03.0

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1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.
0502W2

Lab Name:
Contract:
Lab Code:
Case No.:
SAS No.:
SDG No.: 69091W
Matrix: (soil/water) GROUNDH2O
Lab Sample ID: 9609091-14
Sample wt/vol: 500 (g/mL) mL
Lab File ID: 4L320
Level: (low/med) LOW
Date Received: 09/08/96
% Moisture: ______ decanted: (Y/N)___
Date Extracted: 09/13/96
Concentrated Extract Volume: 0.5(mL)
Date Analyzed: 09/19/96
Injection Volume: 1.0(uL)
Dilution Factor: 1.0
GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q	
91-20-3	naphthalene	10.0	U	U
91-58-7	2-chloronaphthalene	10.0	U	
209-96-8	acenaphthylene	10.0	U	
83-32-9	acenaphthene	10.0	U	
86-73-7	fluorene	10.0	U	
85-01-8	phenanthrene	10.0	U	
120-12-7	anthracene	10.0	U	
206-44-0	fluoranthene	10.0	U	
129-00-0	pyrene	10.0	U	
56-55-3	benzo(a)anthracene	10.0	U	
218-01-9	chrysene	10.0	U	
205-99-2	benzo(b)fluoranthene	10.0	U	
207-08-9	benzo(k)fluoranthene	10.0	U	
50-32-8	benzo(a)pyrene	10.0	U	
193-39-5	indeno(1,2,3-cd)pyrene	10.0	U	
53-70-3	dibenz(a,h)anthracene	10.0	U	
191-24-2	benzo(g,h,i)perylene	10.0	U	

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0503W2

ab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: 69093W

Matrix: (soil/water) WATER Lab Sample ID: 9609093-06

Sample wt/vol: 20 (g/ml) ml Lab File ID: 1Z421

Level: (low/med) LOW Date Received: 09/08/96

% Moisture: not dec. ________ Date Analyzed: 09/12/96

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume:________(uL) Soil Aliquot Volume: ______(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/l	Q	
71-43-2	benzene	5.0	U	U
108-88-3	toluene	5.0	U	↓
100-41-4	ethylbenzene	5.0	U	
1330-20-7	xylenes (total)	5.0	U	

FORM I VOA OLM03.0

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DATA VALIDATION
COPY

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0503W2

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: 69091W

Matrix: (soil/water) GROUNDH2O Lab Sample ID: 9609091-03

Sample wt/vol: 500 (g/mL) mL Lab File ID: 4L310

Level: (low/med) LOW Date Received: 09/08/96

% Moisture: ______ decanted: (Y/N)___ Date Extracted: 09/13/96

Concentrated Extract Volume: 0.5(mL) Date Analyzed: 09/18/96

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q	
91-20-3	naphthalene	10.0	U	U
91-58-7	2-chloronaphthalene	10.0	U	
209-96-8	acenaphthylene	10.0	U	
83-32-9	acenaphthene	10.0	U	
86-73-7	fluorene	10.0	U	
85-01-8	phenanthrene	10.0	U	
120-12-7	anthracene	10.0	U	
206-44-0	fluoranthene	10.0	U	
129-00-0	pyrene	10.0	U	
56-55-3	benzo(a)anthracene	10.0	U	
218-01-9	chrysene	10.0	U	
205-99-2	benzo(b)fluoranthene	10.0	U	
207-08-9	benzo(k)fluoranthene	10.0	U	
50-32-8	benzo(a)pyrene	10.0	U	
193-39-5	indeno(1,2,3-cd)pyrene	10.0	U	
53-70-3	dibenz(a,h)anthracene	10.0	U	
191-24-2	benzo(g,h,i)perylene	10.0	U	↓

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.
0504W2

ab Name: GENERAL ENGINEERING LABOR Contract: NA
Lab Code: NA Case No.: NA SAS No.: NA SDG No.: 69093W
Matrix: (soil/water) WATER Lab Sample ID: 9609093-08
Sample wt/vol: 20 (g/ml) ml Lab File ID: 1Z408
Level: (low/med) LOW Date Received: 09/08/96
% Moisture: not dec. ________ Date Analyzed: 09/12/96
GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 1.0
Soil Extract Volume:________(uL) Soil Aliquot Volume: ______(uL)

BTEX ONLY

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/l	Q	
75-35-4	~~1,1-dichloroeth~~ene	~~5.0~~	~~U~~	
79-01-6	~~trichlor~~oethene	~~5.0~~	~~U~~	
71-43-2	benzene	5.0	U	U
108-88-3	toluene	5.0	U	U
108-90-7	ch~~lorobenzene~~	~~5.0~~	~~U~~	
100-41-4	ethylbenzene	5.0	U	U
1330-20-7	xylenes (total)	5.0	U	U

MAH
12/17/96

FORM I VOA OLM03.0

DATA VALIDATION
COPY

DATA VALIDATION COPY

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0504W2

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: 69091W

Matrix: (soil/water) GROUNDH2O Lab Sample ID: 9609091-18

Sample wt/vol: 500 (g/mL) mL Lab File ID: 4L412

Level: (low/med) LOW Date Received: 09/08/96

% Moisture: ______ decanted: (Y/N)___ Date Extracted: 09/13/96

Concentrated Extract Volume: 0.5(mL) Date Analyzed: 09/19/96

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q	
91-20-3	naphthalene	10.0	U	U
91-58-7	2-chloronaphthalene	10.0	U	
209-96-8	acenaphthylene	10.0	U	
83-32-9	acenaphthene	10.0	U	
86-73-7	fluorene	10.0	U	
85-01-8	phenanthrene	10.0	U	
120-12-7	anthracene	10.0	U	
206-44-0	fluoranthene	10.0	U	
129-00-0	pyrene	10.0	U	
56-55-3	benzo(a)anthracene	10.0	U	
218-01-9	chrysene	10.0	U	
205-99-2	benzo(b)fluoranthene	10.0	U	
207-08-9	benzo(k)fluoranthene	10.0	U	
50-32-8	benzo(a)pyrene	10.0	U	
193-39-5	indeno(1,2,3-cd)pyrene	10.0	U	
53-70-3	dibenz(a,h)anthracene	10.0	U	
191-24-2	benzo(g,h,i)perylene	10.0	U	

APPENDIX C-3

QUALITY CONTROL SUMMARY REPORT

APPENDIX C-3
QUALITY CONTROL SUMMARY REPORT
for
PHASE I CAP-PART A INVESTIGATIONS
FORMER UNDERGROUND STORAGE TANK SITES
FORT STEWART, GEORGIA
February 1997

1.0 INTRODUCTION

The purpose of this project was to perform initial characterization investigations at former underground storage tank (UST) sites located throughout the Fort Stewart garrison area to determine the nature and extent of petroleum contamination at each site and to define a Site Investigation Plan for each site where the initial characterization effort was insufficient to complete delineation of soil and/or groundwater contamination extent. A total of 81 individual former USTs located at 57 separate sites segregated into 26 general areas were included in this project.

Each of the project UST sites were initially assigned either preliminary groundwater status or CAP-Part A status. Preliminary groundwater status was assigned to sites where analytical results for soil samples collected during removal of the tank(s) suggested that groundwater contamination exceeding applicable regulatory limits may be present. CAP-Part A status was assigned to sites where results for the tank(s) removal soil samples indicated that soil and/or groundwater contamination exceeding applicable regulatory limits was present. Of the 57 separate sites included in the project scope, 33 sites were assigned preliminary groundwater status and the remaining 24 sites were assigned CAP-Part A status.

This Quality Control Summary Report (QCSR) consolidates quality control information for the Phase I investigations. Sampling and analytical efforts were coordinated for the various tank locations providing a combined data set for evaluation of data integrity.

