RCRA FACILITY INVESTIGATION REPORT

FOR

FH-038B (Holding Tank, Building 11020) FORT HOOD, TEXAS

PREPARED FOR

U.S. ARMY CORPS OF ENGINEERS FORT WORTH DISTRICT

CONTRACT NO. DACA63-96-D-0021

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Science Applications International Corporation
An Employee-Owned Company

RCRA Facility Investigation Report
For Site FH-038B
(Electrolyte Holding Tank, Bldg. 11020)

Prepared for
U.S. Army Corps of Engineers
Fort Worth District
Fort Worth, Texas

Under Contract Number
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EXECUTIVE SUMMARY

FH-038B is one of four Solid Waste Management Units adjacent to battery shops. Each battery shop is a free-standing building within a tactical motor pool facility in the main cantonment. Each shop has an underground holding tank located adjacent to the building. According to the RFI Work Plan for 35 SWMUs (USACE 1995), the underground tank at FH-038B was made of fiberglass, was installed in 1982 and used until 1992 (CP&Y, Inc.1998), and removed in May 1998. The only known material handled in the tank was spent lead-acid battery electrolyte which was neutralized to pH of 7 prior to discharge from the battery shop to the tanks. Sludge or sediment may also have settled in the bottom of the tank. The tank was constructed with a grated top, allowing access for a final pH test before the effluent was discharged to the sanitary sewer. The tank was contained in a reinforced concrete vault.

The investigation at FH-038B involved three sampling events and analysis of samples for only lead. The initial investigation took place prior to the tank removal action in February 1997, and included three soil borings. No lead was detected in any of these soil samples or the one groundwater sample above the background screening criteria for lead. The presence of groundwater in only one of the three soil borings suggests that the groundwater sample was an isolated perched zone, not a continuous aquifer.

Fort Hood had planned to remove the tank at FH-038B from service separate from the RFI. During May 1998 the 300 gallon fiberglass holding tank and the containment-vault were removed and disposed by Anderson Columbia. The bedding and fill was not entirely removed and some soil/fill/gravel still remained in place. The tankhold pit filled with approximately 4 feet of water that flowed into the pit from the surrounding soils. It is suspected that water may have been perched and trapped in the space between the concrete and soil, and this perched water eventually infiltrated the tankhold by the following day. One water sample was collected from the tankhold pit. The water was pumped-out so soil could also be sampled. Once pumped out of the tankhold, the water did not return. Lead was detected in this water sample above the PQL at a concentration of 44.3 J ppm. A visual observation of this water sample indicated it was brownish and cloudy, suggesting that there were soil particles and fines in the water sample. This may have attributed to the high lead concentration found in the water sample. Four confirmatory soil samples were collected from the tankhold pit: two from the bottom of the tankhold pit, and two from the side walls (immediately below the inlet and outlet iron drain pipes). Lead was detected in the confirmatory soil samples from the bottom of the tankhold pit at concentrations ranging from 816 J to 4480 J ppm at 8 ft to 10 ft bgs. After confirmatory sample collection the tankhold pit was backfilled to prevent a falling and confined-space hazards and then, re-paved with concrete.

In October 1998 five soil borings were advanced to determine the extent of contamination previously identified by sampling at the site during the tank removal. Two geoprobe soil borings were advanced 3.4 feet from the east and west walls within the former tankhold pit to refusal at 10.5 feet bgs. Three soil borings were advanced within roughly 1.5 ft of the south, west, and north sides of the former tankhold pit. Lead was detected in only one subsurface sample at a concentration of 60.9 ppm. No water was encountered during this round of sampling.

Based on the RFI results, a release was identified during the May 1998 removal of the tank and associated containment-vault. Several facts verify the supposition that the remaining lead contamination is only in the soils in the bottom of the former tankhold pit and is immobile:

- The only lead contamination detected at FH-038 above the 95% UTL background screening value was found at the bottom of the tankhold pit after the tank and containment-vault were removed.
- Confirmatory samples collected on the side walls of the tankhold pit below the inlet and outlet drain pipes showed no lead above the 95% UTL background screening value.
- All the samples collected outside of the tankhold pit, both before and after tank removal, have had concentrations of lead below the 95% UTL background screening value.
- All the surface soil samples collected in the vicinity of FH038B, before, during and after tank removal, have had concentrations of lead below the 95% UTL background screening value.
- Bedrock was encountered at a depth of 8 to 10.5 ft bgs and the land surface is covered with concrete.
- During the October 1998 investigation the only sample to exceed the 95% UTL background screening value was the sample from SB124 (60.9 mg/kg) at a depth of 8.0 to 10.0 ft within the tankhold pit. The deeper sample from the same boring collected at 10.0 ft to 10.5 ft bgs contained lead at (2.1 mg/kg) a concentration well below the 95% UTL background screening value (19 mg/kg).
- A conservative approximate volume of lead contaminated soil left in-place is 8.1 cubic yards.
- The predominant silty clay lithology surrounding the tankhold pit will inhibit the mobility of any dissolved or suspended lead contamination should it reach groundwater.
- The presence of groundwater with a lead concentration less than PQL was noted in just one of eight soil borings (SB105) completed in the vicinity of FH038B, suggesting that the groundwater observed is an isolated perched zone, not a continuous aquifer.
- Once the water that entered the tankhold pit after the tank vault removal was pumped out, it did not recharge; further suggesting that the perched water was limited in volume.

Although surface soils in the vicinity of FH038B comply with the TNRCC RRS Number 1 for lead, subsurface soils do not. The TNRCC RRS Number 2 for subsurface soils based on the soil-to-groundwater (GWP-Industrial) cross media value (3.5 ppm) was exceeded. This RRS Number 2 value is almost two orders of magnitude less than the soil/air RRS Number 2 value of 1000 ppm for an industrial setting. The soil-to-groundwater contamination pathway and associated RRS Number 2 are not applicable at FH-038B. The limited groundwater that was encountered at the site represented water that had been trapped between the containment vault and the native soil, and not true groundwater from a water bearing unit. Additionally, the impacted subsurface soils are located 8 to 10.0 ft bgs and are covered with concrete. The potential for risk due to exposure to lead in subsurface soil at FH038B is very low. Based on professional judgement the remaining lead in the soil poses no risk to human health and the environment.

FH038B is located in an area of predominantly silty clay lithology which will inhibit the mobility of any dissolved or suspended lead contamination in groundwater. Also, since groundwater was noted in just one of eight soil borings completed in the vicinity, the groundwater that was observed is believed to be an isolated perched zone, not a continuous aquifer. Therefore, the potential for migration of lead identified in subsurface soils is also quite low.

Based upon these findings, it is recommended that FH-038B be closed under TNRCC RRSs Number 2, and no further action (no corrective measures) are needed to address the contamination associated with SWMU FH-038B. Certification of Remediation documentation in accordance to 30 TAC Section 335.560(b) relating to Post Closure Care and Deed Certification will be submitted as an addendum to this report once the TNRCC has approved this report.

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ACRONYMS

AA	Atomic absorption
BEGM	Bureau of Economic Geology
bkg	background
bgs	below ground surface
CQAR	Corps Quality Assurance Report
DOT	Department of Transportation
FH	Fort Hood
ft	feet or foot
GC/MS	Gas Chromatography/Mass Spectrometry
HSA	hollow stem auger
ICP	Inductively Coupled Plasma
IDW	Investigation Derived Waste
LCS	Laboratory Control Samples
msl	mean sea level
MS/MSD	Matrix Spike/Matrix Spike Duplicate
mg/l	milligrams per liter
ppm	parts per million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RRS	Risk Reduction Standards
SAIC	Science Applications International Corporation
SWMU	Solid Waste Management Unit
TAC	Texas Administrative Code
TCLP	Toxicity Characteristic Leaching Procedure
TNRCC	Texas Natural Resources Conservation Commission
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit

1.0 INTRODUCTION

Fort Hood is an active U.S. Army installation occupying 217,551 acres (339 square miles) in southern Coryell and Bell Counties in central Texas. It is situated 60 miles north of Austin, and about 50 miles south of Waco. The installation is located north of and adjacent to the city of Killeen, east of and adjacent to the city of Copperas Cove, and four miles south of the city of Gatesville. A vicinity map is shown in Figure 1.1.

Fort Hood began operations in 1942. Robert Gray Air Field, originally operated by the Air Force as Robert Gray Air Force Base, was established in 1947 (U. S. Army 1996a). Fort Hood's mission is training, testing, and deployment of military personnel and equipment. The post is commanded by the III Corps Commander. Currently, the post supports two full armored divisions (the 1st Cavalry and 4th Infantry Divisions). Forty-three thousand military personnel are stationed there; and an additional 30,000 family members, civilians, volunteers, and private-sector employees also live or work at Fort Hood (U.S. Army 1996a). Among the military assets of Fort Hood are approximately 2,500 tracked vehicles, over 11,000 wheeled vehicles, six fixed wing aircraft, and 230 rotary-wing aircraft. The post has 67 active firing and demolition ranges.

The Fort Hood military reservation is regulated under the Resource Conservation and Recovery Act (RCRA) as a hazardous waste management facility. Fort Hood has a RCRA permit to operate three hazardous waste storage units. The RCRA permit requires that Fort Hood perform a RCRA Facility Investigation (RFI) for 40 solid waste management units (SWMUs) listed in the permit. These SWMUs are distributed across the military reservation, in the main cantonment, West Fort Hood, and North Fort Hood. They include former solid waste landfills and burial sites, former and inactive underground storage tank locations, active wash rack/sewer systems, effluent ponds, and a sanitary sewer network. An installation map is shown in Figure 1.2.

FH-038B is located immediately northwest of Building 11020, near the intersection of 31st Street and North Avenue. This report describes the collection and analysis of soil data from SWMU FH-038B, Building 11020 Electrolyte Holding Tank which is one of 35 SWMUs investigated during the RFI conducted November 1996 through October 1998.

1.1 BACKGROUND

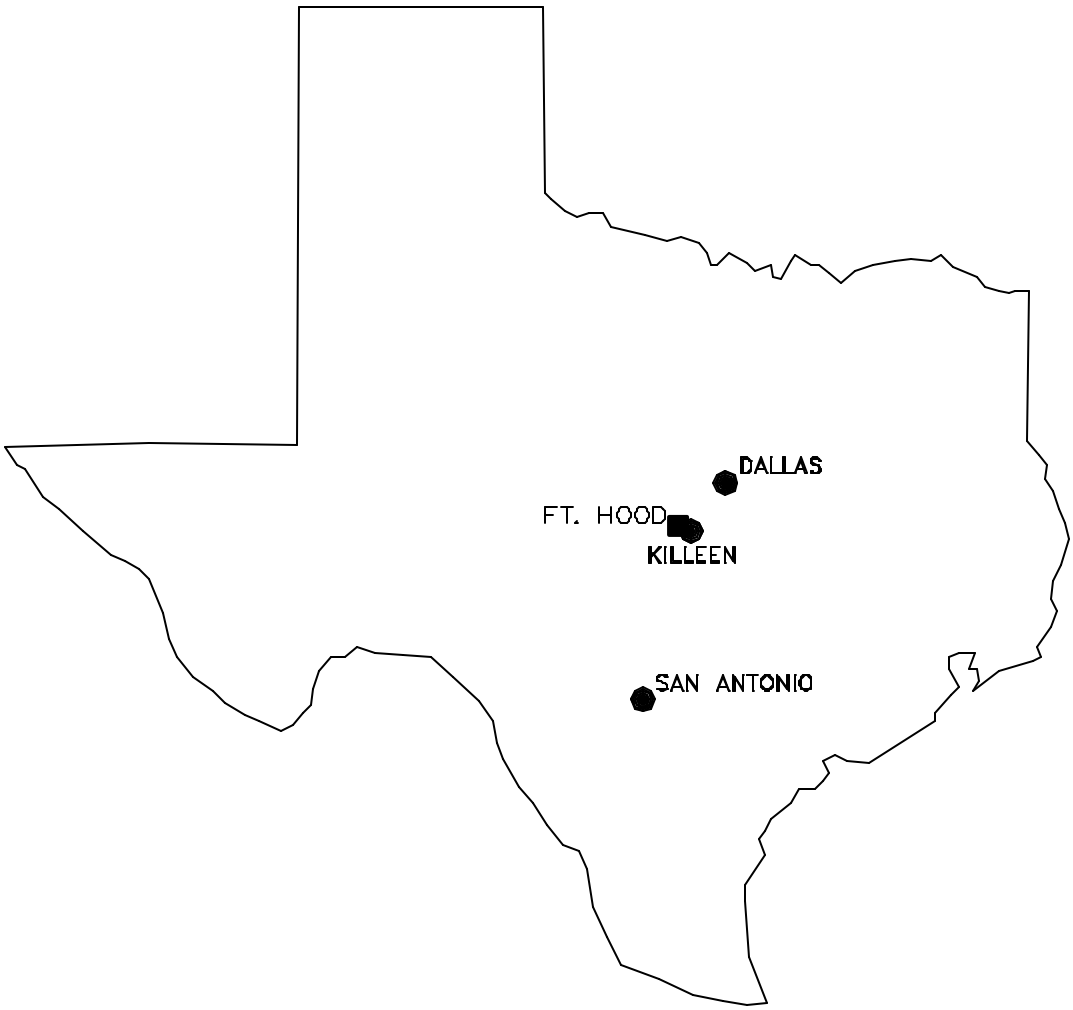
FH-038B is one of four SWMUs adjacent to battery shops. Each battery shop is a free-standing building within a tactical motor pool facility in the main cantonment. Each shop is approximately 30 ft by 30 ft in size, with an underground holding tank located adjacent to the building. According to the RFI Work Plan for 35 SWMUs (USACE 1995), these underground tanks are reported to be made of fiberglass, were installed in 1982 and used until 1992 (CP&Y, Inc.1998), and removed in April and May 1998. The only known material handled in the tank was spent lead-acid battery electrolyte.

1.2 SCOPE AND OBJECTIVES

The objective of the RFI at FH-038B was to determine if a release of spent electrolyte drained to the tank has occurred. This report assesses the nature of soil contamination at the site and evaluates what, if any, corrective measures are needed.