1.1 Project Description

Phase I field sampling activities for the 57 UST sites began and were completed in September of 1996. Inspection activities at preliminary groundwater sites consisted of continuous collection of soil samples over 2.5-foot intervals from two boreholes located within the former tank pit. Each borehole was advanced down to the water table using the hollow-stem auger drilling method and soil samples were collected using a split-barrel sampler. Immediately after collection of each soil sample, a portion of the sample underwent field screening to determine organic vapor headspace gas concentration. Based on these results, two soil samples were selected for laboratory chemical analysis from boreholes where detectable vapor concentrations were encountered, or one sample was selected for analysis from boreholes where no vapor concentrations were encountered.

Inspection activities at CAP-Part A sites were similar to those described for the preliminary groundwater sites with the following exceptions. First, four soil boreholes were drilled within and around the former tank pit. Second, two soil samples were selected for laboratory chemical analysis from each borehole regardless of the field screening results.

Upon completion of soil sampling at both preliminary groundwater and CAP-Part A sites, one groundwater sample was collected from each borehole for laboratory chemical analysis. These samples were either collected directly from the saturated zone using a PowerPunch in situ sampling device, or from temporary piezometers installed within the boreholes using a Teflon bailer. Collection of samples from temporary piezometers was only implemented at borehole locations where the PowerPunch device could not be used because of subsurface obstructions or slow groundwater recharge into the device.

Laboratory analytical results for the soil samples collected at each site were screened against applicable risk-based threshold levels for those compounds identified in Chapter 391-3-15 of the Georgia Department of Natural Resources (GDNR) Rules for Underground Storage Tank Management. Analytical results for the groundwater samples collected at each site were screened against federally mandated Maximum Contaminant Levels (MCLs) for those compounds identified by the GDNR. The screening results for both soil and groundwater samples were used to delineate the nature and extent of contamination at each UST site.

1.2 Project Objectives

The scope of the project involved performance of initial characterization activities relative to the GDNR Underground Storage Tank Management Program regulations at 57 sites, and preparation of CAP-Part A reports as required based on the investigation results. The overall purpose of the site investigations was to determine the nature and extent of soil and groundwater contamination exceeding regulatory screening criteria, and to determine if additional characterization sampling was necessary to complete delineation of contaminant extent. Additional sampling requirements were defined in the Site Investigation Plan section of the CAP-Part A reports. CAP-Part A reports were not prepared for those preliminary groundwater sites where soil and groundwater contamination was documented to be below applicable regulatory screening criteria.

Specific requirements for the preliminary groundwater and CAP-Part A investigations were defined in the Georgia Underground Storage Tank (GUST) CAP-Part A guidance document GUST-7A (issued November 1995), the project Work Plan, and subsequent work plan revisions developed by the U.S. Army Corps of Engineers (USACE)-Savannah District for the project. In summary, the objectives of the project were as follows:

1. Determine the vertical extent of Total Recoverable Petroleum Hydrocarbon (TRPH) contamination below UST sites designated for preliminary groundwater investigations. Determine if benzene, toluene, ethylbenzene, xylene (BTEX), or polyaromatic hydrocarbon (PAH) compounds were present at concentrations exceeding screening criteria.

2. Determine the horizontal and vertical extent of BTEX or PAH contamination exceeding threshold levels in soil below UST sites designated for CAP-Part A investigations. Determine horizontal and vertical extent of BTEX or PAH contamination exceeding MCLs in groundwater at these sites.

3. Delineate soil and groundwater contaminant plumes where present.

4. Determine groundwater flow direction for all sites included in the project.

5. Prepare No Further Action reports and CAP-Part A reports for the various UST sites as deemed appropriate from the information gathered.

The general quality assurance (QA) objectives of the project are as follows:

1. Ensure that the method used for borehole drilling will allow for collection of soil samples representative of surface and subsurface soil contamination conditions, and for description of the hydrogeologic environment.

2. Ensure that the method used for collection of groundwater samples will allow for collection of samples representative of water table contamination conditions.

3. Ensure that sampling methods used for soil and groundwater collection minimize alteration of contaminant concentrations, and that drilling and sampling equipment decontamination methods prevent cross-contamination between sampling locations.

4. Ensure that field measurement and analytical laboratory results are accurate, representative of site conditions, and fulfill data quality objectives (DQOs) defined for the project.

The first three QA objectives were accomplished through implementation of the procedures and requirements described in the Work Plan and associated Field Sampling Plan. The fourth QA objective was accomplished through data management practices, associated internal laboratory QC analyses, related procedures and requirements defined in the Chemical Data Acquisition Plan (CDAP), and through collection and analysis of field quality control (QC) samples.

1.3 Project Implementation

Phase I field work was initiated and completed by Science Applications International Corporation (SAIC) in September 1996. A project-specific Site Health and Safety Plan was compiled for the work completed by SAIC and sub-tier contractors. Ms. Patty Stoll was designated as Field Manager for the project. She was responsible for the collection of samples in accordance with the work plan, completion of the Daily Quality Control Reports (DQCRs), coordination of site access, shipment of samples to the laboratories, and documentation and correction of problems as they occurred. Quality Control Officer for the project was Ms. Sharon Stoller. She was responsible for data quality control for the SAIC sampling effort. This included, but was not limited to, validation of both field and laboratory data in accordance with the Geological Data Acquisition Plan (GDAP), the CDAP, and the Work Plan. As laboratory and analytical data coordinator, Mr. Nile Luedtke was responsible for maintaining analytical files for the project, approval of payment invoices from the laboratories, and documentation and correction of problems as they occurred. As the SAIC project manager, Christopher Potter was responsible for overall project success, budgetary control, USACE interfaces, and completion of Monthly Progress Reports (MPRs).

One analytical laboratory was utilized by SAIC for testing samples collected by SAIC personnel. General Engineering Laboratory of Charleston, South Carolina completed all groundwater and soil analysis for BTEX, PAHs, gasoline range organics (GRO), diesel range organics (DRO), and TRPH. The laboratory used U.S. Environmental Protection Agency (EPA) analytical methods and is validated through the USACE Missouri River Division (MRD) laboratory review process. The QA laboratory for the entire project was the USACE South Atlantic Division (SAD) Laboratory in Marietta, Georgia.

1.4 Purpose of This Report

Environmental data must always be interpreted relative to known limitations and intended use. As can be expected in environmental media of this type, there are areas and data points where the user needs to be cautioned relative to the quality of the project information presented. The data validation process and this data quality assessment are intended to provide current and future data users assistance throughout the interpretation of these data.

The purpose of this QCSR is to describe Quality Control (QC) procedures followed to ensure data generated by SAIC during the investigations at Fort Stewart would meet project requirements, to describe the quality of the data collected, and to describe problems encountered during the course of the study and their solutions. A separate QA report will be completed by the SAD Laboratory covering data generated from SAIC collected samples remanded to their custody.

This appendix provides an assessment of the analytical information gathered during the course of the Phase I UST investigations and documents that the quality of the data employed for the CAP-Part A reports met the objectives. Evaluation of field and laboratory QC measures will constitute the majority of this assessment; however, references will also be directed toward those QA procedures that establish data credibility. The primary intent of this assessment is to illustrate that data generated for the UST investigations can withstand scientific scrutiny, are appropriate for their intended purpose, are technically defensible, and are of known and acceptable sensitivity, precision, and accuracy.

Multiple activities were performed to achieve the desired data quality in this project. As discussed in the text, decisions were made during the initial scoping to define the quality and quantity of data required. DQOs were established to guide the implementation of the field sampling and laboratory analysis. A QA program was established to standardize procedures and to document activities. This program provided a means to detect and correct any deficiencies in the process. Upon receipt by the project team, data was subjected to a verification and validation review that identified and qualified problems related to the analysis. These review steps contribute to this final Data Quality Assessment (DQA) which defines that data used in the investigation met the criteria and are used appropriately.

2.0 QUALITY ASSURANCE PROGRAM

A CDAP was developed for this project and was included as one of several subplans with the overall project Work Plan. The purpose of this document was to enumerate the quantity and type of samples to be taken to inspect the various sites, and to define the quantity and type of Quality Assurance/Quality Control (QA/QC) samples to be used to evaluate the quality of the data obtained.

The CDAP established requirements for both field and laboratory QC procedures. In general field QC duplicates and QA split samples were required for each environmental sample matrix collected at sites being investigated at a frequency of 10%; volatile organic compound (VOC) trip blanks were to accompany each cooler containing water samples for VOC determinations; and analytical laboratory QC duplicates, matrix spikes, laboratory control samples, and method blanks were required for every 20 samples or less of each matrix and analyte.

A primary goal of the QA program was to ensure that the quality of results for all environmental measurements were appropriate for their intended use. To this end, a CDAP and standardized field procedures were compiled to guide the investigation. Through the process of readiness review, training, equipment calibration, QC implementation, and detailed documentation, the project has successfully accomplished the goals set by the QA Program.

2.1 Monthly Progress Reports

An MPR was completed by the SAIC Project Manager for every month during project implementation. The MPRs contain the following information: work completed, problems encountered, corrective actions/solutions, summary of findings, and upcoming work. These reports were issued to the USACE-Savannah District Project Manager and may be obtained through their office.

2.2 Daily Quality Control Reports (DQCRs)

The Field Manager, Patty Stoll, produced all Daily Quality Control Reports. These include information such as, but not limited to, sub-tier contractors on site, equipment on site, work performed summaries, QC activities, Health and Safety activities, problems encountered, and corrective actions. The DQCRs were submitted to the SAIC and USACE-Savannah District Project Managers, and are on file in their offices.

2.3 Laboratory "Definitive" Level Data Reporting

The CDAP for this project identified requirements for laboratory data reporting and identified General Engineering Laboratories as the laboratory for the project. EPA "definitive" data have been reported including the following basic information:

a. laboratory case narratives
b. sample results
c. laboratory method blank results
d. laboratory control standard results
e. laboratory sample matrix spike recoveries
f. laboratory duplicate results
g. surrogate recoveries (BTEX, GRO, PAHs, DRO)
h. sample extraction dates
I. sample analysis dates

This information from the laboratory, along with field information, provides the basis for subsequent data evaluation relative to sensitivity, precision, accuracy, representativeness, and completeness. These have been presented in Section 4.0 of this appendix.

3.0 DATA VALIDATION

The objective when evaluating the quality of the project data is to determine its usability. The evaluation is based on the interpretation of laboratory QC measures, field QC measures, and the project DQOs.

This project implemented the use of data validation checklists to facilitate laboratory data validation. These checklists were completed by the project-designated SAIC validation staff and were reviewed by the project laboratory coordinator. Data validation checklists for each laboratory sample delivery group (SDG) have been retained with laboratory data deliverables by SAIC.

3.1 Field Data Validation

DQCRs were completed by the Field Manager. The DQCRs and other field generated documents such as sampling logs, boring logs, daily health and safety summaries, daily safety inspections, equipment calibration and maintenance logs, and sample management logs were peer reviewed on site. These logs and all associated field information have been delivered to the USACE-Savannah District Project Manager and can be obtained through their office.

3.2 Laboratory Data Validation

Analytical data generated for this project have been subjected to a process of data verification, validation, and review. The following describes this systematic process and the evaluation activities performed. Several criteria have been established against which the data are compared and from which a judgment is rendered regarding the acceptance and qualification of the data. Because it is beyond the scope of this report to cite those criteria, the reader is directed to the following documents for specific detail:

- SAIC Technical Support Contractor QA Technical Procedure (TP-DM-300-7) Data Verification and Validation;
- Region I EPA - Laboratory Data Validation, Functional Guidelines for Evaluating Inorganic Analyses;
- Region I EPA- Laboratory Data Validation, Functional Guidelines for Evaluating Organic Analyses; and
- Work Plan for Preliminary Groundwater and Corrective Action Plan - Part A & Part B Investigations at Former Underground Storage Tank Sites, Fort Stewart, Georgia, August 1996.

Upon receipt of field and analytical data, SAIC verification staff performed a systematic examination of the reports, following standardized data package checklists to ensure the content, presentation, and administrative validity of the data. Discrepancies identified during this process were recorded and documented using the QA program Analytical Data Nonconformance Report (ADNCR) and Nonconformance Report (NCR) systems.

In conjunction with the data verification, and if standardized laboratory electronic data diskettes were available, the diskette deliverables were subjected to review using SAIC Electronic Data Deliverable (EDD) review software. This software performed both a structural and technical assessment of the laboratory-delivered electronic reports. The structural evaluation ensured that all required data had been reported and contract specified requirements were met (i.e., analytical holding times, contractual turnaround times, etc.).

During the validation phase of the review and evaluation process, data were subjected to a systematic technical review by examining all field and analytical QC results and laboratory documentation, following appropriate guidelines for laboratory data validation. These data validation guidelines define the technical review criteria, methods for evaluation of the criteria, and actions to be taken resulting from the review of these criteria. The primary objective of this phase was to assess and summarize the quality and reliability of the data for the intended use and to document factors that may affect the usability of the data. Data verification/validation included but was not necessarily limited to the following parameters:

Inorganic	Organic
Data completeness	Data completeness
Holding times	Holding times
Calibration	Calibration
- Initial	- Initial
- Continuing	- Continuing
Blanks	Blanks
Sample results verification	Surrogate recovery
Matrix spike recovery	
Field duplicate sample analysis	
Laboratory control sample analysis	Internal standards performance
Furnace atomic absorption QC (when implemented)	
Detection limits	Compound quantitation and reported detection limits
Secondary dilutions	Secondary dilutions

As an end result of this phase of the review, the data were qualified based on the technical assessment of the validation criteria. Qualifiers were applied to each field and analytical result to indicate the usability of the data for their intended purpose.

3.3 Definition of Data Qualifiers (Flags)

During the data validation process, all laboratory data were assigned appropriate data validation flags and reason codes. Validation flags are defined as follows:

"U" When the material was analyzed for, but not detected above the level of the associated value.

"J" When the associated value is an estimated quantity, indicating there is cause to question accuracy or precision of the reported value.

"UJ" When the analyte was analyzed for, but not detected, above the associated value; however, the reported value is an estimate and demonstrates an decreased knowledge of its accuracy or precision.

"R" When the analyte value reported is unusable. The integrity of the analyte's identification, accuracy, precision, or sensitivity have raised significant question as to the reality of the information presented.

SAIC validation flagging codes have been provided in Attachment 1 of this appendix, while copies of validation checklists and qualified data forms are on-file with the analytical laboratory deliverable.

3.4 Data Acceptability

A total of 749 environmental soil, groundwater, and field QC samples were collected with approximately 11,000 discrete analyses (i..e., analytes) being obtained, reviewed, and integrated into the assessment (these totals do not include field measurements and field descriptions). The project produced acceptable results for over 99% of the sample analyses performed and successfully collected all required investigation samples. Rejected data were relegated to PAH determinations in one soil and two groundwater samples.

Table 1 presents a summary of the number of collected investigation samples for each of the 26 general investigation areas. It also tallies the successful collection of appropriate targeted field QC and QA split samples. Table 2 provides a summary of rejected analyses grouped by media and analyte category. Copies of the project Chain-of-Custody forms are provided in appendices C-1 and C-2 of the CAP-Part A reports.

Through appropriate data verification, validation, and review, analytical information has been identified as estimated and rejected. Analyses were estimated for several soil samples due to missed analytical holding times. This occurred because of the need to re-analyze these samples or it consisted of a time lapse of only a few days. Subsequently the data has been estimated, however, it is considered useable to the project. None of the soil or groundwater BTEX, DRO, or GRO data were rejected. BTEX values were estimated in various soil samples due to poor second column gas chromatograph (GC) confirmation percent difference comparisons (>25%). None of the results were extremely disparate and the data have been appropriately identified. Approximately 2% of the DRO and GRO data has been estimated due to variable matrix spike/matrix spike duplicate (MS/MSD) recoveries or continuing calibration variances, however, all data is considered useable for the project needs.