The specific objectives of the investigation of FH-038B were as follows:

- determine presence or absence of contaminants in surface and subsurface soils associated with the tank and piping,



U.S. ARMY
FORT HOOD, TEXAS

RCRA FACILITY INVESTIGATION

FORT HOOD
VICINITY MAP

Science Applications International Corporation — Columbus, Ohio

DRAWN	CHECKED	DATE	SCALE	PROJECT NO.	FIGURE NO.
SC			NO SCALE		1.1

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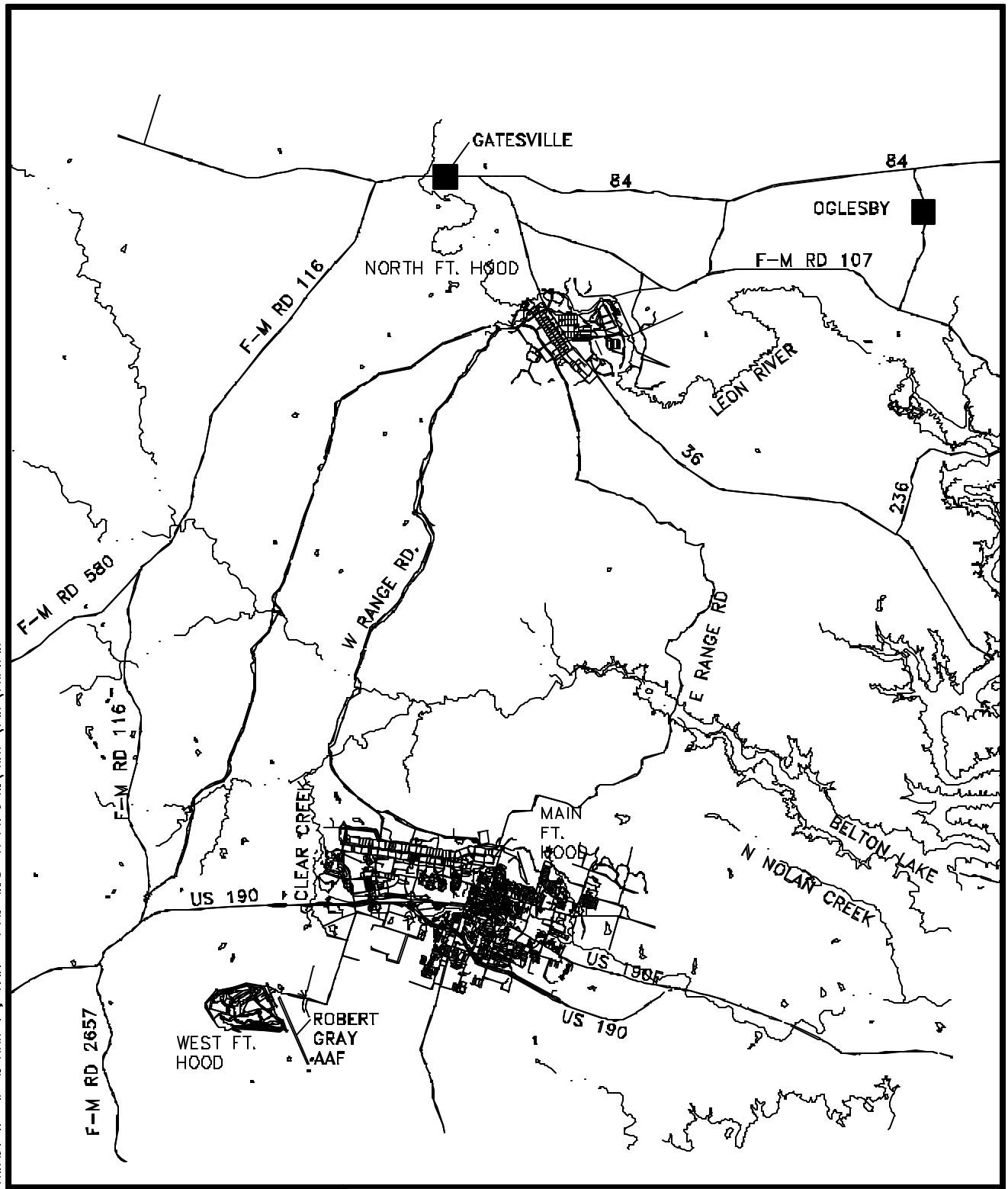

LEGEND

MAJOR ROADS

RIVERS/STREAMS

WATER BODIES

U.S. ARMY
FORT HOOD, TEXAS

RCRA FACILITY INVESTIGATION

FT. HOOD INSTALLATION MAP

Science Applications International Corporation — Columbus, Ohio

DRAWN	CHECKED	DATE	SCALE	PROJECT NO.	FIGURE NO.
			1"=7000M		1.2

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- characterize migration potential of any contaminants identified in the surface and subsurface soils;
- determine if groundwater is present below the former tank pit and if present, determine if the groundwater is contaminated;
- evaluate the potential human health risks associated with contaminants detected in surface and subsurface soils; and
- determine what, if any, corrective measures are needed to address contamination associated with SWMU FH-038B.

RFI investigations included field sampling and laboratory analysis of surface and subsurface soils and water collected from the bottom of the former tankhold pit. The sampling and analysis program was conducted in accordance with the Final RCRA Facility Investigation Work Plan for Fort Hood Site FH-038B (USACE 1995).

2.0 ENVIRONMENTAL SETTING

This section describes the physical characteristics of FH-038B and its surroundings. The geology, physiography, and climate are presented using regional and site-specific data where available.

2.1 PHYSIOGRAPHIC SETTING

Fort Hood is located within the eastern edge of the Lampasas Cut Plains region of the North-Central Plains physiographic province. The topography of Fort Hood consists of small stream valleys separated by ridge-forming mesas. Relief is as great as 340 ft. The Black and Blackwell Mountains are prominent features north of the main cantonment, as are Seven Mile Mountain at West Fort Hood, and the Dalton Mountains southwest of North Fort Hood. A topographic map of the main cantonment of Fort Hood is provided in Figure 2.1.

Local relief of the main cantonment and at West Fort Hood is generally less than 100 ft, with flat to gently rolling topography. Elevations on the main cantonment range from 860 to 940 ft above mean sea level (msl). SWMU FH-038B elevation is approximately 930 ft above msl.

The rivers, streams, and creeks that constitute the main surface water pathways at Fort Hood are shown on Figure 2.1. The main cantonment lies along a watershed divide between Belton Lake and the Leon River, downstream from the lake. The western and north-central parts of the main cantonment are drained by Clear Creek, which discharges to House Creek. House Creek is a tributary to the eastward-flowing Cowhouse Creek, which discharges to Belton Lake, a man-made reservoir. South Nolan Creek and North Nolan Creek both originate on Fort Hood and flow eastward to the Leon River, below Belton Lake.

2.2 GEOLOGIC CONDITIONS

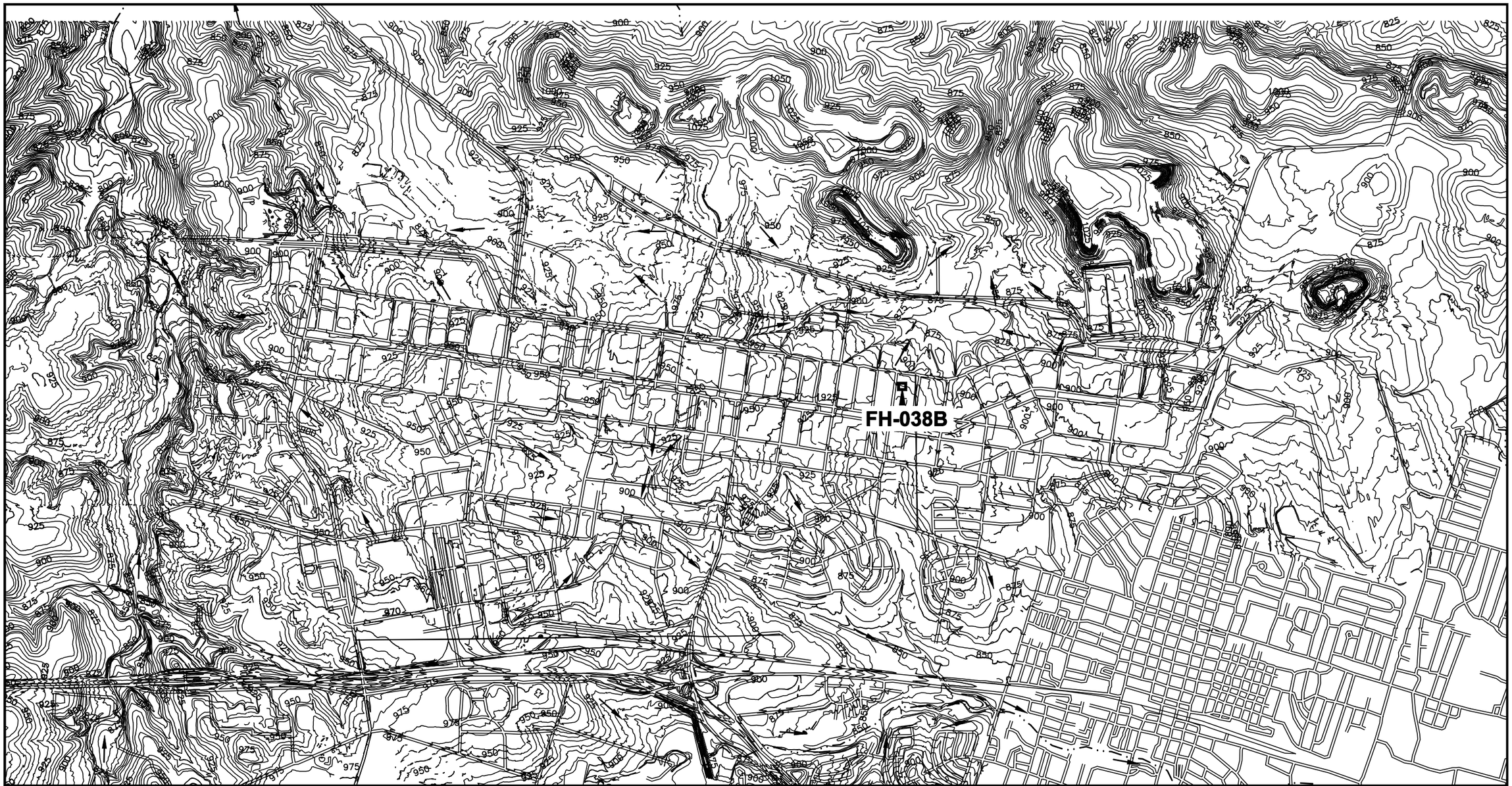
A summary of the geology of the Fort Hood area relevant to this RFI is adapted from the Final RCRA Facility Investigation Work Plan, 35 Solid Waste Management Units, Fort Hood, Texas (USACE 1995). Relevant information on the occurrences of soils and bedrock has been incorporated to further characterize the geology of FH-038B and its surroundings.

2.2.1 Bedrock

Lower Cretaceous marine sedimentary rocks make up the stratigraphy underlying Fort Hood. The Fredericksburg Group consists of several stratigraphic units. The Walnut Formation is the lowermost unit of the Fredericksburg Group and is the dominant stratigraphic unit in the main cantonment. It consists of shales with inter-bedded limestone, chalky nodular limestone, and shell aggregates. The fossiliferous Walnut Formation is exposed in many locations at Fort Hood. It varies in thickness from 100 to 150 ft (BEGM 1979). The Comanche Peak Formation and an undifferentiated unit overlie the Walnut Formation, but are present at the surface only north of the main cantonment in the Black and Blackwell Mountains, and on West Fort Hood on Seven Mile Mountain. Bedrock dips gently to the southeast throughout the area. Inactive faults are present in the subsurface to the east of Fort Hood along the Balcones Fault Zone, which runs through Bell, McLennan, and Hill Counties.

2.2.2 Unconsolidated Materials

Alluvial deposits of Quaternary age are present along stream valleys on the main cantonment, specifically along South Nolan Creek on the southern edge of the cantonment (USACE 1995). It is suspected that much



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N
True North

400 0 400 800
METERS

LEGEND

TOPOGRAPHIC CONTOUR (FT.)
DRAINAGE
SURFACE DRAINAGE FLOW
FH-038B

U.S. ARMY
FORT HOOD, TEXAS

RCRA FACILITY INVESTIGATION

TOPOGRAPHY AND DRAINAGE
OF MAIN CANTONMENT FT. HOOD

SAIC Science Applications International Corporation Columbus, Ohio

DRAWN	CHECKED	DATE	SCALE	PROJECT NO.	FIGURE NO.
BW			AS SHOWN		2.1

alluvium and other natural surface deposits have been reworked during construction projects throughout the active life of Fort Hood.

2.3 CHARACTERIZATION OF SOILS

In many areas of the main cantonment, silty clay or sandy clay soils overlie bedrock. In upland areas, these soils contain abundant rock fragments. In general, these soils have low permeabilities (USDA 1985a,b). They range in thickness from 15 to 20 ft. Because soils have been extensively reworked for construction and landfilling in the SWMUs that were investigated, it is difficult to apply the USDA classification to the soils encountered on the main cantonment.

No previous investigations have been performed at any of the electrolyte tank sites to determine if a release has occurred. However, two soil borings were installed at FH-038B in 1975 by the USACE. One boring was completed at a depth of 23 ft, and the second boring was completed at 14 ft below ground surface (bgs). The boring logs for these holes are provided in the RFI Work Plan for 35 SWMUs (USACE 1995).

2.4 CHARACTERIZATION OF CLIMATE

The climate of the Fort Hood-Killeen area can be characterized as semi-arid continental. Winters (December-March) are mild, with the average daily maximum temperature in January (the coldest month) reaching 60° F. Below-freezing temperatures occur on an average of 23 days per year. The normal daily winter temperature range is 42 to 62° F. At times, strong northerly winds accompanied by sharp drops in temperature occur during the winter months. Summers (June-September) are hot and dry. The average daily maximum temperature in August, the hottest month, reaches 95.9^{o} F. The normal daily temperature range for summer is 75 to 95° F. The average daily temperature in Killeen is 68.1^{o} F.

Average annual rainfall in the Killeen area is 30.4 inches, and is most concentrated from September to May (U.S. Army 1996). Snowfall is rare. The average annual humidity in the region is 55 percent. Total rainfall for 1996 at Fort Hood was 26.7 inches. The ten months prior to the start of the field program for this RFI were anomalously dry. Severe weather in the form of heavy rain, hail storms, and ice storms is common in the winter months.

3.0 UNIT CHARACTERIZATION

FH-038B is in an industrial area of the main cantonment where the ground surface is covered with a thick concrete hardstand. Figure 3.1 shows the location of FH-038B. The only known material handled at this and the other three FH-038 SWMUs was spent lead-acid battery electrolyte. Electrolyte from batteries was poured into a stainless steel sink, diluted with water, and neutralized with sodium bicarbonate (U.S. Army 1992). The pH of the solution was checked with pH paper. When a pH of 7 was achieved, the sink drain was opened, and the mixture was allowed to drain to the underground 300-gallon fiberglass storage tank. Sludge or sediment may also have settled in the bottom of the tank. The tank was constructed with a grated top, allowing access for a final pH test before the effluent was discharged to the sanitary sewer. The tank was contained in a reinforced concrete vault.

The tank removal action took place during May 12, 1998 through May 29, 1998. The physical condition of the fiberglass tank was sound with no evidence of cracks. However, the iron influent and effluent piping entering the tank were deteriorated and had holes. Figure 3.2 shows photographs of the FH-038B area prior to the tank and containment vault removal. The top photograph in Figure 3.2 is facing east and the bottom photograph is facing northeast. The containment-vault's inside dimensions were approximately 6 ft by 8 ft by 7 ft deep with the wall thickness roughly 10 inches thick. The location of the soil borings can be seen in the photographs in Figure 3.2. Photographs of FH-038B, looking down into the tank-hold and taken in May 1998 during the tank and containment vault removal action, are presented in Figure 3.3. No other construction details or historical operational data about the site relevant to the RFI have been discovered. No previous investigations have been performed at any of the electrolyte tank sites to determine if a release has occurred.