A total of three sample's (1-soil, 2-water) PAH analyses have been rejected. Soil data were rejected relative to internal standard deviations, while groundwater data were rejected due to extremely poor surrogate standard recoveries. Additional PAH data have been estimated due to less extreme variation in these same control parameters. All

Table 1. Summary of Samples Collected

Tank Area	---------------Environmental Samples----------------------				--Field QC Samples--		QA Split Samples
	Soil	Soil Duplicates	Water	Water Duplicates	Trip Blanks	Equipment Rinsates	
A	13	2	7	1	2	0	2
C	18	4	10	1	3	3	3
D	37	2	24	3	8	3	1
E	12	0	6	0	1	2	3
E/F	16	2	8	1	1	0	3
G	3	0	2	0	1	2	0
H	10	2	6	1	2	0	0
I	7	0	4	1	2	0	1
J	4	0	2	0	1	0	2
K	8	2	4	1	1	0	0
L	7	0	4	0	1	2	2
M	26	3	14	2	3	2	2
N	26	5	13	1	3	2	3
O	6	0	4	1	1	0	0
P	17	0	9	0	2	3	3
Q	9	2	5	0	1	1	0
R	16	2	8	1	3	0	3
S	13	1	9	0	2	3	3
T	18	4	9	2	2	0	2
U	8	0	4	0	1	0	0
V	22	4	11	1	2	3	0
W	20	2	12	3	3	0	5
X	12	2	6	0	1	1	0
Y	28	2	16	3	6	4	4
Z	28	1	14	1	0	4	3
Totals	384	42	211	24	53	35	

Table 2. Summary of Rejected Analytes
(grouped by media and analysis group)

Media	Analysis Group	Rejected/Total	Percent Rejected
Soil	BTEX Compounds	0/ 1,280	0.0
	Diesel Range Org.	0/ 165	0.0
	Gasoline Range Org.	0/ 165	0.0
	PAH Compounds	9/ 5,432	0.2
	TRPH	0/ 154	0.0
	Subtotal	9/ 7,196	0.1
Groundwater	BTEX Compounds	0/ 735	0.0
	PAH Compounds	34/ 3,084	1.1
	Subtotal	34/ 3,819	0.9
Total		43/ 11,015	0.4

rejected results reflect a tendency to exhibit extreme negative bias and were therefore unable to support the requirements of the project.

4.0 DATA EVALUATION

4.1 Accuracy

Accuracy provides a gauge or measure of the agreement between an observed result and the true value for an analysis. Analytical accuracy is evaluated by measuring the agreement between an analytical result and its known or true value. This is generally determined through use of Laboratory Control Samples (LCSs), Matrix Spike (MS) analysis, and Performance Evaluation (PE) Samples. Accuracy as measured through the use of LCSs determines the method implementation accuracy independent of sample matrix. They document laboratory analytical process control. Accuracy determined by the MS is a function of both matrix and analytical process. Tables 3 and 4 present average LCS recovery values for the various parameters under investigation during these studies. Method blank surrogate compound recoveries and method blank target compound spiked analyses are two forms of laboratory control sample analyses. Table 5 consolidates the average sample matrix spike (MS) recovery values for BTEX, GRO, PAH, DRO, and TRPH parameters.

Volatile Organic Compounds

Volatile organic compounds (BTEX) LCS recovery, surrogate recovery, and MS recovery information provide measures of accuracy. Recoveries determined for laboratory volatile organic method blank spike and method blank surrogate analyses indicate the analytical processes for both GC and gas chromatograph/mass spectrometer (GC/MS) procedures were in control. Individual sample surrogate recoveries and sample MS recoveries indicate analytical accuracy for these compounds was in control and the data are usable.

Method blank surrogate recoveries (Table 3) were all within 80 to 100% for the volatile analyses. Summaries in Table 4 show average soil and water LCS values range from 94.8% to 104.1%, while all recoveries were within 80 to 120% for the four target compounds.

BTEX sample MS recoveries (Table 5) indicate analytical accuracy was in control with average soil MS recoveries of 105.5%, 97.6%, 97.7%, and 88.2% for benzene, toluene, ethylbenzene, and xylenes, respectively. Average groundwater sample MS recoveries for benzene and toluene were 104.9% and 93.5%, respectively. The wider range of spike recovery observed in actual environmental samples is indicative of matrix and heterogeneity variations, especially when dealing with soil matrices.

Table 3. Laboratory Control Sample Evaluation - Method Blank Average Surrogate Percent Recovery (%Rec)

Analysis	Soil Average %Rec	 Min. %Rec	 Max. %Rec	 N	Water Average %Rec	 Min. %Rec	 Max. %Rec	 N
Volatile Organic Compounds (BTEX)								
TOLUENE-d8	-	-	-	-	105.2	86	111	29
BROMOFLUOROBENZENE	-	-	-	-	108.4	89	116	29
DIBROMOFLUOROMETHANE	-	-	-	-	116.8	95	135	29
Volatile Organic Compounds (BTEX)								
n-PROPYLBENZENE (primary column)	101.6	87	136	35	-	-	-	-
n-PROPYLBENZENE (secondary column)	100.6	84	107	35	-	-	-	-
Gasoline Range Organics								
n-PROPYLBENZENE	97.6	47	144	22	94.0	61	110	6
Polyaromatic Hydrocarbons (PAHs)								
NITROBENZENE-d5	62.8	23	96	23	75.5	48	101	26
2-FLUOROBIPHENYL	68.2	37	103	23	77.7	52	90	26
TERPHENYL-d14	90.2	74	103	23	83.4	54	112	26
Diesel Range Organics								
o-TERPHENYL	83.4	58	109	16	81.4	76	89	7

Table 4. Laboratory Control Sample Evaluation - Method Blank Matrix Spike Average Percent Recovery (%Rec)

Analysis	Soil Average %Rec	Soil Min. %Rec	Soil Max. %Rec	Soil N	Water Average %Rec	Water Min. %Rec	Water Max. %Rec	Water N
Volatile Organic Compounds (BTEX)								
BENZENE	98.3	80	110	51	102.2	94	110	19
TOLUENE	103.0	90	115	51	94.8	87	101	19
ETHYLBENZENE	98.7	85	110	51	-	-	-	-
XYLENES	104.1	88	120	51	-	-	-	-
Gasoline Range Organics								
GRO	91.9	78	108	42	89.0	79	105	4
Polyaromatic Hydrocarbons (PAHs)								
ACENAPTHENE	77.8	47	108	45	79.6	52	94	50
PYRENE	87.5	65	103	45	88.8	53	115	50
Diesel Range Organics								
DRO	57.5	44	73	32	68.5	60	81	10
Total Recoverable Petroleum Hydrocarbon								
TRPH	113.0	102	126	22	102.3	83	121	4

Table 5. Sample Matrix Sike Evaluation - Average Percent Recovery (%Rec)

Analysis	Soil Average %Rec	Soil Min. %Rec	Soil Max. %Rec	Soil N	Water Average %Rec	Water Min. %Rec	Water Max. %Rec	Water N
Volatile Organic Compounds (BTEX)								
BENZENE	105.5	80	280	42	104.9	96	118	34
TOLUENE	97.6	10	210	42	93.5	86	99	34
ETHYLBENZENE	97.7	70	176	42	-	-	-	-
XYLENES	88.2	70	128	42	-	-	-	-
Gasoline Range Organics								
GRO	74.7	6	213	30	92.5	88	101	4
Polyaromatic Hydrocarbons (PAHs)								
ACENAPTHENE	68.7	22	94	42	70.1	31	147	26
PYRENE	84.9	23	123	42	82.0	30	146	26
Diesel Range Organics								
DRO	49.3	8	110	18	65.7	47	95	10
Total Recoverable Petroleum Hydrocarbon								
TRPH	84.3	76	103	20	-	-	-	-

Polyaromatic Hydrocarbon Compounds

Average LCS percent recovery values for PAH compounds in soils and waters range from 77.8% to 88.8%. These values are well within the normally accepted advisory limits established by the analytical methods. They are also within project accuracy goals of 14 to 30% for semivolatile compounds. None of the soil data required qualification based on the LCS, while only a few of the groundwater samples required qualification as estimated due to low LCS recoveries. Method blank surrogate recoveries (Table 3) were all well within acceptable ranges for semivolatile compounds. Re-enforcing the analytical process was in control.

Sample MS information (Table 5) for PAH compounds parallels LCS data, with the overall accuracy for these measurements being considered acceptable.

Gasoline Range, Diesel Range, and Total Recoverable Petroleum Hydrocarbons

The laboratory analytical process for these measurements was demonstrated to be under control by maintaining a general 50 to 150% LCS percent recovery for both water and soil matrices. Average method blank surrogate recoveries were maintained in the range of 80 to 120%.

Matrix spike information demonstrated acceptable accuracy control for both soils and waters. A few low soil MS recovery values did cause some data to be estimated. During data use and interpretation, these values present the possibility of providing false negative results and must be interpreted relative to validation flags placed on the data.

4.2 Precision

Laboratory Precision

As a measure of analytical precision, Tables 6 and 7 contain average relative percent differences (RPD) for laboratory duplicate sample pairs for the various analytical groups. Data are presented for parameters where both values meet or exceed five times the project required detection limits for that analyte. TRPH duplicate pairs evaluate actual sample concentrations while other organic duplicate pairs compare MS and MSD values. As the RPD approaches zero, complete agreement is achieved between the duplicate sample pairs. Sample homogeneity, analytical method performance, and the quantity of the analyte being measured all contribute to this measure of sample analytical precision.

Soil and water precision are considered acceptable when the RPD does not exceed 40. This limit was not exceeded for most analytes. All average RPD values were well within this criteria. In only a few instances did individual duplicate comparisons fall outside the criteria as demonstrated by the maximum RPDs presented. RPD values are quite good for these samples and reflect great effort on the part of the field and laboratory teams to homogenize the samples prior to aliquotting and analysis.

Table 6. Laboratory Control Sample Evaluation - Method Blank Matrix Spike Duplicate Relative Percent Difference (RPD)

	Soil				Water			
Analysis	Average RPD	Min. RPD	Max. RPD	N	Average RPD	Min. RPD	Max. RPD	N
Volatile Organic Compounds (BTEX)								
BENZENE	7.6	0	22	18	-	-	-	-
TOLUENE	7.0	0	20	18	-	-	-	-
ETHYLBENZENE	7.9	0	21	18	-	-	-	-
XYLENES	6.7	0	17	18	-	-	-	-
Gasoline Range Organics								
GRO	7.3	0	24	21	12.0	6	18	2
Polyaromatic Hydrocarbons (PAHs)								
ACENAPTHENE	10.6	1	50	21	8.0	0	35	24
PYRENE	6.6	2	19	21	7.7	0	36	24
Diesel Range Organics								
DRO	5.8	0	13	16	9.6	3	17	5
Total Recoverable Petroleum Hydrocarbon								
TRPH	6.7	4	13	11	5.7	5	7	2

Table 7. Sample Matrix Spike Duplicate or Duplicate Evaluation - Relative Percent Difference (RPD)

	Soil				Water			
Analysis	Average RPD	Min. RPD	Max. RPD	N	Average RPD	Min. RPD	Max. RPD	N
<u>Volatile Organic Compounds (BTEX)</u>								
BENZENE	6.2	0	21	21	3.9	0	9	17
TOLUENE	13.2	0	133	21	1.4	0	4	17
ETHYLBENZENE	7.0	0	22	21	-	-	-	-
XYLENES	8.0	0	24	21	-	-	-	-
<u>Gasoline Range Organics</u>								
GRO	26.9	0	162	15	10.0	6	14	2
<u>Polyaromatic Hydrocarbons (PAHs)</u>								
ACENAPTHENE	8.5	0	26	21	12.3	0	57	13
PYRENE	8.2	0	28	21	14.5	0	58	13
<u>Diesel Range Organics</u>								
DRO	38.2	8	86	9	9.4	0	22	5
<u>Total Recoverable Petroleum Hydrocarbon</u>								
TRPH	11.8	0	29	14	-	-	-	-

Duplicate comparison for those data within five times the reporting level have also been reviewed and evaluated. Acceptance limits for these data were set at ± two times the reporting level. In all cases, laboratory duplicate comparison at these low levels were in agreement.

Individual data points affected by poor precision measures appear in the data set qualified as estimated, when necessary. The precision for those data is considered acceptable and has been determined to be useable for project objectives.

Field Precision

Field duplicate samples were collected to ascertain the contribution to variability (i.e., precision) due to the combination of environmental media, sampling consistency, and analytical precision. Field duplicate samples were collected from the same spatial and temporal conditions as the primary environmental sample. Soil samples were collected from the same sampling device after homogenization for all analytes except BTEX.

Tables 8 and 9 provide a summary of soil and groundwater field duplicate comparisons by analyte. The tables present both absolute difference and RPD evaluations for field duplicate measurements. RPD was calculated only when both samples were >5 times the analyte reporting level. When one or both sample values were between the quantitation level and 5 times the analyte reporting level, the absolute difference was evaluated. If both samples were not detected for a given analyte, precision was considered acceptable. Only duplicate pairs having measurable values are included in the tabulation.

In order to review information, this data quality assessment has implemented general criteria for comparison of absolute difference measurements and RPDs. RPD criteria are identified below. Absolute difference criteria were set at three times the analyte reporting level.

RPD Evaluation Categories

Matrix	Good	Fair	Poor	Unacceptable
Water	<30%	<60%	<100%	>100%
Soil	<50%	<90%	<150%	>150%

Soil field duplicate RPDs are considered Fair (51%=Good; 23%=Fair; 24%=Poor, and 2%=Unacceptable), while absolute differences were predominantly within three times the analyte reporting level criteria. Most groundwater analyte concentrations were not high enough to provide RPD evaluation, however, absolute difference considerations indicate a Good comparison for the data.

Table 8. Soil Field Duplicate Evaluation - Relative Percent Difference (RPD) and Absolute Difference

Analysis	Area A 0101A1/0101A3 RPD(%)	Area C 0304A1/0304A3 RPD(%)	Area C 0304B1/0304B3 RPD(%)	Area E/F 1505B1/1505B3 RPD(%)	Area H 1803D1/1803D3 RPD(%)	Area K 2203B1/2203B3 RPD(%)
Volatile Organic Compounds (BTEX)						
BENZENE	*	*	*	*	*	*
TOLUENE	*	*	*	*	97	*
ETHYLBENZENE	*	*	UNAC	*	*	*
XYLENES	27	98	126	*	*	*
Gasoline Range Organics	-	114	5	2	*	-
Polyaromatic Hydrocarbons (PAHs)						
NAPHTHALENE	*	*	*	*	*	*
2-CHLORONAPTHALENE	*	*	*	*	*	*
ACENAPHTHYLENE	*	*	*	*	*	*
ACENAPHTHENE	*	*	*	*	*	*
FLUORENE	*	*	*	*	*	*
PHENANTHRENE	*	*	*	*	*	*
ANTHRACENE	*	*	*	*	*	*
FLUORANTHENE	*	*	*	*	*	*
PYRENE	*	*	*	*	*	*
BENZO(a)ANTHRACENE	*	*	*	*	*	*
CHRYSENE	*	*	*	*	*	*
BENZO(b)FLUORANTHENE	*	*	*	*	*	*
BENZO(k)FLUORANTHENE	*	*	*	*	*	*
BENZO(a)PYRENE	*	*	*	*	*	*
INDENO(1,2,3-cd)PYRENE	*	*	*	*	*	*
DIBENZO(a,h)ANTHRACENE	*	*	*	*	*	*
BENZO(g,h,i)PERYLENE	*	*	*	*	*	*
Diesel Range Organics	-	*	*	*	*	-
Total Petroleum Hydrocarbon	59	-	-	-	-	*

*	Acceptable = At least one value is <5X the reported detection level and duplicate comparison is within 3X the reported detection level.
UNAC	Unacceptable = At least one value is <5X the reported detection level and duplicate comparison is greater than 3X the reported detection level.