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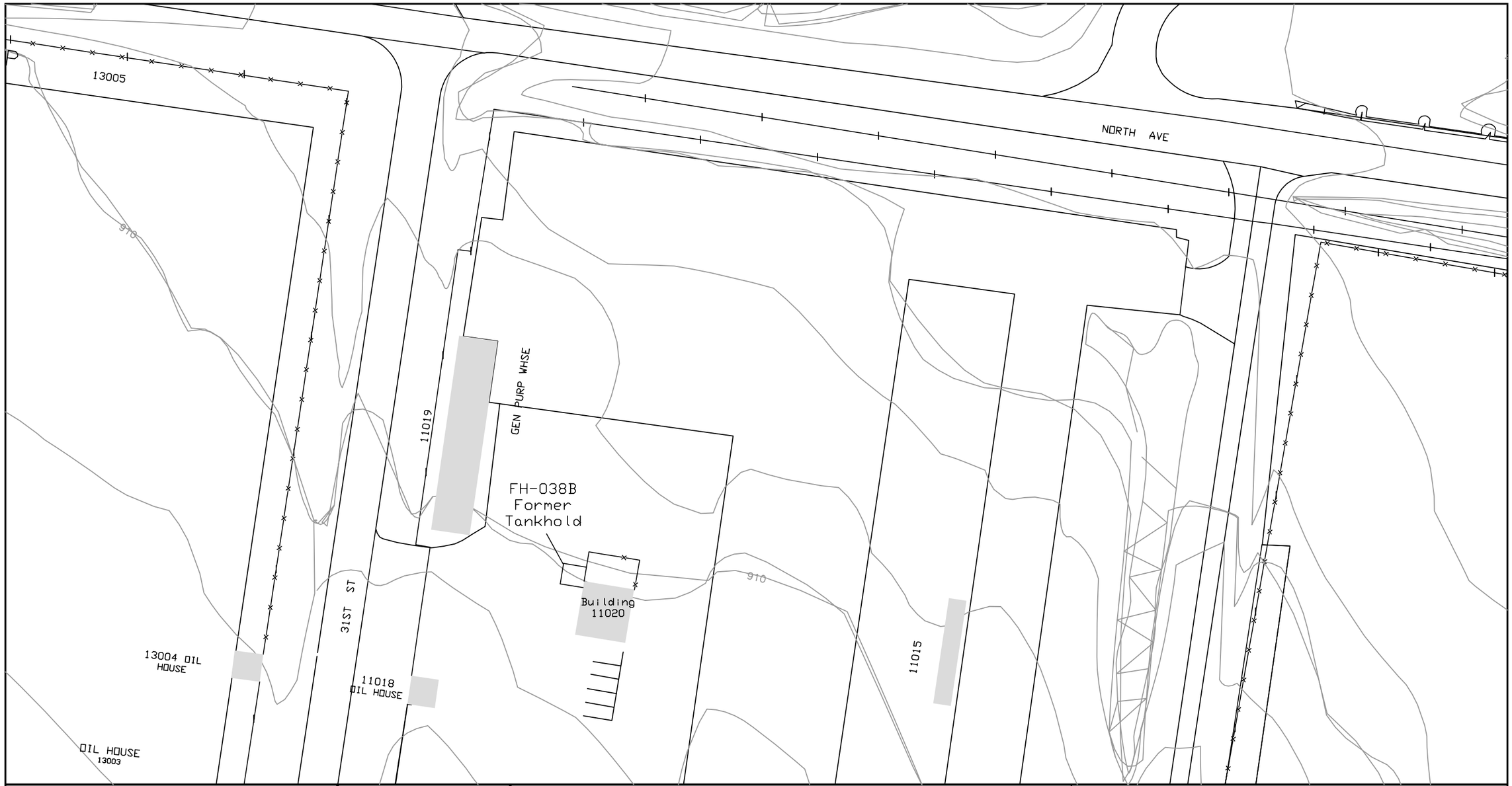

MAIN FT. HOOD LOCATION MAP

N
True North

20 0 10 20
METERS

LEGEND

FENCE

TOPOGRAPHIC CONTOUR (FT.)

U.S. ARMY
FORT HOOD, TEXAS

RCRA FACILITY INVESTIGATION

FH-038B LOCATION MAP

SAIC

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SCALE	FIGURE NO.
AS SHOWN	3.1

Grated top of Tank Vault; facing east.

Grated top of Tank Vault; facing northeast.

Figure 3.2 Photographs of FH-038B Before Tank Vault Removal

Interior of Tank Vault after Tank removed.

Tankhold Pit after Tank and Vault Removed, Facing South.

Figure 3.3 Photographs of FH-38B After Tank Vault Removal

4.0 CHARACTERIZATION OF UNIT CONTAMINATION

The RFI field program was designed to do the following at SWMU FH-038B:

- confirm the presence or absence of contaminants in the soils associated with the tank and its piping;
- determine if groundwater is present below the tank and if present, determine if the groundwater is contaminated;
- characterize the migration potential of the contaminants identified in the soils; and
- obtain information about the local geological conditions at the site.

4.1 TECHNICAL APPROACH

Both surface (0 - 2 ft below the concrete hardstand) and subsurface soils (> 2 ft below the concrete hardstand) were sampled at FH-038B. Contaminant concentrations will vary based on soil depth due to the chemical nature of the contaminant and the method by which the contaminant is deposited in the soil (i.e., spills, leaks and atmospheric deposition). At FH-038B the contaminant of concern is lead which adheres to soil particles and would be transported along with the soil particles. The highest concentrations of lead would be found in the immediate area of the source of contamination (leak or spill from tank or piping) with concentrations decreasing as one moves away from the source. Exposures associated with surface soils (direct contact) will differ from exposure, if any, associated with contaminants in deeper soils. At FH-038B, direct contact with surface soils is not likely because the entire site is covered with concrete.

The initial investigation, which took place in February 1997, included three soil borings (SB105, SB106 and SB107) advanced along the south, west, and north sides of the underground tank at FH-038B, respectively. Soil borings SB-105, SB-106, and SB-107 were advanced 4.4 feet, 4.5 feet, and 0.8 feet from the excavation limits, respectively. These three soil borings were advanced using a hollow stem auger rig (4 1/4 inch, 1D augers) and all samples were collected using a 2 inch split spoon sampler. Down-hole, breathing-zone, and head-space organic vapors were monitored during sampling activities. There was no visual sign of contamination. However, at 2 ft to 3.5 ft bgs a sulfuric acid odor was observed in soil boring SB107. This odor could be from the electrolyte solution in lead batteries, and indicates the potential for a release at this location. The samples were analyzed for lead, the principal material associated with the battery acid tanks. All soil sampling, sample handling, chain-of-custody, and other field activities were conducted in accordance with the RCRA Facility Investigation Work Plan for 35 SWMUs (USACE 1995).

One surface soil sample was collected from each of three borings. Samples were also collected from the subsurface in all three borings: one in SB105, two in SB106, and three in SB107. Because of the presence of the concrete hardstand, 1-2 ft below ground surface (bgs) is regarded as a surface soil sample. SB105 was completed to a total depth of 6 ft bgs where bedrock (limestone layer) and groundwater were encountered. A sample of the groundwater was collected at SB105 and analyzed for lead. SB106 was completed to a total depth of 11 ft bgs in weathered shale. SB107 was advanced to a depth of 16 ft bgs where bedrock (unweathered shale) was found. The boring logs for FH-038B are presented in Appendix A. Analytes detected in soil above the practical quantitation limit (PQL) during the February 1997 investigation are provided in Table 4.1. The absence of groundwater in SB106 and SB107 suggests that the groundwater observed in SB105 is an isolated perched zone, not a continuous aquifer.

Fort Hood had planned to remove the tank at FH-038B from service separate from the RFI. A copy of a section of the removal action report for the FH-038B tank prepared by Anderson Columbia Environmental is included in Appendix B. During May 1998 the 300 gallon fiberglass holding tank and the containment-vault were removed and disposed. After the tank, containment-vault, the bedding and fill material had been

removed, the resulting tankhold pit's dimensions were approximately 15 ft by 15 ft by 8 ft deep. The bedding and fill was not entirely removed and some soil/fill/gravel still remained in place. The tankhold pit filled with approximately 4 feet of water that flowed into the pit from the surrounding soils. It is suspected that water may have been perched and trapped in the space between the concrete and soil, and this perched water eventually infiltrated the tankhold by the following day. After one water sample was collected from the tankhold pit the water was pumped-out so soil could also be sampled. Once pumped out of the tankhold, the water didn't return. Analytes detected in this water above the PQL are listed in Table 4.2. Four confirmatory soil samples were collected from the tankhold pit: two from the bottom of the tankhold pit (two feet from the center of the east and west walls), and two from the side walls (immediately below the inlet and outlet drain pipes). The soil samples were collected by hand method, no boring equipment was needed, and analyzed for lead. As with the soil samples, water was collected and analyzed for lead following the procedures specified in the RCRA Facility Investigation Work Plan for 35 SWMUs (USACE 1995). Analytes detected in soil above the PQL during the electrolyte tank removal are provided in Table 4.3. After confirmatory sample collection the tankhold pit was backfilled to prevent a falling and confined-space hazards and then, re-paved with concrete.

In October 1998 additional soil samples were taken to determine the extent of contamination previously identified by sampling at the site during the tank removal. Five geoprobe soil borings were advanced with continuous sampling attempted every 2 feet from ground surface until refusal except within the former tankhold pit. Two geoprobe soil borings SB124 and SB125 were advanced 3.4 feet from the east and west walls within the former tankhold pit. Within the former tankhold sampling began at approximately 8 feet bgs. Three soil borings were advanced within roughly 1.5 ft of the south, west, and north sides of the former tankhold pit at FH-038B (SB121, SB122, and SB123). Analytes detected in soil above the PQL during the October 1998 investigation are provided in Table 4.4. No groundwater was encountered in any of the borings during the October 1998 sampling event. All soil borings have been closed in accordance with applicable requirements and the Work Plan.

4.2 UNIT INVESTIGATION AND ANALYTICAL RESULTS

Summary analytical results for soils and water at FH-038B are provided in their entirety in Appendix C. Tables 4.1, 4.3, and 4.4 summarizes where lead was detected in soil above practical quantitation limits (PQLs) during the three phases of investigation conducted at FH-038B. Table 4.2 presents the results of the only water sample collected and analyzed at FH-038B. Figure 4.1 shows the locations of the February 1997 and the October 1998 sampling points. Figure 4.2 exhibits the sampling locations for the May 1998 and again the October 1998 sampling events. Samples which contained lead above PQLs were screened against background screening criteria as described in Section 4.3 and Section 5.0. Tables 4.5 and 4.6 show those lead concentrations that were greater than the background screening criteria for soils and water, respectively.

4.2.1 Surface Soil Analytical Results

Because of the presence of concrete hardstand throughout the FH-038B area, 1-2 ft below ground surface (bgs) is regarded as a surface soil sample. Lead was detected above practical quantitation limits (PQL) in all surface soil sample collected at FH-038B at concentrations ranging from 0.87J ppm (SB105) to 13.3J ppm (tankhold pit confirmation sample). None of these values exceeds the 95% UTL background screening value for lead of 19.0 ppm.

4.2.2 Subsurface Soil Analytical Results

Lead was present above PQLs in the every subsurface soil sample collected from the tankhold pit and boring

completed in the vicinity of FH-038B. Concentrations ranged from 1.1 ppm at SB121 (6.0 ft to 6.8 ft) to 4,480J ppm and at a tankhold pit confirmation sample from 8.0 ft to 10.0 ft deep (38SB162). Three subsurface soil samples exceed the 95% UTL background criterion for lead of 19.0 ppm. All three exceedances were

Table 4.1 FH-038B Analytes Detected in Soil Above Practical Quantitation Limits (PQLs) During February 1997 Investigation

Location	Sample ID	Depth	Analysis Type	Parameter	Result		PQL	Units
SB105	38SB136	1.0-2.0	Metals	Lead	0.87	N	0.19	mg/kg
	38SB137	4.0-5.0	Metals	Lead	5.8	N	0.22	mg/kg
SB106	38SB133	1.0-2.0	Metals	Lead	12.6	N	0.25	mg/kg
	38SB134	6.0-7.0	Metals	Lead	6.1	N	0.21	mg/kg
	38SB135	10.0-11.0	Metals	Lead	2.4	N	0.20	mg/kg
SB107	38SB129	1.0-2.0	Metals	Lead	7.5	N	0.24	mg/kg
	38SB130	5.0-6.0	Metals	Lead	2.1	N	0.20	mg/kg
	38SB131	10.0-11.0	Metals	Lead	1.9	N	0.19	mg/kg
	38SB132	15.0-16.0	Metals	Lead	2	N	0.19	mg/kg

N - Spike sample recovery not within control limits.

Table 4.2 FH-038B Analytes Detected in Water Above PQLs During Electrolyte Tank Removal

Location	Sample ID	Depth	Analysis Type	Parameter	Result	PQL	Units
UST	38GW101	--	Metals	Lead	44.3 J	0.0075	mg/l

J - Indicates estimated value

Table 4.3 FH-038B Analytes Detected in Soil Above PQLs During Electrolyte Tank Removal

Location	Sample ID	Depth	Analysis Type	Parameter	Result		PQL	Units
UST	38SB159	2.0-2.5	Metals	Lead	13.3	J	0.18	mg/kg
	38SB160	2.0-2.5	Metals	Lead	1.5	J	0.16	mg/kg
	38SB161	8.0-10.0	Metals	Lead	816	J	0.17	mg/kg
	38SB162	8.0-10.0	Metals	Lead	4480	J	0.18	mg/kg

J - Indicates estimated value

Table 4.4 FH-038B Analytes Detected in Soil Above PQLs During October 1998 Investigation

Location	Sample ID	Depth	Analysis Type	Parameter	Result	PQL	Units
SB121	38SB186	0.0-2.0	Metals	Lead	3.3	0.17	mg/kg
	38SB187	4.0-6.0	Metals	Lead	1.2	0.16	mg/kg
	38SB188	6.0-6.8	Metals	Lead	1.1	0.16	mg/kg
SB122	38SB189	0.0-2.0	Metals	Lead	5.4	0.17	mg/kg
	38SB190	2.0-4.0	Metals	Lead	2.5	0.16	mg/kg
	38SB191	4.0-6.0	Metals	Lead	2.5	0.16	mg/kg
	38SB192	6.0-6.5	Metals	Lead	2.3	0.16	mg/kg
SB123	38SB193	0.0-2.0	Metals	Lead	1.9	0.15	mg/kg
	38SB194	4.0-6.0	Metals	Lead	1.5	0.17	mg/kg
SB124	38SB195	8.0-10.0	Metals	Lead	60.9	0.16	mg/kg
	38SB196	10.0-10.5	Metals	Lead	2.1	0.16	mg/kg
SB125	38SB197	8.0-9.5	Metals	Lead	11.2	0.16	mg/kg

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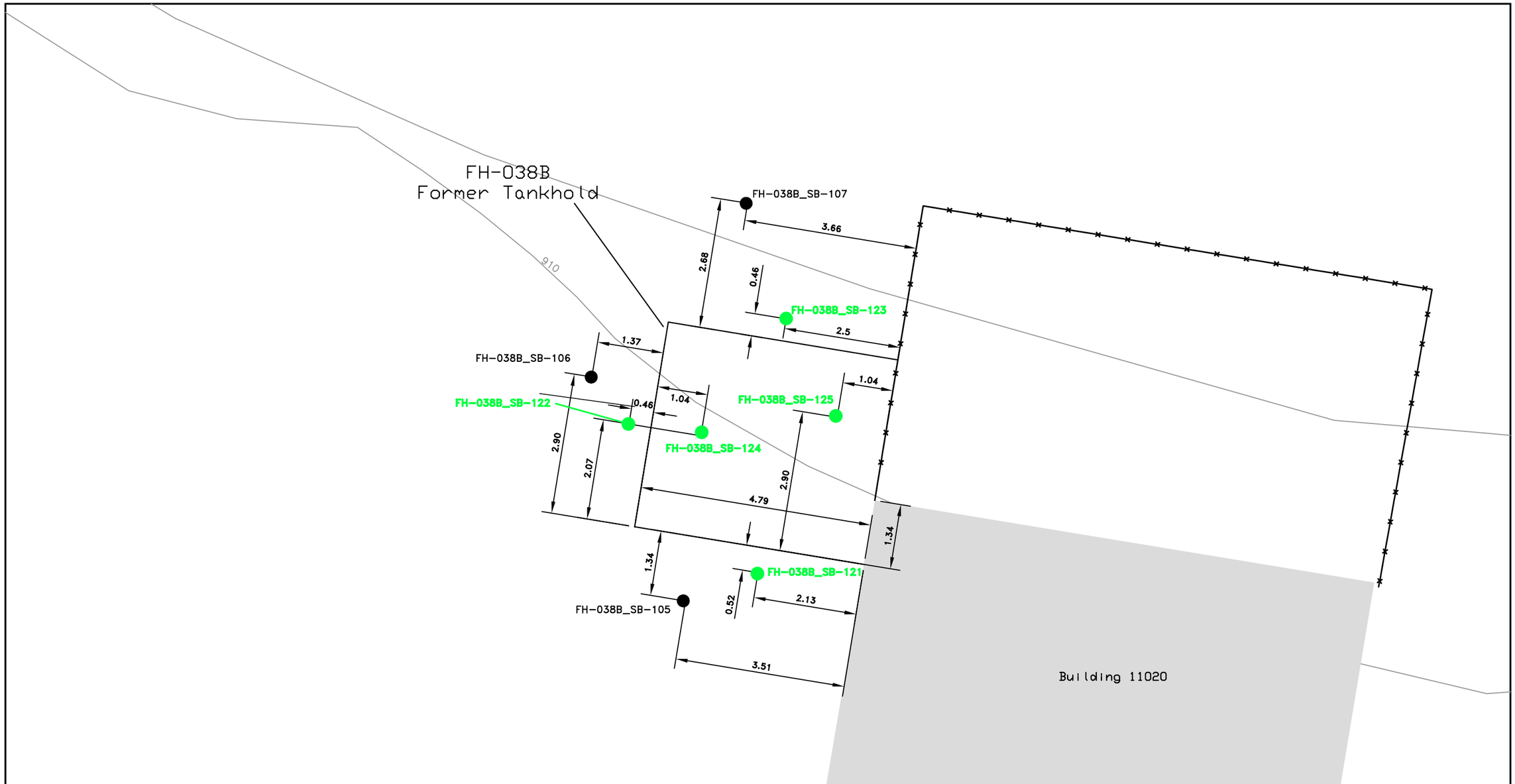


MAIN FT. HOOD LOCATION MAP

N
True North

2 0 1 2
METERS

LEGEND

	FENCE
	TOPOGRAPHIC CONTOUR (FT.)
FH-038B_SB-160	FEB. 1997 SOIL BORING LOCATION
FH-038B_SB-123	OCT. 1998 GEOPROBE LOCATION

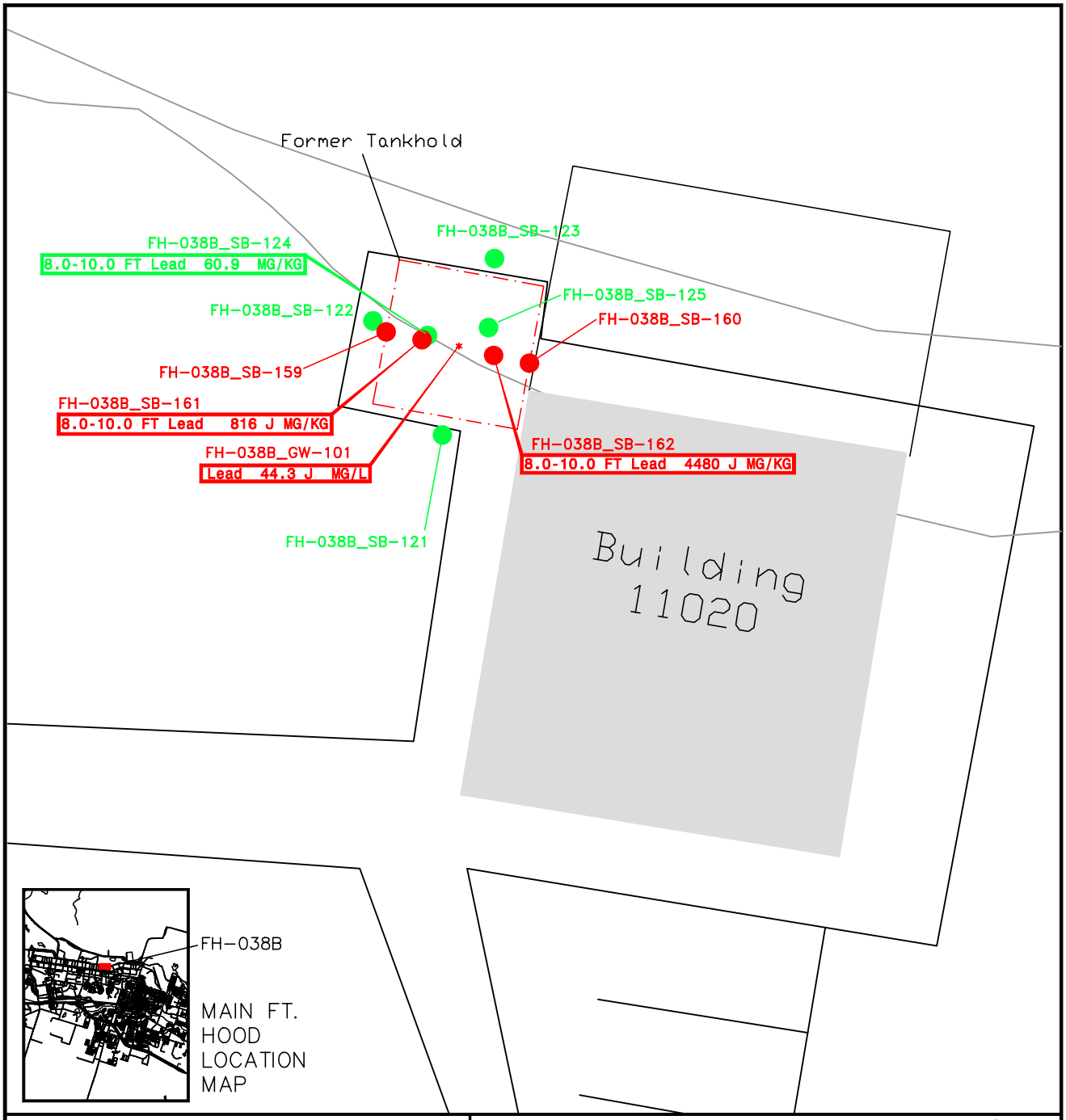
U.S. ARMY
FORT HOOD, TEXAS

RCRA FACILITY INVESTIGATION

FH-038B TANKHOLD, FEBRUARY 1997 SOIL BORING AND OCT. 1998 GEOPROBE LOCATIONS

SAIC Science Applications International Corporation Columbus, Ohio

SCALE	FIGURE NO.
AS SHOWN	4.1



LEGEND

	TOPOGRAPHIC CONTOUR (FT.)
	FORMER TANKHOLD
●	SAMPLING LOCATION
Lead 44.3 MG/L	MAY 1998 CONFIRMATORY SAMPLING
Lead 44.3 MG/L	OCTOBER 1998 SAMPLING
*	WATER SAMPLE COLLECTED FROM BOTTOM OF TANKHOLD PIT

N

2 0 2 4
METERS

U.S. ARMY
FORT HOOD, TEXAS

RCRA FACILITY INVESTIGATION

FH-038B MAY AND OCTOBER 1998 SAMPLING LOCATIONS

SAIC Science Applications International Corporation Columbus, Ohio

DRAWN	CHECKED	DATE	SCALE	PROJECT NO.	FIGURE NO.
			AS SHOWN		4.2

NAME: S:\HOOD\P2\38BSC99B.DWG DATE: MAR 12, 1999 TIME: 12:09 PM PCP: S:\HOOD\PCP\FRP1.PCP

Table 4.5 FH-038B Soil Analytes Above Screening Criteria

Location	Sample ID	Depth	Parameter	Result		Units	Screening Criteria	Screening Concentration	Units
SB124	38SB195	8.0-10.0	Lead	60.9		mg/kg	Soil Background	19	mg/kg
UST	38SB161	8.0-10.0	Lead	816	J	mg/kg	Soil Background	19	mg/kg
	38SB162	8.0-10.0	Lead	4480	J	mg/kg	Soil Background	19	mg/kg

J - Indicates estimated value

Table 4.6 FH-038B Water Analytes Above Screening Criteria

Location	Sample ID	Depth	Parameter	Result		Units	Screening Criteria	Screening Concentration	Units
UST	38GW101	--	Lead	44.3	J	mg/l	30 TAC 335 Groundwater	0.015	mg/l

J - Indicates estimated value

located at a depth of 8.0 ft to 10.0 ft bgs within the tankhold pit. They are SB124 at 60.9 mg/kg, tankhold pit confirmations samples 38SB161 at 816J mg/kg and 38SB162 at 4,480J mg/kg.

4.2.3 Water Analytical Results

One groundwater sample was collected at SB105 during the February 1997 sampling event and one water sample was collected from the FH-038B tankhold pit in May 1998, before it was pumped dry, and analyzed for lead. No lead was detected in the February 1997 sample above the PQL. The water sample collected from the bottom of the tankhold had a lead concentration of 44.3J mg/L which is above the screening criterion of 0.015 mg/L. The water sample collected in May 1998 during the tank removal was brownish and cloudy, suggesting that there were soil particles and fines in the water sample. This may have attributed to the high lead concentration found in the water sample.

4.2.4 Disposition of Investigation Derived Waste (IDW)

All IDW generated during drilling at FH-038B was stored in 55 gallon drums. All drums were clearly identified with Department of Transportation (DOT) - approved labels containing the drum's contents, the date they were filled, and the SWMU where the IDW was generated. IDW from the FH-038 drums were staged in the SAIC compound pending disposition. Analytical results from corresponding soil samples were used to determine whether a drum's contents were hazardous or non-hazardous. Contaminant levels were screened against the Resource Conservation and Recovery Act (RCRA) "20 times" rule for the Toxicity Characteristic Leaching Procedure (TCLP). The "20 times" rule for TCLP means that lead would have to be detected in the corresponded soil samples at concentrations greater than or equal to twenty times the respective leachate concentration listed in 30 TAC Chapter 335, Subchapter R, Appendix 1, Table 1,for the IDW to be considered hazardous. A total of 19 drums of solid IDW and 14 drums of liquid IDW was generated at the four FH-038 areas (FH-038A, FH-038B, FH-038C, and FH-038D). Eighteen drums of solid IDW was determined to be non-hazardous by this method was transported to the Fort Hood Sanitary Landfill for disposal. One drum of solid IDW was determined to be hazardous and was delivered to the Fort Hood Directorate of Public Works Classification Units with the accompanying characterization data. Fourteen drums of liquid IDW were generated from the four FH-038 SWMUs from the decontamination of the geoprobe rig and other sampling equipment. Thirteen drums of liquid IDW was non-hazardous and was disposed of at the 1st Calvary Division Tactical Vehicle Wash Facility. The drums containing the non-hazardous liquid are expected to contain a significant amount of sediment. For this reason, disposal at the 1st Calvary Division Tactical Vehicle Wash Facility was determined to be more appropriate than discharging the liquid to the sanitary sewer system. The Vehicle Wash Facility is a closed loop system consisting of three ponds used to settle out the dirt and sediment washed off the armored vehicles. One liquid IDW drum was determined to by hazardous and was delivered to the Fort Hood Directorate of Public Works Classification Units with the accompanying characterization data.

4.3 BACKGROUND CHARACTERIZATION AND COMPARISONS WITH WASTE UNIT SAMPLING RESULTS

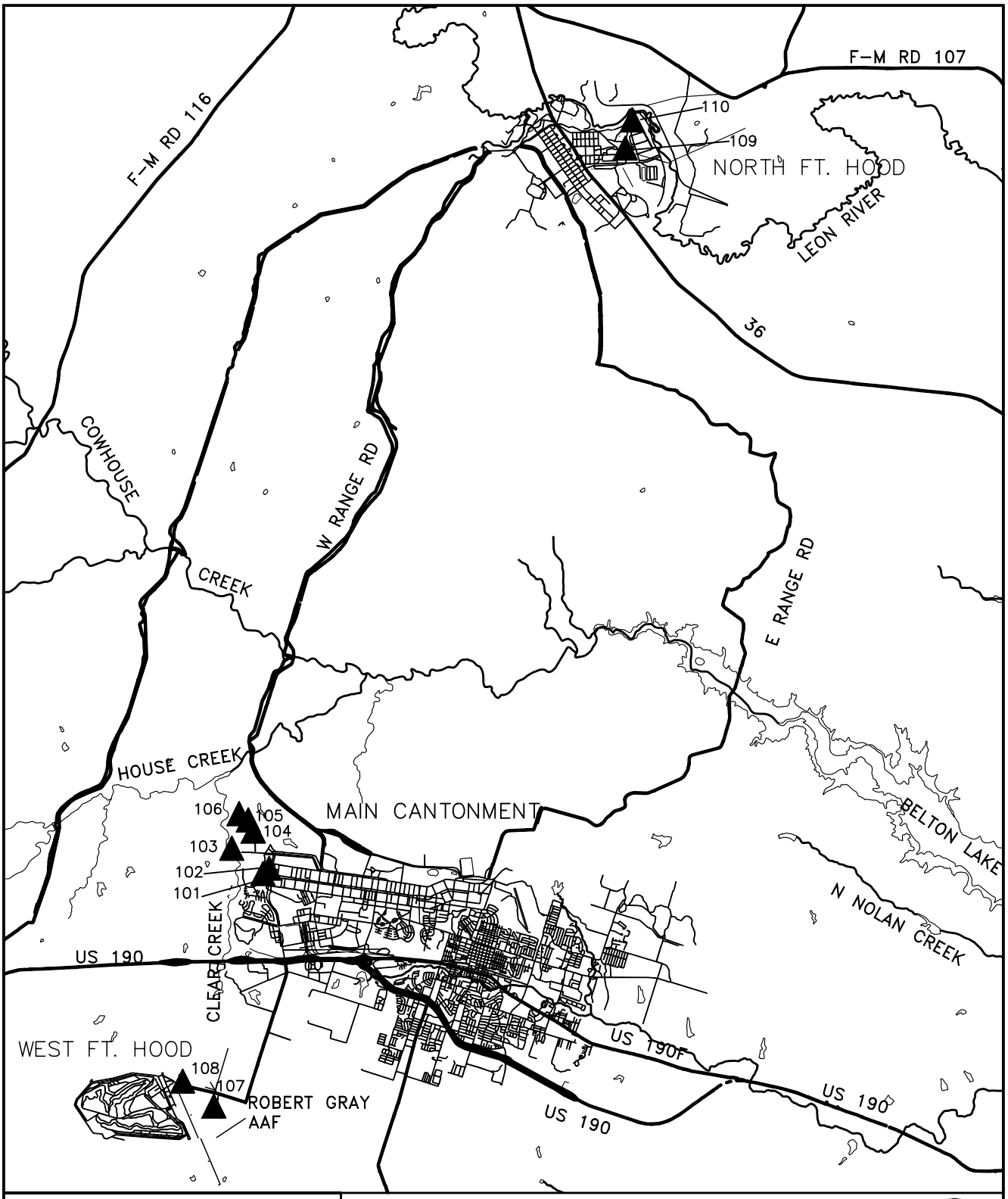
In order to characterize naturally occurring constituents in soils at Fort Hood, background samples were collected at 10 separate locations within the facility boundaries in the north, west, and main cantonments. Sampling locations were selected to be outside the influence of past or current industrial and/or waste activities at the facility. The general background sampling locations are presented in Figure 4.3. Background soils data and soil boring logs are presented in Appendices C and D, respectively.