Table 8. (Continued)

Analysis	Area K 2203C1/2203C3 RPD(%)	Area N 3001B1/3001B3 RPD(%)	Area N 3001D1/3001D3 RPD(%)	Area R 3401A1/3401A3 RPD(%)	Area R 3401C1/3401C3 RPD(%)	Area T 3903C1/3903C3 RPD(%)
Volatile Organic Compounds (BTEX)						
BENZENE	*	101	132	*	*	*
TOLUENE	3	63	*	*	*	*
ETHYLBENZENE	*	52	187	*	38	*
XYLENES	*	76	*	*	9	*
Gasoline Range Organics	-	28	118	56	5	*
Polyaromatic Hydrocarbons (PAHs)						
NAPHTHALENE	*	*	*	*	*	*
2-CHLORONAPTHALENE	*	*	*	*	*	*
ACENAPHTHYLENE	*	*	*	*	*	*
ACENAPHTHENE	*	*	*	*	*	*
FLUORENE	*	*	*	*	*	*
PHENANTHRENE	*	*	*	*	*	42
ANTHRACENE	*	*	*	*	103	*
FLUORANTHENE	*	*	114	*	*	*
PYRENE	*	*	115	*	*	*
BENZO(a)ANTHRACENE	*	*	*	*	*	*
CHRYSENE	*	*	*	*	*	*
BENZO(b)FLUORANTHENE	*	*	*	*	*	*
BENZO(k)FLUORANTHENE	*	*	*	*	*	*
BENZO(a)PYRENE	*	*	*	*	*	*
INDENO(1,2,3-cd)PYRENE	*	*	*	*	*	*
DIBENZO(a,h)ANTHRACENE	*	*	*	*	*	*
BENZO(g,h,i)PERYLENE	*	*	*	*	*	*
Diesel Range Organics	-	UNAC	13	126	135	38
Total Petroleum Hydrocarbon	*	-	-	-	-	-

* Acceptable = At least one value is <5X the reported detection level and duplicate comparison is within 3X the reported detection level.

UNAC Unacceptable = At least one value is <5X the reported detection level and duplicate comparison is greater than 3X the reported detection level.

4.3 Sensitivity

Determination of minimum detectable values allows the investigation to assess the relative confidence that can be placed in a value relative to the magnitude or level of analyte concentration observed. The closer a measured value comes to the minimum detectable concentration, the less confidence and more variation the measurement will have. Project sensitivity goals were expressed as quantitation level goals in the CDAP. These levels were achieved or exceeded throughout the analytical process. There were individual exceptions that have generated qualification of the data or elevation of detections levels when the original goal was not achieved. Variations observed were caused by fluctuations in moisture content or the need to dilute high concentration analytes into linear range for analysis.

Variations in observed detection levels may affect the usability of some of the data for the project. Moisture content and blank levels did not impact data usability, however, high levels of individual compounds did impact reported detection levels for benzene and other organic compounds. In several instances, dilution factors of 100 were required to bring contaminant concentrations into their analytical linear ranges. These levels of contamination decreased the analytical sensitivity for the other analyses in that sample fraction.

Table 10 provides an overview of elevated detection level frequency for the project. Individual data point interpretation must consider the impact of elevated detection levels, however, the low percentages of elevated detection levels produced during these studies should minimize these issues. Less than 2% of BTEX data exhibit elevated detection levels greater than 10X the norm, with approximately 8% of the PAH data exhibiting elevated detection levels greater than 10X the norm.

Evaluation of overall project sensitivity can be gained through review of field blank information. These actual sample analyses may provide a comprehensive look at the combined sampling and analysis sensitivity attained by the project. Field QC blanks obtained during sampling activities included samples of VOC trip blank waters and samples of the final equipment decontamination rinse water. Summary information for those blank determinations exhibiting detectable levels is presented in Table 11.

There were a minimal number of detected VOCs in project trip blanks. These were all below their associated reporting levels and only just above the laboratory instrument detection levels. These levels are not considered significant and have not caused data qualification. Table 11 provides a list of those analytes observed in field blank samples. It is therefore determined that VOC analysis has not been affected through the transportation and storage process, and that the procedures and precautions used were effective in preserving the integrity of the sample analysis.

Equipment rinsates document that effective decontamination of equipment has been performed for those contaminants of primary interest to the project. No VOC or metal

Table 10. Frequency of Elevated Detection Levels

Soil

Analyte	**Units**	**Detection Level**	**Total Number of Non-detects**	**2 - 10 X Detection Level**	**10 - 100 X Detection Level**	**> 100 X Detection Level**
BTEX Compounds						
Benzene	UG/KG	5.00000	293	8	15	0
Ethylbenzene	UG/KG	5.00000	260	1	0	0
Toluene	UG/KG	5.00000	197	3	9	0
Xylenes, Total	UG/KG	5.00000	227	3	0	0
Gasoline Range Organics						
TPH-Gasoline Range Organics	UG/KG	102.00000	82	1	0	0
Polynuclear Aromatic Hydrocarbons						
2-Chloronaphthalene	UG/KG	330.00000	311	10	14	2
Acenaphthene	UG/KG	330.00000	302	10	11	0
Acenaphthylene	UG/KG	330.00000	309	10	13	2
Anthracene	UG/KG	330.00000	310	10	14	2
Benzo(a)anthracene	UG/KG	330.00000	307	9	14	2
Benzo(a)pyrene	UG/KG	330.00000	310	10	14	2
Benzo(b)fluoranthene	UG/KG	330.00000	304	9	13	2
Benzo(g,h,i)perylene	UG/KG	330.00000	310	9	15	2
Benzo(k)fluoranthene	UG/KG	330.00000	306	9	14	2
Chrysene	UG/KG	330.00000	307	9	14	2
Dibenzo(a,h)anthracene	UG/KG	330.00000	313	10	15	2
Fluoranthene	UG/KG	330.00000	298	9	11	2
Fluorene	UG/KG	330.00000	308	10	14	2
Indeno(1,2,3-cd)pyrene	UG/KG	330.00000	300	9	14	2
Naphthalene	UG/KG	330.00000	295	8	11	1
Phenanthrene	UG/KG	330.00000	293	8	9	1
Pyrene	UG/KG	330.00000	291	9	10	2
Petroleum Hydrocarbons						
Total Petroleum Hydrocarbons	MG/KG	2.17000	19	17	0	0

Table 10. (Continued)

Groundwater

Analyte	Units	Detection Level	Total Number of Non-detects	2 - 10 X Detection Level	10 - 100 X Detection Level	> 100 X Detection Level
BTEX Compounds						
Benzene	UG/L	5.00000	99	1	2	1
Ethylbenzene	UG/L	5.00000	103	1	0	0
Toluene	UG/L	5.00000	17	0	0	0
Xylenes, Total	UG/L	5.00000	102	1	0	1
Polynuclear Aromatic Hydrocarbons						
2-Chloronaphthalene	UG/L	8.40000	176	9	24	4
Acenaphthene	UG/L	8.40000	169	9	22	4
Acenaphthylene	UG/L	8.40000	175	9	23	4
Anthracene	UG/L	8.40000	171	9	22	4
Benzo(a)anthracene	UG/L	8.40000	174	9	23	4
Benzo(a)pyrene	UG/L	8.40000	172	9	24	4
Benzo(b)fluoranthene	UG/L	8.40000	174	9	23	4
Benzo(g,h,i)perylene	UG/L	8.40000	174	9	23	4
Benzo(k)fluoranthene	UG/L	8.40000	175	9	24	4
Chrysene	UG/L	8.40000	173	9	22	4
Dibenzo(a,h)anthracene	UG/L	8.40000	176	9	24	4
Fluoranthene	UG/L	8.40000	166	9	19	4
Fluorene	UG/L	8.40000	161	8	18	3
Indeno(1,2,3-cd)pyrene	UG/L	8.40000	175	9	24	4
Naphthalene	UG/L	8.40000	136	6	10	1
Phenanthrene	UG/L	8.40000	151	7	13	1
Pyrene	UG/L	8.40000	162	9	17	3

Table 11. Field Blank Detected Values

Trip Blank

Area	Sample ID	Date Collected	Analyte	Results	Units	Qual
Tank Area D	TB0010	09/07/96	Toluene	0.19	UG/L	J
Tank Area Y	TB0050	09/21/96	Xylenes, Total	0.34	UG/L	J

Equipment Rinsate

Area	Sample ID	Date Collected	Analyte	Results	Units	Qual
Tank Area C	0302R6	09/07/96	Toluene	2.4	UG/L	J
Tank Area S	3804R5	09/17/96	TPH-Diesel Range Organics	.041	MG/L	=
Tank Area X	4804R5	09/17/96	TPH-Diesel Range Organics	0.043	MG/L	=

parameters were above their associated reporting levels and only minor levels were reported above the laboratory instrument detection levels. There is no indication that cross-contamination has occurred nor has any data been qualified relative to these rinsates (Table 11).

4.4 Representativeness and Comparability

Representativeness expresses the degree to which data accurately reflect the analyte or parameter of interest for the environmental site and is the qualitative term most concerned with the proper design of the sampling program. Factors that affect the representativeness of analytical data include proper preservation, holding times, use of standard sampling and analytical methods, and determination of matrix or analyte interferences. No data points were rejected based on extended holding times, while only a few analyses were estimated and qualified. Sample preservation, analytical methodologies, and soil sampling methodologies were documented to be adequate and consistently applied. Both soil and groundwater sampling methods have been proven to be an effective application for this study.

Comparability, like representativeness, is a qualitative term relative to a project data set as an individual. The UST investigations used appropriate sampling methodologies, site surveillance, use of standard sampling devices, uniform training, documentation of sampling, standard analytical protocols/procedures, QC checks with standard control limits, and universally accepted data reporting units to ensure comparability to other data sets. Through the proper implementation and documentation of these standard practices, the project has established the confidence that the data will be comparable to other project and programmatic information.

4.5 Completeness

Usable data are defined as those data that pass individual scrutiny during the verification and validation process and are accepted for unrestricted application to the human health risk assessment evaluation or equivalent type applications. It has been determined that estimated data are acceptable for the UST project objectives.

Objectives for the UST investigations have been achieved. The project produced valid results for over 99% of the sample analyses performed and successfully collected all required investigation samples.

5.0 DATA QUALITY ASSESSMENT SUMMARY

The overall quality of Fort Stewart preliminary groundwater and CAP-Part A investigation information meets or exceeds the established project objectives. Through proper implementation of the project data verification, validation, and assessment process, project information has been determined to be acceptable for use.

Data, as presented, have been qualified as usable, but estimated when necessary. Data that have been estimated provide indications of either accuracy, precision, or sensitivity being less than desired but adequate for interpretation.

Data produced for these studies demonstrate that they can withstand scientific scrutiny, are appropriate for intended purpose, are technically defensible, and are of known and acceptable sensitivity, precision, and accuracy. Data integrity has been documented through proper implementation of QA/QC measures. The environmental information presented has an established confidence that allows use for the project objectives and provides data for future needs.

6.0 REFERENCES

SAIC (Science Applications International Corporation) 1995. *Data Validation Guidelines for Analytical Data*, Quality Assurance Technical Procedure TP-DM-300-7, Rev. 1.

Work Plan for Preliminary Groundwater and Corrective Action Plan - Part A & Part B Investigations at Former Underground Storage Tank Sites, Fort Stewart, Georgia, August 1996.

DATA VALIDATION FLAGGING CODES

Blanks

F01	Sample data were qualified as a result of the method blank.
F02	Sample data were qualified as a result of the field blank.
F03	Sample data were qualified as a result of the equipment rinsate.
F04	Sample data were qualified as a result of the trip blank.
F05	Gross contamination exists.
F06	Concentration of the contaminant was detected at a level below the CRQL.
F07	Concentration of the contaminant was detected at a level less than the action limit, but greater than the CRQL.
F08	Concentration of the contaminant was detected at a level that exceeds the action level.
F09	No laboratory blanks were analyzed.
F10	Blank had a negative value >5×'s the IDL.
F11	Blanks were not analyzed at required frequency.
F12	Professional judgement was used to qualify the data.

Surrogate Recovery

G01	Surrogate recovery was above the upper control limit.
G02	Surrogate recovery was below the lower control limit.
G03	Surrogate recovery was <10%.
G04	Surrogate recovery was zero.
G05	Surrogate was not present.
G06	Professional judgement was used to qualify the data.

Matrix Spike/Matrix Spike Duplicate

H01	MS/MSD recovery was above the upper control limit.
H02	MS/MSD recovery was below the lower control limit.
H03	MS/MSD recovery was <10%.
H04	MS/MSD pairs exceed the RPD limit.
H05	No action was taken on MS/MSD results.
H06	Professional judgement was used to qualify the data.

Matrix Spike

I01	MS recovery was above the upper control limit.
I02	MS recovery was below the lower control limit.
I03	MS recovery was <30%.
I04	No action was taken on MS data.
I05	Professional judgement was used to qualify the data.

Laboratory Duplicate

J01	Duplicate RPD was outside the control limit.
J02	Duplicate sample results were >5× the CRDL.
J03	Duplicate sample results were <5× the CRDL.
J04	Professional judgement was used to qualify the data.

Internal Area Summary

K01	Area counts were outside the control limits.
K02	Extremely low area counts or performance was exhibited by a major drop off.
K03	IS retention time varied by more than 30 seconds.
K04	Professional judgement was used to qualify the data.

Laboratory Control Samples (LCSs)

P01	LCS recovery was above upper control limit.
P02	LCS recovery was below lower control limit.
P03	LCS recovery was <50%.
P04	No action was taken on the LCS data.
P05	LCS was not analyzed at required frequency.

Target Compound Identification

M01	Incorrect identifications were made.
M02	Qualitative criteria were not met.
M03	Cross contamination occurred.
M04	Confirmatory analysis was not performed.
M05	No results were provided.
M06	Analysis occurred outside 12 hr GC/MS window.
M07	Professional judgement was used to qualify the data.
M08	The %D between the two pesticide/PCB column checks was >25%.

Initial/Continuing Calibration - Organics

C01	Initial calibration RRF was <0.05.
C02	Initial calibration RSD was >30%.
C03	Initial calibration sequence was not followed as required.
C04	Continuing calibration RRF was <0.05.
C05	Continuing calibration %D was >25%.
C06	Continuing calibration was not performed at the required frequency.
C07	Resolution criteria were not met.
C08	RPD criteria were not met.
C09	RSD criteria were not met.
C10	Retention time of compounds was outside windows.
C11	Compounds were not adequately resolved.
C12	Breakdown of endrin or DDT was >20%.
C13	Combined breakdown of endrin/DDT was >30%.
C14	Professional judgement was used to qualify the data.