Background soil samples were analyzed for the following metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Two statistical methods could be used to determine if there is a statistically significant difference between background soil concentrations and the concentrations of lead detected in FH-038B samples. Background statistical calculations were determined based on metal results from the combined data set of surface soil (0 - 2 ft bgs) and subsurface soil (> 2 ft bgs) results with duplicate results excluded from the data sets.

The statistical methods used to evaluate the background soil results are presented in Section 6 of the Final RCRA Facility Investigation Work Plan (USACE 1995). The methods include a 95% upper tolerance limit (UTL) calculation and an overall data set mean background concentration. The primary statistical method for screening data is to compare SWMU data to the respective background 95% UTL values. The 95% UTL is an estimate of the 95th percentile of the population of background concentrations. The UTL is a value such that, with a high degree of confidence, 95% of all concentrations would be less than the UTL value. The result of the 95% UTL calculation for lead in background soils is 19.0 mg/kg (Table 4.5) which was used as the background screening value.

The second statistical method to be used is either a mean comparison using the t-test, or the Wilcoxon Rank Sum Test. The second statistical method to be used is dependent on the distribution of the data set. The t-test is to be used on data sets that have a normal distribution or that can be transformed to a normal distribution. For the FH-038B results from the October 1998 sampling event the data set was not normally distributed and transformed data was not normally distributed. Therefore, according to the Work Plan a nonparametic method, the Wilcoxon Rank Sum Test, is to be used to test the difference in the background versus the FH-038B data when the t-test is not appropriate. The Wilcoxon Rank Sum Test for FH-038B resulted in a Z value of 2.08 versus the critical Z value of a one-tailed test of 1.645. This indicates there is a slight difference between the background lead data and FH-038B lead data.

The flow chart from the RCRA Facility Investigation Work Plan for 35 SWMU's (USACE 1995) used for the statistical evaluations is provided in Appendix F. Spreadsheets of calculations for the 95% UTLs, means, standard deviations, and Shapiro-Wilk test, and the Wilcoxon Rank Sum Test are presented in Appendix F.



LEGEND

- MAJOR ROADS
- RIVERS/STREAMS
- WATER BODIES
- BACKGROUND SOIL SAMPLE LOCATION

U.S. ARMY
FORT HOOD, TEXAS

RCRA FACILITY INVESTIGATION

LOCATIONS OF
BACKGROUND SOIL SAMPLES

SAIC Science Applications International Corporation Columbus, Ohio

DRAWN	CHECKED	DATE	SCALE	PROJECT NO.	FIGURE NO.
SC			1"=5000M		4.2

NAME: S:\HOOD\BACK.DWG DATE: OCT 13, 1999 TIME: 5:22 PM PCP: S:\HOOD\PCP\FRP.PCP

Table 4.7 Statistical Analysis of 95% UTL Concentrations Background Soils

Analyte (units)	Mean	95% UTL	Maximum Detect	Results > Detection Limit	Distribution
Background Soils:					
Lead (mg/kg)	5.77	19.04	33.20	44/44	L

L-distribution most similar to log normal.

5.0 SCREENING ANALYSIS

The Texas Natural Resource Conservation Commission (TNRCC) has promulgated risk reduction standards (30 TAC 335, Subchapter S) for soils and groundwater for residential and industrial land uses. Risk reduction standards (RRSs) Number 1 are defined as 95% UTL background concentrations or analytical practical quantitation limit (PQL) values, whichever are greater. RRSs Number 2 are health-based standards and criteria that are deemed protective of human health or the environment. The TNRCC RRSs have been used to screen the data generated at FH-038B to determine whether or not constituents are present at the site at concentrations that warrant further investigation.

The TNRCC RRS Number 1 was used to determine if there has been a release of hazardous constituents from the site. In order to determine whether there has been a release at FH-038B, soil sample results were compared to the 95% UTL background concentration level for lead. Background soil levels (95% UTL) were determined for lead in November 1996 and the results are presented in Section 4.3. Lead detected above background levels are considered a potential release from the unit. In order to determine whether or not the concentrations of lead detected at FH-038B warrant further action, sample results were screened against the TNRCC RRS Number 2 for lead.

Analytical results that contained lead above TNRCC RRSs Number 1 were further screened using TNRCC RRSs Number 2. The TNRCC RRSs Number 2 for soils are numerical values established by the TNRCC as protective of human health and the environment. Constituents that are present at levels at or below these values are not considered to be a risk to human health. TNRCC has calculated soil RRSs Number 2 based on both residential and industrial land use scenarios. Standards are developed based on two pathways: (1) ingestion of soil and inhalation of particulates and volatiles and, (2) a soil-to-groundwater cross-media protection concentration. TNRCC RRSs Number 2 based on an industrial land use scenario and a soil-to-groundwater cross-media protection concentration were used to screen the lead detects above TNRCC RRSs Number 1 in FH-038B soils. The soil-to-groundwater contamination pathway and associated RRS Number 2 are not applicable at FH-038B. The limited groundwater that was encountered at the site represented water that had been trapped between the containment vault and the native soil, and not true groundwater from a water bearing unit. The industrial scenario is consistent with current and planned use of the site. The site is currently covered by concrete and is used by military personnel as a driveway/parking area for the nearby buildings. Based on this scenario, there is little likelihood for direct contact with soils.

5.1 SHALLOW SOIL SCREENING RESULTS

The results from the shallow soil samples (1 ft to 2 ft bgs) collected in February 1997, prior to tank removal, and in October 1998 indicated that lead was present in shallow soils at concentrations greater than the PQL but not greater than the 95% UTL (TNRCC RRS Number 1) for lead (19.0 ppm). The shallow soils present no risk to human health and the environment.

5.2 SUBSURFACE SOIL SCREENING RESULTS

The results of the subsurface soil sampling collected in February 1997, prior to tank removal, indicated that lead was present at concentrations above PQLs but not greater than the 95% UTL for lead. Subsequent subsurface soil samples were collected during the tank removal in May 1998, and again after the removal action in October 1998. During the removal action lead concentrations (816 J ppm and 4480 J ppm) in

subsurface soils taken from two locations at the bottom of the excavated tankhold (8-10 ft bgs) exceeded the TNRCC RRS Number 1 (95% UTL of 19.0 ppm), identifying a release at the unit. Two samples were also taken at that time in the soil from the tankhold walls and directly below the influent and effluent piping (2-2.5 ft bgs), and had lead concentrations that exceeded the PQL but not TNRCC RRS Number 1.

In the October 1998 sampling event, lead was detected at a concentration that exceeds the TNRCC RRS Number 1value in only one sample. This sample was collected at SB124 at a depth of 8-10.0 ft. and was found to have a lead concentration of 60.9 ppm. This sample was located at the same approximate depth and area as the confirmatory samples collected from the bottom of the tankhold pit. The high concentration found during the confirmatory sampling was not replicated by the October 1998 samples. The variation in concentrations is a result of the difficulty in removing all of the backfill down to native soil during the tank removal because of the close proximity to bedrock. The subsurface soil samples, therefore, were randomly interspersed with remnant contaminated backfill. The sample collected immediately below the interval where the 60.9 ppm concentration of lead was found, was at 10.0 ft to 10.5 ft (refusal) and had a lead concentration of 2.1 ppm; well below the 95% UTL of 19.0 ppm. The remaining subsurface samples collected in October 1998 were collected outside of the former tankhold area to determine extent of possible migration. These samples contained lead at concentrations greater than PQL but less than the background screening criteria (TNRCC RRS Number 1).

The TNRCC RRS Number 2 for lead for the soil/air ingestion and inhalation industrial exposure pathway (SAI-Industrial) is 1000 ppm for the residential exposure the lead value is 500 ppm. The TNRCC RRS Number 2 for lead for the soil/groundwater cross-media (GWP-Industrial) exposure pathway is 3.5 ppm. According to TAC 335 the GWP-industrial value is to be used for comparison to subsurface (> 2 ft bgs) soils. The soil-to-groundwater contamination pathway and associated RRS Number 2 are not applicable at FH-038B. The limited groundwater that was encountered at the site represented water that had been trapped between the containment vault and the native soil, and not true groundwater from a water bearing unit. Additionally, lead is a chemical that does not readily leach, once in place it is bound tightly to soil particles. According to the toxicological profile for lead developed by the Agency for Toxic Substances and Disease Registry (ATSDR), movement of lead from soil particles into underground water is unlikely unless the water is acidic. At FH-038B the pH of spent electrolyte solutions was adjusted to neutral prior to discharge to the tank. For the composite soil samples from the bottom of tankhold pit during tank removal by Anderson Columbia Environmental, the pH was found to range from 8.8 to 11.0. At this pH level any lead present in the soil would not likely be leached from the soil into any underground water. Therefore, the use of the soil-to groundwater TNRCC RRS Number 2 lead clean-up level is not the most appropriate for actual site conditions and potential exposure pathways at FH-038B. The concentration detected in the October 1998 post-tank removal sample was 60.9 ppm which is almost two orders of magnitude less than the proposed industrial clean-up level for direct contact with soils (SAI-Industrial) of 1000 ppm. Based on this discussion, there is no risk to human health or the environment from the soil at this unit.

5.3 WATER SCREENING RESULTS

Groundwater was encountered in one boring SB105 and sampled in February 1997, prior to the removal of the tank at FH-038B. No lead was detected at concentrations greater than the PQL. During the tank removal action in May 1998, water infiltrated the bottom of the tankhold and was sampled. It is suspected that the water was from perched water that had been trapped between the concrete and soil layer. During tank removal the water was no longer dammed against the concrete and then easily infiltrated the tankhold

overnight. After the water was pumped out of the tankhold it did not infiltrate the area again, indicating the perched water was very limited in volume. Results from the analysis of this water sample indicated the presence of lead at a concentration of 44.3 J ppm which exceeded the PQL of 0.0075 ppm and the TNRCC RRSs Number 2, 30 TAC 335 groundwater criteria of 0.015 ppm. No water was encountered in the October 1998 sampling event. Based on these results, there is no risk to human health or the environment from the water at this unit.

6.0 INVESTIGATION ANALYSIS

6.1 DATA QUALITY ASSURANCE/QUALITY CONTROL

The Fort Hood RFI Work Plan, the contract laboratory's Quality Assurance Plan, and USEPA SW-846 or other approved procedures for analytical chemistry and physical testing methods were followed for field and laboratory quality assurance/quality control (QA/QC) of FH-038B samples. Field QC samples included; trip blanks, rinsate blanks, field duplicates, and split samples. All QA and QC samples were collected as replicate samples of the same field sample. The QA and QC samples were collected at a frequency of 10 percent and analyzed along with the associated environmental samples. Laboratory QC procedures as prescribed by each analytical method were followed by the contract laboratory and included, where applicable; gas chromatography/mass spectrometry (GC/MS) tuning, initial and continuing calibrations, method/extraction blanks, laboratory control samples (LCS), surrogate spikes, internal and external standards, duplicates, matrix spikes/matrix spike duplicates (MS/MSDs), inductively coupled plasma (ICP) and atomic absorption (AA) related QC procedures/samples and spiked sample clean-up results.

Quality control analyses were conducted by the contract laboratory as an internal control measure of the accuracy and precision of the data. Quality assurance sample analyses were performed by the Army Corps of Engineers' Southwest District Laboratory as an external control measure of the accuracy and precision of the contract laboratory's results and of sampling procedures. The QA/QC, and corresponding field sample results are reviewed by Army Corps of Engineers quality assurance personnel, who then issues a Corps Quality Assurance Report (CQAR).

According to the CQAR, a total of four sample pairs (primary and QC/QA splits) were collected from FH-038A, FH-038B, FH-038C, and FH-038D. The QA splits were analyzed by the Southwestern Division Laboratory and the results of all four sample pairs agreed within acceptable limits. Additionally, the CQAR presented findings that indicated there was potential for:

- false positives and high bias in the sample results for soil boring field locations numbers SB101 through SB109 (FH-038C and FH-038D) due to method blank contamination;
- low bias in the sample results for soil boring field locations numbers SB129 through SB137 (FH-038B) due to low matrix spike recoveries;
- high variability in the sample results for soil boring locations numbers SB129 through SB148 (FH-038A, FH-038B and FH-038C) due to high variation in matrix duplicate results; and

These findings in the CQAR indicate that caution needs to be applied when interpreting the results due to the above analytical deviations. Based on these findings, no data would be rejected and all data is useable. The only impact that these CQAR findings would have on the data set is that the above samples would be qualified as estimated detects (J or N) or estimated non-detects (UJ) if data validation was conducted on those samples. The split QA/QC sample analyses by the Corp's laboratory indicated agreement in lead results in three of the four QA samples received with the associated primary sample results. This does not impact the usability of the data because the QC sample results agreed with the primary samples according to the guidelines for replication.

It should be noted that replication of a concentration of a constituent in soil samples is difficult due to the heterogeneity of soils. Analyses are considered good and reproducible for soil samples if the highest concentration reported in a set of samples for a single field sample is less than five times the lowest

concentration reported in the same set of samples. This holds true as long as all other quality control measures and data quality objectives (e.g. holding times, surrogate recoveries, internal standards, etc) are met. A review of the data results for the primary and QC split samples indicate the replicate soil sample results are considered good and reproducible for this site based on the criteria cited above.