APPENDIX D

DOCUMENTATION OF WATER SUPPLY SURVEY FOR THE FORT STEWART GARRISON AREA

FORT STEWART DIRECTORATE OF PUBLIC WORKS
SUMMARY OF WATER SUPPLY WELL INFORMATION

Well No. 1:

1750 gallons per minute
Water Tank Storage Capacity - 300,000 gallons
High Water Elevation - 149.5 feet
Overflow - 144 feet
Pump Outlet - 93.43 feet

Well No. 2:

No Operational Information Available

Well No. 3:

1400 gallons per minute
Pump Elevation - 71.0 feet

Well No. 4:

1400 gallons per minute

Well No. 5:

500 gallons per minute
100 HP Electric Pump
200 PSI Pressure
Water Tank Storage Capacity - 25,000 gallons

Water Tower:

Hero Road near Davis Avenue
Storage Capacity - 250,000 gallons
Well Number and Operational Information Not Available

Well No. 8:

No Operational Information Available
Water Tank Storage Capacity - 250,000 gallons

APPENDIX E

SITE RANKING FORM
FOR FACILITY ID #9-089069

APPENDIX II

SITE RANKING FORM

1. Soil Contamination

a. Total PAHs - Maximum Concentration

☐ > 10 mg/kg = 50

☐ 1 - 10 mg/kg = 25

☐ 0.66 - 0.99 mg/kg = 10

☒ < 0.660 = 0

b. Total BTEX - Maximum Concentration

☐ > 150 mg/kg = 50

☐ 50 - 149.9 mg/kg = 40

☐ 10 - 49.9 mg/kg = 25

☒ 0.5 - 9.9 mg/kg = 10

☐ 0.005 - .499 mg/kg = 1

☐ <0.005 mg/kg = 0

c. Depth to Groundwater (bls = Below Land Surface)

☒ < 10' bls = 10

☐ 10' - 25' bls = 5

☐ 25' - 50' bls = 2

☐ >50' bls = 1

2. Groundwater Contamination

a. Free Product (Nonaqueous-phase liquid hydrocarbons)

☐ > 6" = 2,000

☐ 1/8" - 6" = 1,500

☐ Sheen - 1/8" = 250

☒ No free product = 0

b. Dissolved Benzene - Maximum Concentration

☐ > 10,000 ug/L = 250

☐ 1,000 - 10,000 ug/L = 100

☐ 100 - 1,000 ug/L = 50

☐ 5 - 100 ug/L = 10

☒ <5 ug/L = 0

If (1.a.) + (1.b.) + (2.a.) + (2.b) is < 1, and the CAP is complete, then no further action is required. Go to summary.

3. Distance from Contaminant Plume to Point of Withdrawal for Water Supply

A. Public				B. Non-public			
CATEGORY	NUMBER IDENTIFIED	SCORE	TOTAL	CATEGORY	NUMBER IDENTIFIED	SCORE	TOTAL
Impacted	0 X	100 =	0	Impacted	0 X	100 =	0
< 500'	0 X 0.5 X	50 =	0	< 100'	0 X 0.5 X	26 =	0
500' - 1/4 mi	0 X 0.5 X	20 =	0	100' - 500'	0 X 0.5 X	10 =	0
1/4 mi - 1 mi	2 X 0.5 X	10 =	10	500' - 1/4 mi	0 X 0.5 X	6 =	0
1 mi - 2 mi	3 X 0.5 X	6 =	9	1/4 - 1/2 mi	0 X 0.5 X	4 =	0
> 3 mi	N/A	0 =	0	> 1/2 mi	N/A	0 =	0
		A. Subtotal =	19			B. Subtotal =	0

Note: If site is in lower susceptibility area, do not use the shaded area.

4. Distance from Contaminant Plume to Surface-Waters or Utility Trenches Below the Water Table

___ Impacted = 100

___ < 500 = 12

___ 500' - 1000' = 6

X > 1,000 = 1

5. Susceptibility Area Multiplier

___ If site is located in a Low Ground-Water Pollution Susceptibility Area,
<u>and</u> no points of withdrawal for water supply lie within 500'
<u>and</u> no surface water bodies or submerged utility trenches lie within 500'
of the source: = 0.5

X All other sites = 1

SUMMARY

[(1.a. + 1.b.) X (1.c.) + (2.a. + 2.b.) X (3.a. + 3.b. + 4.)] X [(5.)] = 100
ENVIRONMENTAL SENSITIVITY SCORE

APPENDIX F

PUBLIC NOTIFICATION NEWSPAPER ANNOUNCEMENT FOR THE FACILITY ID #9-089069 CAP-PART A ACTIVITIES

****** PUBLIC NOTICE ******

Notification of Corrective Action Plan
Underground Storage Tank Releases
Fort Stewart Garrison Area
Fort Stewart, Georgia

The United States Army Corps of Engineers and Fort Stewart Directorate of Public Works have prepared Corrective Action Plan (CAP)-Part A reports to assess the environmental impact of diesel, gasoline, or waste oil releases from numerous underground storage tanks (USTs) located at the above referenced property. These reports were submitted to the Georgia Environmental Protection Division on or about February 3, 1997. A listing of the UST sites for which CAP-Part A reports have been prepared is presented at the end of this notification.

The Georgia rules for UST Management require notification of the public most directly affected by the plans. If you would like a copy of any of the plans, please contact:

Commander
24th Infantry Division (Mechanized) and Fort Stewart
ATTN: AFZP-DEV (M. Little)
Building 1139
Fort Stewart, Georgia 31314-5000

A copy of each requested plan will be mailed at a nominal copying and shipping fee.

If you desire to make comments on any of the plans, or to examine the Georgia Environmental Protection Division's files, you should contact the Corrective Action Unit, Underground Storage Tank Management Program, Environmental Protection Division, at (404) 362-2687. The Underground Storage Tank Management Program will accept public comments on the CAP-Part A reports up to 30 days after submittal to the Georgia Environmental Protection Division. Their mailing address is:

Corrective Action Unit
Underground Storage Tank Management Program
4244 International Parkway
Suite 100
Atlanta, Georgia 30354

Fort Stewart CAP-Part A Underground Storage Tank Sites

Facility ID Number	Building Number	Tank Number
9-089064	Building 1841	Tank #1
9-089068	Building 1810	Tank #11, #12
9-089069	Building 1811	Tank #14
9-089012	Building 1721	Tank #15, #16
9-089011	Building 1722/1720	Tank #18, #20, #28A
9-089088	Building 1636/1643	Tank #29
9-089114	Building 1630	Tank #30, #31, #32
9-089028	Building 1622	Tank #33, #34, #35
9-089013	Building 1544	Tank #43, #44
9-089104	Building 1161	Tank #61
9-089046	Building 1130	Tank #64A
9-089021	Building 967	Tank #67
9-089020	Building 961	Tank #68, #69
9-089019	Building 955	Tank #70
9-089024	Building 1205/1255	Tank #72, #73
9-089003	Building 1809	Tank #75
9-089025	Building 1213	Tank #77, #78
9-089089	Building 1266/1268	Tank #80, #81
9-089029	Building 1281	Tank #82
9-089074	Building 1247	Tank #89
9-089075	Building 1333	Tank #90, #91
9-089111	Building 1331	Tank #92
9-089078	Building 1320	Tank #94A
9-089077	Building 1325	Tank #95, #96, #97
9-089079	Building 1346	Tank #98, #99
9-089115	Building 1343	Tank #100
9-089040	Building 233	Tank #205, #206
9-089036	Building 275	Tank #208, #209
9-089035	Building 272	Tank #210
9-089059	Building 4506	Tank #222, #223
9-089042	Building 4526/4530	Tank #226, #227
9-089061	Building 4577	Tank #232, #233
9-089117	Building 4572	Tank #234, #235
9-089062	Building 4578	Tank #236, #237
9-089100	Building 4583/4578	Tank #239, #240