Data QA/QC procedures also included an independent data validation of 10 percent of the results for compliance of analyses to data quality objectives. All results for FH-038B data that were reviewed as a function of the data validation task met project data quality objectives, and are useable data. No other problems with the data were encountered that would have resulted in rejection of the data.

6.2 INVESTIGATION RESULTS

The quality of the data set for surface and subsurface soils at FH-038B are useable for the objectives of the RFI as described in Section 4.0 of this report. During the course of the RFI at FH-038B a total of 25 soil samples (6 surface, 19 subsurface) and two water sample were collected from eight soil boring locations and the tankhold pit and analyzed according to the Final RCRA Facility Investigation Work Plan for 35 SWMUs (USACE 1995). The number and location of the samples were adequate to provide information regarding the presence or absence of lead contamination.

The initial sampling event conducted during February 1997 involved the sampling of soils from three soil borings (SB105, SB106, SB107) surrounding the tank's location and the sampling of groundwater encountered at SB105. Analysis of the samples indicated that lead was present in all 9 soil samples (3 surface, 6 subsurface) but was present at concentrations below the 95% UTL background screening value for lead of 19.0 ppm. These initial results of soil analysis indicated that lead is present in surface and subsurface soils at concentrations consistent with naturally occurring background values and no release was detected in the area of FH-038B. Lead was not detected in the groundwater sample from SB105 above the PQL.

The confirmatory samples collected in May 1998, after the tank and containment-vault were removed, indicated that lead was present above the 95% UTL background screening value in soil remaining in the bottom of the tankhold pit and in water that had pooled in the pit. The soil remaining at the bottom of the tankhold was a combination of native soil and a small amount of backfill material that had surrounded the tank. The confirmatory samples from the base of the tankhold pit were collected at a depth of 8.0 ft to 10.0 ft bgs: samples 38SB161 at 816J mg/kg and 38SB162 at 4480J mg/kg. One water sample was collected from the FH-038B tankhold pit before the pit was pumped dry. The water sample had a lead concentration of 44.3J mg/L which is above the screening criterion of 0.015 mg/L. The water sample collected in May 1998 during the tank removal was brownish and cloudy, suggesting that there were soil particles and fines in the water sample. This may have attributed to the high lead concentration found in the water sample. The pooled water was pumped-out and water did not infiltrate back into the bottom of the tankhold. The tankhold pit was then backfilled. After the backfill material had settled the area was paved in concrete to match the surrounding area.

Due to the lead concentrations detected in the confirmatory samples, additional soil samples were taken during October 1998 to determine the possible extent of contamination in the FH-038B area. Five soil borings were advanced with a geoprobe and used to collect 12 samples (3 surface, 9 subsurface). Three soil borings were advanced within roughly 1.5 ft of the south, west, and north sides of the former tankhold at FH-038B (SB121, SB122, and SB123). Soil borings SB124 and SB125 were located within the former tankhold. The only sample to exceed the 95% UTL background screening value was the sample from SB124 (60.9 mg/kg) at

a depth of 8.0 ft to 10.0 ft within the tankhold pit. The other sample collected within the former tankhold (SB125) and the deeper sample from SB124 (10.0 ft to 10.5 ft bgs) were below the 95% UTL background screening value. The samples from SB121, SB122, and SB123 were also below the 95% UTL background screening value. No water was encountered during this investigation.

Confirmatory sample results collected during May 1998 indicate that a release of lead contamination was identified during the tank and containment-vault removal process. Subsequent sampling results indicate that lead contamination is confined to soil in the bottom of the tankhold pit. Additional soil samples collected in October 1998 confirm the assertion that lead contamination remains in the soil in the bottom of the former tankhold pit. No groundwater was encountered during this third sampling event. A conservative estimate of the amount of contaminated soil in place at the bottom of the tank hold is an area approximately half of the size of the tankhold pit and two feet deep (15.7 ft by 7.0 ft by 2.0ft-- roughly 220 cubic feet or 8.1 cubic yards).

7.0 CONCLUSIONS AND RECOMMENDATIONS

Analytical results of the soil investigation at FH-038B indicate that lead is present in soils at concentrations above the corresponding background concentrations. However the only location where lead is present above the 95% UTL background screening value is in the bottom of the former tankhold pit approximately 8-10 ft bgs. Based on the RFI results, a release was identified during the May 1998 removal of the tank and associated containment-vault. Several facts verify the supposition that the remaining lead contamination is only in the soils in the bottom of the former tankhold pit and is immobile:

- The only lead contamination detected at FH-038 above the 95% UTL background screening value was found at the bottom of the tankhold pit after the tank and containment-vault were removed.
- Confirmatory samples collected on the side walls of the tankhold pit below the inlet and outlet drain pipes showed no lead above the 95% UTL background screening value.
- All the samples collected outside of the tankhold pit, both before and after tank removal, have had concentrations of lead below the 95% UTL background screening value.
- All the surface soil samples collected in the vicinity of FH038B, before, during and after tank removal, have had concentrations of lead below the 95% UTL background screening value.
- Bedrock was encountered at a depth of 8 to 10.5 ft bgs and the land surface is covered with concrete.
- During the October 1998 investigation the only sample to exceed the 95% UTL background screening value was the sample from SB124 (60.9 mg/kg) at a depth of 8.0 to 10.0 ft within the tankhold pit. The deeper sample from the same boring collected at 10.0 ft to 10.5 ft bgs contained lead at (2.1 mg/kg) a concentration well below the 95% UTL background screening value (19 mg/kg).
- A conservative approximate volume of lead contaminated soil left in-place is 8.1 cubic yards.
- The predominant silty clay lithology surrounding the tankhold pit will inhibit the mobility of any dissolved or suspended lead contamination should it reach groundwater.
- The presence of groundwater with a lead concentration less than PQL was noted in just one of eight soil borings (SB105) completed in the vicinity of FH038B, suggesting that the groundwater observed is an isolated perched zone, not a continuous aquifer.
- Once the water that entered the tankhold pit after the tank vault removal was pumped out, it did not recharge; further suggesting that the perched water was limited in volume.

Although surface soils in the vicinity of FH038B comply with the TNRCC RRS Number 1 for lead, subsurface soils do not. The TNRCC RRS Number 2 for subsurface soils based on the soil-to-groundwater (GWP-Industrial) cross media value (3.5 ppm) was exceeded. This RRS Number 2 value is almost two orders of magnitude less than the soil/air RRS Number 2 value of 1000 ppm for an industrial setting. The soil-to-groundwater contamination pathway and associated RRS Number 2 are not applicable at FH-038B. The limited groundwater that was encountered at the site represented water that had been trapped between the containment vault and the native soil, and not true groundwater from a water bearing unit. Additionally, the impacted subsurface soils are located 8 to 10.0 ft bgs and are covered with concrete. The potential for risk due to exposure to lead in subsurface soil at FH038B is very low. Based on professional judgement the remaining lead in the soil poses no risk to human health and the environment.

FH038B is located in an area of predominantly silty clay lithology which will inhibit the mobility of any dissolved or suspended lead contamination in groundwater. Also, since groundwater was noted in just one of eight soil borings completed in the vicinity, the groundwater that was observed is believed to be an isolated

perched zone, not a continuous aquifer. Therefore, the potential for migration of lead identified in subsurface soils is also quite low.

Based upon these findings, it is recommended that FH-038B be closed under TNRCC RRSs Number 2, and no further action (no corrective measures) are needed to address the contamination associated with SWMU FH-038B. Certification of Remediation documentation in accordance to 30 TAC Section 335.560(b) relating to Post Closure Care and Deed Certification will be submitted as an addendum to this report once the TNRCC has approved this report.

8.0 REFERENCES

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APPENDIX A

FH-038B Soil Boring Logs

RCRA
Facilities
Investigation
Fort Hood, Texas

U. S. Army Corp of Engineers
Fort Worth District
Fort Worth, Texas

Boring FH038-SB105

(Page 1 of 1)

SWMU FH038B	: Electrolyte Holding Tanks
Start Date	: 02/14/97
End Date	: 02/14/97
Northing Coord.	: 3445980.75 m
Easting Coord.	: 619050.00 m UTM 14 North
Total Depth of Boring	: 6.0 feet

Drilling Company	: Terra-Mar
Driller	: Bill Christopher
Designation of Drill	: Mobile Drill B-59
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Jeff DeVaughn
Depth to Bedrock	: Not Encountered
Depth Drilled Into Rock	: NA
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. 910.97ft	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0					Concrete.	
1	910	GC			Clayey GRAVEL, poorly sorted; damp; soft; loose; non-plastic; 7.5YR6/6 reddish yellow.	Samples 38SB136, duplicate, split sample, and MS/MSD collected 1.0-2.0' bgs.
2	909				Same as above; damp; mottled with 2.5Y3/1 very dark gray silty clay 2.0-2.5' bgs.	
3	908	CL			Silty CLAY; weathered limestone fragments; wet; moderately plastic; 2.5Y7/2 light gray.	Acrid odor.
4	907				Same as above; damp.	Sample 38SB137 collected 4.0-5.0' bgs.
5	906	CL		▼	Silty CLAY; weathered limestone fragments; soft; highly plastic; mottled 2.5Y6/8 olive yellow and 2.5Y6/2 light brownish gray.	
					Same as above; wet.	Water in hole.
6	905				Bottom of Boring @ 6.0' bgs. Limestone layer.	
7	904					
8	903					
9	902					Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
10	901					

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Fort Worth District
Fort Worth, Texas

Boring FH038-SB106

(Page 1 of 1)

SWMU FH038B	: Electrolyte Holding Tanks
Start Date	: 02/14/97
End Date	: 02/14/97
Northing Coord.	: 3445984.83 m
Easting Coord.	: 619047.92 m UTM 14 North
Total Depth of Boring	: 11.0 feet

Drilling Company	: Terra-Mar
Driller	: Ken Stanford
Designation of Drill	: Mobile Drill B-61
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Mike Woodlee
Depth to Bedrock	: Not Encountered
Depth Drilled Into Rock	: NA
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. 910.97ft	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0					Concrete Paving.	Sample 38SB133 collected 1.0-2.0' bgs.
1	910	CL			Sandy CLAY; moist; 2.5Y7/8 yellow.	
2	909	CL			Sandy CLAY; moist; 5Y2.5/1 black.	
3	908					Description from CME Sampler 2.0-4.0' bgs.
4	907	CL			Sandy CLAY; with coarse sand and rounded rock; moist; plastic; 2.5Y6/4 light yellowish brown.	
5	906				Same as above.	
6	905	CL			CLAY; moist; firm; 2.5Y6/8 olive yellow mottled with 5Y6/3 pale olive.	Sample 38SB134 collected 6.0-7.0' bgs.
7	904				Same as above.	
8	903					Description from CME Sampler 7.0-8.5' bgs.
		LS			LIMESTONE, weathered; 2.5Y8/2 pale yellow.	
9	902	CL			CLAY; 40% oyster; hard; 2.5Y7/6 yellow.	
10	901	SH			SHALE, fine; with oyster; very dry; 5Y3/1 very dark gray.	Sample 38SB135 collected 10.0-11.0' bgs.
11	900				Bottom of Boring @ 11.0' bgs.	
12	899					
13	898					
14	897					Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
15	896					

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Fort Worth District
Fort Worth, Texas

Boring FH038-SB107

(Page 1 of 1)

SWMU FH038B	: Electrolyte Holding Tanks
Start Date	: 02/14/97
End Date	: 02/14/97
Northing Coord.	: 3445988.89 m
Easting Coord.	: 619051.02 m UTM 14 North
Total Depth of Boring	: 16.0 feet

Drilling Company	: Terra-Mar
Driller	: Ken Stanford
Designation of Drill	: Mobile Drill B-61
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Mike Woodlee
Depth to Bedrock	: Not Encountered
Depth Drilled Into Rock	: NA
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. 910.44ft	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	910				Concrete Paving.	
1	909	CL			Crushed Limestone base over CLAY; 5Y2.5/1 black.	Sample 38SB129 collected 1.0-2.0' bgs.
2	908	CL			CLAY; with limestone nodules; moist; plastic; odor of sulfuric acid; 5Y2.5/1 black.	Odor of sulfuric acid.
3	907					Description from CME Sampler 2.0-5.0' bgs.
4	906	CL			CLAY; 15% 1/2" limestone nodules, subangular; moist; plastic; 5Y5/2 olive gray.	
5	905				Same as above.	Samples 38SB130, duplicate and split sample collected 5.0-6.0' bgs.
6	904					
7	903				Same as above.	
8	902					Description from CME Sampler 6.0-10.0' bgs.
9	901	CL			CLAY; with 40% marine fossil hash; dry; 5Y6/4 pale olive.	
10	900	SH			SHALE, fine; with oyster 3/4" to 1" size; 5Y3/1 very dark gray.	Sample 38SB131 collected 10.0-11.0' bgs.
11	899	SH			SHALE, fine; harder with depth; 5Y5/1 gray.	
12	898					
13	897					Description from CME Sampler 11.0-15.0' bgs.
14	896					
15	895				Same as above.	Sample 38SB132 collected 15.0-16.0' bgs.
16	894				Bottom of Boring @ 16.0' bgs.	
17	893					
18	892					
19	891					Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
20						

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Boring FH038-SB121

(Page 1 of 1)

SWMU FH038B	: Electrolyte Holding Tanks
Start Date	: 10/29/98
End Date	: 10/29/98
Northing Coord.	: Not
Easting Coord.	: Surveyed
Total Depth of Boring	: 6.75 feet

Drilling Company	: SAIC
Driller	: John Haselhoff
Designation of Drill	: Geoprobe 5400
Type of Drill Rig	: Direct Push Technology
Geologist	: Pete Ferron
Depth to Bedrock	: Not Encountered
Depth Drilled Into Rock	: NA
Borehole Diameter	: 2 inches
Sampling Equipment	: 2" Core Barrel 4' Long

Depth in feet	Surf. Elev. NS	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	0				Concrete.	
1	-1	GC			Clayey GRAVEL, poorly sorted; damp; soft; loose; 7.5YR6/6 reddish yellow.	Sample 38SB186 collected 0.0-2.0' bgs.
2	-2	CL			Silty CLAY; weathered limestone; 2.5Y7/2 light gray.	
3	-3	NR			No recovery.	
4	-4	CL			Same as above.	
5	-5					Sample 38SB187 collected 4.0-6.0' bgs.
6	-6	CL			Silty CLAY; weathered limestone fragments; soft; plastic; mottled 2.5Y6/8 olive yellow and 2.5Y6/2 light brownish gray.	Sample 38SB188 collected 6.0-6.8' bgs.
7	-7				Bottom of Boring @ 6.75' bgs. Refusal.	
8	-8					
9	-9					
10	-10					
11	-11					
12	-12					
13	-13					
14	-14					Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
15						

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Boring FH038-SB122

SWMU FH038B	: Electrolyte Holding Tanks
Start Date	: 10/29/98
End Date	: 10/29/98
Northing Coord.	: Not
Easting Coord.	: Surveyed
Total Depth of Boring	: 6.5 feet

Drilling Company	: SAIC
Driller	: John Haselhoff
Designation of Drill	: Geoprobe 5400
Type of Drill Rig	: Direct Push Technology
Geologist	: Pete Ferron
Depth to Bedrock	: Not Encountered
Depth Drilled Into Rock	: NA
Borehole Diameter	: 2 inches
Sampling Equipment	: 2" Core Barrel 4' Long

Depth in feet	Surf. Elev. NS	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	0				Concrete.	
1	-1	GC			Clayey GRAVEL, poorly sorted; soft; loose; non-plastic; 7.5YR6/6 reddish yellow.	Sample 38SB189 collected 0.0-2.0' bgs.
2	-2					
		CL			Sandy CLAY; 5Y2.5/1 black.	
3	-3					Sample 38SB190 collected 2.0-4.0' bgs.
		CL			Sandy CLAY; coarse rock; 2.5Y6/4 light yellowish brown.	
4	-4					
5	-5				Same as above.	Sample 38SB191 collected 4.0-6.0' bgs.
		CL			CLAY; mottled 2.5Y6/8 olive yellow and 2.5Y6/3 light yellowish brown.	
6	-6					Sample 38SB192 collected 6.0-6.5' bgs.
					Bottom of Boring @ 6.5' bgs. Refusal.	
7	-7					
8	-8					
9	-9					
10	-10					
11	-11					
12	-12					
13	-13					
14	-14					Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
15						

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Boring FH038-SB123

SWMU FH038B	: Electrolyte Holding Tanks
Start Date	: 10/29/98
End Date	: 10/29/98
Northing Coord.	: Not
Easting Coord.	: Surveyed
Total Depth of Boring	: 6.2 feet

Drilling Company	: SAIC
Driller	: John Haselhoff
Designation of Drill	: Geoprobe 5400
Type of Drill Rig	: Direct Push Technology
Geologist	: Pete Ferron
Depth to Bedrock	: Not Encountered
Depth Drilled Into Rock	: NA
Borehole Diameter	: 2 inches
Sampling Equipment	: 2" Core Barrel 4' Long

Depth in feet	Surf. Elev. NS	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	0				Concrete.	
1	-1	GC			Clayey GRAVEL, poorly sorted; soft; loose; non-plastic; 7.5YR6/6 reddish yellow.	Sample 38SB193 collected 0.0-2.0' bgs.
		CL			Silty CLAY; 2.5Y7/2 light gray.	
2	-2	NR			No recovery.	
3	-3					
4	-4	CL			Silty CLAY; weathered limestone fragments; plastic; mottled 2.5Y6/8 olive yellow and 2.5Y6/2 light brownish gray.	
5	-5					Sample 38SB194 collected 4.0-6.0' bgs.
6	-6				Bottom of Boring @ 6.2' bgs. Refusal.	
7	-7					
8	-8					
9	-9					
10	-10					
11	-11					
12	-12					
13	-13					
14	-14					Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
15						

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Boring FH038-SB124

(Page 1 of 1)

SWMU FH038B	: Electrolyte Holding Tanks
Start Date	: 10/29/98
End Date	: 10/29/98
Northing Coord.	: Not
Easting Coord.	: Surveyed
Total Depth of Boring	: 10.5 feet

Drilling Company	: SAIC
Driller	: John Haselhoff
Designation of Drill	: Geoprobe 5400
Type of Drill Rig	: Direct Push Technology
Geologist	: Pete Ferron
Depth to Bedrock	: Not Encountered
Depth Drilled Into Rock	: NA
Borehole Diameter	: 2 inches
Sampling Equipment	: 2" Core Barrel 4' Long

Depth in feet	Surf. Elev. NS	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	0				Concrete.	
1	-1	FL			FILL.	
2	-2					
3	-3					
4	-4					
5	-5					
6	-6					
7	-7					
8	-8	CL			CLAY; moist; 2.5Y6/8 olive yellow mottled with 5Y6/3 pale olive.	
9	-9					Sample 38SB195 collected 8.0-10.0' bgs.
10	-10					Sample 38SB196 collected 10.0-10.5' bgs.
		SH			SHALE; with oysters; very dry; 5Y3/1 olive.	
11	-11				Bottom of Boring @ 10.5' bgs. Refusal.	
12	-12					
13	-13					
14	-14					
15						Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.

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Boring FH038-SB125

(Page 1 of 1)

SWMU FH038B	: Electrolyte Holding Tanks
Start Date	: 10/29/98
End Date	: 10/29/98
Northing Coord.	: Not
Easting Coord.	: Surveyed
Total Depth of Boring	: 9.5 feet

Drilling Company	: SAIC
Driller	: John Haselhoff
Designation of Drill	: Geoprobe 5400
Type of Drill Rig	: Direct Push Technology
Geologist	: Pete Ferron
Depth to Bedrock	: Not Encountered
Depth Drilled Into Rock	: NA
Borehole Diameter	: 2 inches
Sampling Equipment	: 2" Core Barrel 4' Long

Depth in feet	Surf. Elev. NS	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	0				Concrete.	
1	-1	FL			FILL.	
2	-2					
3	-3					
4	-4					
5	-5					
6	-6					
7	-7					
8	-8	CL			CLAY matrix with oysters; hard; 2.5Y7/6 yellow.	Sample 38SB197 collected 8.0-9.5' bgs.
9	-9					
10	-10				Bottom of Boring @ 9.5' bgs. Refusal.	
11	-11					
12	-12					
13	-13					
14	-14					Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
15						

APPENDIX B

TANK REMOVAL REPORT

FIELD REPORT
for
Fort Hood Military Installation
Fort Hood, Texas

COPY

DELIVERY ORDER NO. 0001

Contract Number DACW63-98-D-004

Prepared by:

ANDERSON COLUMBIA ENVIRONMENTAL, INC.
P. O. Box 1386
Lake City, Fl. 32056
(904) 755-1196

UNITED STATES ARMY CORPS OF ENGINEERS
Fort Worth District

Facility 11020

Summary

The scope of work at this facility included the removal of one (1) 300-gallon fiberglass lead acid battery neutralization tank and associated concrete vault. Also included was the installation of a dual direction cleanout in the drain line to the sanitary sewer.

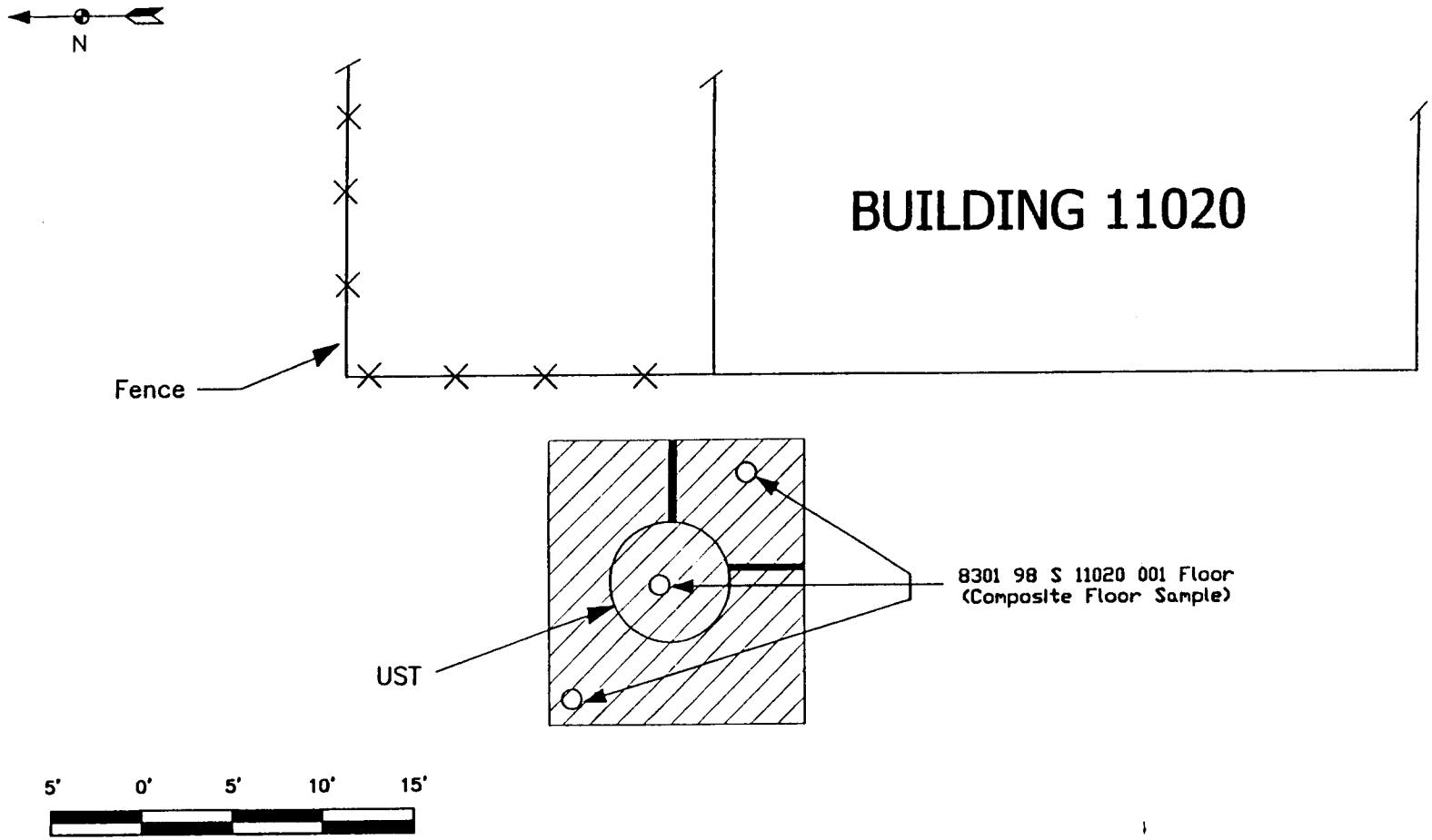
Chronology

May 12, 1998	The tank and vault contents were sampled.
May 13, 1998	The tank contents were removed and drummed
May 14, 1998	The tank was cleaned and removed. Rinsate was contained with the tank contents.
May 19, 1998	Demolition of the vault was begun.
May 21, 1998	Demolition of the vault was completed. Soil samples were collected
May 29, 1998	The excavation was backfilled up to the level of the pipe run.
June 1, 1998	A cleanout was installed in the sewer drain line, and the caution signs were removed.

Site Characterization and Field Investigation

Description of Facility

The tank/vault structure was located on the west side of building 11020 at the Fort Hood Military installation. The structure consisted of a 300-gallon fiberglass cylindrical tank contained within a concrete vault with a steel cover. The tank was used as a sediment trap for the lead acid neutralization waste lines that were connected to the Fort Hood sewer system.



Legend

- Excavation Limits
- O Composite Soil Sub-Samples
- 1E Sample ID
- Drain Line

ANDERSON COLUMBIA ENVIRONMENTAL, INC.
GEOSCIENCE DIVISION
SAMPLING AND DRAFTING BRANCH

Fort Hood, Building 11020
Fort Hood, Texas

Lead Acid Battery Neutralization Tank
Sampling Site Map

DRAWN BY: J. BRYAN
REVIEWED BY: D. F. BLACK

KEVIN P. HOYLE
PROJECT GEOLOGIST
GEOSCIENCE DIVISION

DATE: AUGUST 1994
DRAWING NUMBER: Figure 6
SEQUENCE NO: 1

In-Place Soil Assessment and Remedial Operations

One (1) soil sample was collected from the floor of the completed excavation for Total Lead (6010B) and pH (9045B) analysis. This sample was a composite of three (3) aliquots collected diagonally across the bottom of the excavation. Results of the laboratory analyses appear below, and the complete laboratory analytical data report can be found in Appendix N. Sample locations appear on the site map.

SOIL ANALYTICAL DATA SUMMARY

Date Sampled	Lab ID No.	Field ID No.	Matrix	Total Pb (mg/Kg)	pH* (su)
5/21/98	71721	8301 98 S 11020 001 Floor	Soil	460	11
5/21/98	71722	8301 98 S 11020 001 Stockpile	Soil	300	8.8
BDL = Below Detection Limit					

Table 14 – Soil Analytical Summary – Facility 11020

Site Excavated Soil Assessment and Disposition

Soil removed during the excavation was stockpiled on site and sampled for pH and Total Lead analyses. Soil analytical results are summarized in Table 14 above, and the complete laboratory analytical data report can be found in Appendix N. At the direction of the COE, all soil was returned to the excavation.

Site Groundwater/Surface Water Assessment

Groundwater samples were not collected at this facility.

Free Product (PSH)/Tank Contents Assessment and Disposition

A composite sample of the liquid from the tank and vault was analyzed for BTEX, Flashpoint, pH and Lead. BTEX and Flashpoint analyses were conducted due to the presence of a sheen on the contents. Laboratory anaytical data reports can be found in Appendix N. Tank contents were drummed with rinsate waters generated during tank/vault cleaning activities.

PRODUCT ANALYTICAL DATA SUMMARY							
Date Sampled	Lab ID No.	Field ID No.	Matrix	Total Pb (mg/L)	Total BTEX (mg/L)	Flashpoint (°F)	pH* (su)
5/12/98	71605	8301 98 P 11020001	Liquid	1170	BTEX	>160	2.6
BDL = Below Detection Limit							

Table 15 – Product Analytical Summary – Facility 11020

Waste Management and Disposition

After cleaning and removal, the fiberglass tank was crushed and placed in a rolloff along with debris from other facilities covered under this delivery order for final disposal in the Fort Hood Landfill. The concrete removed from this site was also disposed of at the Fort Hood Landfill.

16 drums of rinsate and tank contents and nine (9) drums of sludge were generated during tank cleaning activities. These drums were taken to ACE's storage yard for temporary storage until disposal was arranged. On July 22, 1998, the rinsate drums, along with drums from other sites included in this delivery order, were transported by Re-Claim Environmental to their reclamation/disposal facility in Shreveport, Louisiana. The drums of sludge were sampled, and were determined to be hazardous based upon lead concentrations. These drums are awaiting disposal at an appropriate facility.

WASTE ANALYTICAL DATA SUMMARY					
Date Sampled	Lab ID No.	Field ID No.	Matrix	TCLP Metals (mg/Kg)	pH (su)
6/2/98	71960	8301 98 P 11020002	Sludge	0.68 – Ba 0.006 – Cd 5.7 - Pb	6.68
BDL = Below Detection Limit * Only those metals detected are listed. All others were BDL.					

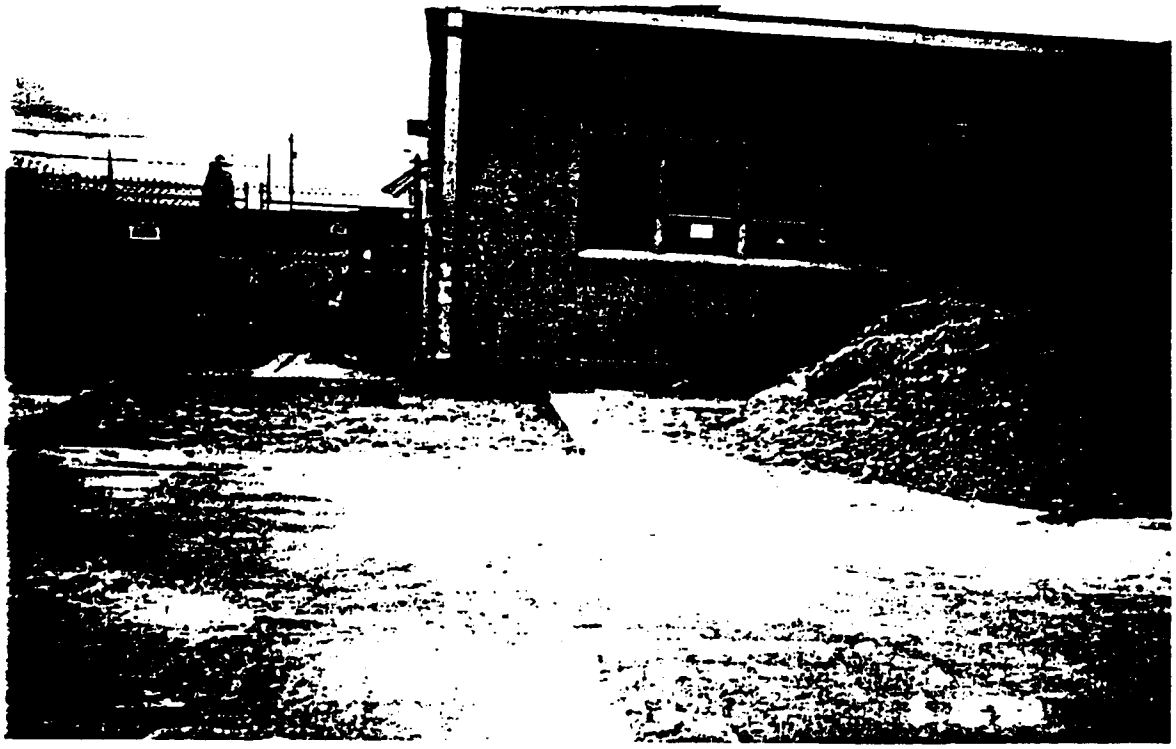
Table 16 – Waste Analytical Summary – Facility 11020

Contents from UST being pumped out at Building 11020

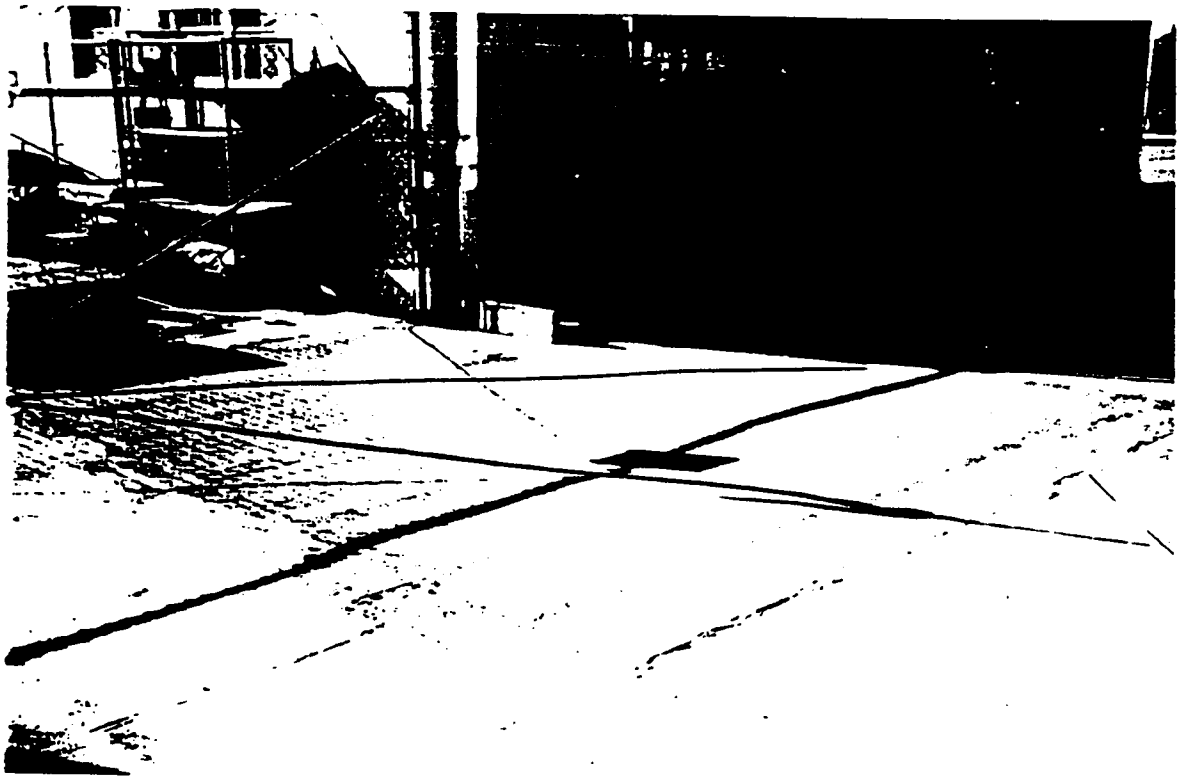
Demolition of vault at Building 11020

Water in excavation at Building 11020

New drain line to sanitary sewer at Building 11020



Site view just prior to completion



Finished site at Building 11020

APPENDIX C

FH-038B Analytical Results

Location: SB105
Sample ID: 38SB136 **Depth:** 1.0-2.0
COE Sample ID: FH038-SB136/02-14-97/1.0-2.0
Date Collected: 2/14/97

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	0.87	0.19	N		mg/kg	SW846 6010

Location: SB105
Sample ID: 38SB137 **Depth:** 4.0-5.0
COE Sample ID: FH038-SB137/02-14-97/4.0-5.0
Date Collected: 2/14/97

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	5.8	0.22	N		mg/kg	SW846 6010

Location: SB105
Sample ID: FHGW131 **Depth:** NA
COE Sample ID: FH038-GW131/02-14-97
Date Collected: 2/14/97

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	0.9	0.90	U		ug/l	SW846 6010

Location: SB106
Sample ID: 38SB133 **Depth:** 1.0-2.0
COE Sample ID: FH038-SB133/02-14-97/1.0-2.0
Date Collected: 2/14/97

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	12.6	0.25	N		mg/kg	SW846 6010

Location: SB106
Sample ID: 38SB134 **Depth:** 6.0-7.0
COE Sample ID: FH038-SB134/02-14-97/6.0-7.0
Date Collected: 2/14/97

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	6.1	0.21	N		mg/kg	SW846 6010

Location: SB106
Sample ID: 38SB135 **Depth:** 10.0-11.0
COE Sample ID: FH038-SB135/02-14-97/10.0-11.0
Date Collected: 2/14/97

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	2.4	0.20	N		mg/kg	SW846 6010

Location: SB107
Sample ID: 38SB129 **Depth:** 1.0-2.0
COE Sample ID: FH038-SB129/02-14-97/1.0-2.0
Date Collected: 2/14/97

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	7.5	0.24	N		mg/kg	SW846 6010

Location: SB107
Sample ID: 38SB130 **Depth:** 5.0-6.0
COE Sample ID: FH038-SB130/02-14-97/5.0-6.0
Date Collected: 2/14/97

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	2.1	0.20	N		mg/kg	SW846 6010

Location: SB107
Sample ID: 38SB131 **Depth:** 10.0-11.0
COE Sample ID: FH038-SB131/02-14-97/10.0-11.0
Date Collected: 2/14/97

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	1.9	0.19	N		mg/kg	SW846 6010

Location: SB107
Sample ID: 38SB132 **Depth:** 15.0-16.0
COE Sample ID: FH038-SB132/02-14-97/15.0-16.0
Date Collected: 2/14/97

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	2	0.19	N		mg/kg	SW846 6010

Location: SB121
Sample ID: 38SB186 **Depth:** 0.0-2.0
COE Sample ID: FH038-SB186/10-29-98/0.0-2.0
Date Collected: 10/29/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	3.3	0.17			mg/kg	SW 6010B

Location: SB121
Sample ID: 38SB187 **Depth:** 4.0-6.0
COE Sample ID: FH038-SB187/10-29-98/4.0-6.0
Date Collected: 10/29/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	1.2	0.16			mg/kg	SW 6010B

Location: SB121
Sample ID: 38SB188 **Depth:** 6.0-6.8
COE Sample ID: FH038-SB188/10-29-98/6.0-6.8
Date Collected: 10/29/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	1.1	0.16			mg/kg	SW 6010B

Location: SB122
Sample ID: 38SB189 **Depth:** 0.0-2.0
COE Sample ID: FH038-SB189/10-29-98/0.0-2.0
Date Collected: 10/29/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	5.4	0.17			mg/kg	SW 6010B

Location: SB122
Sample ID: 38SB190 **Depth:** 2.0-4.0
COE Sample ID: FH038-SB190/10-29-98/2.0-4.0
Date Collected: 10/29/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	2.5	0.16			mg/kg	SW 6010B

Location: SB122
Sample ID: 38SB191 **Depth:** 4.0-6.0
COE Sample ID: FH038-SB191/10-29-98/4.0-6.0
Date Collected: 10/29/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	2.5	0.16			mg/kg	SW 6010B

Location: SB122
Sample ID: 38SB192 **Depth:** 6.0-6.5
COE Sample ID: FH038-SB192/10-29-98/6.0-6.5
Date Collected: 10/29/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	2.3	0.16			mg/kg	SW 6010B

Location: SB123
Sample ID: 38SB193 **Depth:** 0.0-2.0
COE Sample ID: FH038-SB193/10-29-98/0.0-2.0
Date Collected: 10/29/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	1.9	0.15			mg/kg	SW 6010B

Location: SB123
Sample ID: 38SB194 **Depth:** 4.0-6.0
COE Sample ID: FH038-SB194/10-29-98/4.0-6.0
Date Collected: 10/29/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	1.5	0.17			mg/kg	SW 6010B

Location: SB124
Sample ID: 38SB195 **Depth:** 8.0-10.0
COE Sample ID: FH038-SB195/10-29-98/8.0-10.0
Date Collected: 10/29/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	60.9	0.16			mg/kg	SW 6010B

Location: SB124
Sample ID: 38SB196 **Depth:** 10.0-10.5
COE Sample ID: FH038-SB196/10-29-98/10.0-10.5
Date Collected: 10/29/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	2.1	0.16			mg/kg	SW 6010B

Location: SB125
Sample ID: 38SB197 **Depth:** 8.0-9.5
COE Sample ID: FH038-SB197/10-29-98/8.0-9.5
Date Collected: 10/29/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	11.2	0.16			mg/kg	SW 6010B

Location: UST
Sample ID: 38GW101 **Depth:** NA
COE Sample ID: FH038-GW101/05-21-98
Date Collected: 5/21/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	44300	7.5	*	J	ug/l	SW846 6010

Location: UST
Sample ID: 38SB159 **Depth:** 2.0-2.5
COE Sample ID: FH038-SB159/05-28-98/2.0-2.5
Date Collected: 5/28/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	13.3	0.18	*	J	mg/kg	SW846 6010

Location: UST
Sample ID: 38SB160 **Depth:** 2.0-2.5
COE Sample ID: FH038-SB160/05-19-98/2.0-2.5
Date Collected: 5/28/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	1.5	0.16	*	J	mg/kg	SW846 6010

Location: UST
Sample ID: 38SB161 **Depth:** 8.0-10.0
COE Sample ID: FH038-SB161/05-28-98/8.0-10.0
Date Collected: 5/28/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	816	0.17	*	J	mg/kg	SW846 6010

Location: UST
Sample ID: 38SB162 **Depth:** 8.0-10.0
COE Sample ID: FH038-SB162/05-28-98/8.0-10.0
Date Collected: 5/28/98

Parameter	CAS Number	Result	Detection Limit	Lab Qual	Data Qual	Units	Method
INORGANICS							
Lead	7439-92-1	4480	0.18	*	J	mg/kg	SW846 6010

APPENDIX D

Fort Hood RFI Background Soils Data

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Station: SB101 Background Soil Boring SB101

Sample ID: FH000-SB10112-10-96/2.0-2.5 (BKSB101) Sample Depth: 2.0-2.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/10/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	3	0.41	MG/KG		
Barium	21.3	0.10	MG/KG	*	J
Cadmium	0.12	0.05	MG/KG	B	
Chromium	5.1	0.10	MG/KG	E*	J
Lead	6	0.17	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.37	0.37	MG/KG	U	U
Silver	0.24	0.24	MG/KG	U	U

Sample ID: FH000-SB10212-10-96/4.0-4.7 (BKSB102) Sample Depth: 4.0-4.7 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/10/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	2	0.39	MG/KG		
Barium	8	0.10	MG/KG	*	J
Cadmium	0.05	0.05	MG/KG	B	
Chromium	10.3	0.10	MG/KG	E*	J
Lead	5	0.17	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.36	0.36	MG/KG	U	U
Silver	0.23	0.23	MG/KG	U	U

Sample ID: FH000-SB10312-10-96/10.5-11.0 (BKSB103) Sample Depth: 10.5-11.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/10/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	9.1	0.42	MG/KG		
Barium	14.7	0.10	MG/KG	*	J
Cadmium	0.05	0.05	MG/KG	U	U
Chromium	10.1	0.10	MG/KG	E*	J
Lead	9.5	0.18	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.38	0.38	MG/KG	U	U
Silver	0.24	0.24	MG/KG	U	U

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Station: SB102 Background Soil Boring SB102

Sample ID: FH000-SB12112-12-96/0.0-1.5 (BKSB121) Sample Depth: 0.0-1.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	4.1	0.38	MG/KG		
Barium	24	0.09	MG/KG		
Cadmium	0.18	0.05	MG/KG	B	
Chromium	6.3	0.09	MG/KG		
Lead	10.2	0.16	MG/KG	EN	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.34	0.34	MG/KG	U	U
Silver	0.22	0.22	MG/KG	U	U

Sample ID: FH000-SB12212-12-96/14.0-14.5 (BKSB122) Sample Depth: 14.0-14.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	3.2	0.36	MG/KG		
Barium	6.1	0.09	MG/KG		
Cadmium	0.06	0.04	MG/KG	B	
Chromium	4.9	0.09	MG/KG		
Lead	4.1	0.15	MG/KG	EN	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.33	0.33	MG/KG	U	U
Silver	0.21	0.21	MG/KG	U	U

Sample ID: FH000-SB12312-12-96/19.0-19.5 (BKSB123) Sample Depth: 19.0-19.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	3.8	0.36	MG/KG		
Barium	5.5	0.09	MG/KG		
Cadmium	0.08	0.04	MG/KG	B	
Chromium	4.3	0.09	MG/KG		
Lead	3.8	0.15	MG/KG	EN	
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.33	0.33	MG/KG	U	U
Silver	0.21	0.21	MG/KG	U	U

Sample ID: FH000-SB20212-12-96/0.0-1.5 (BKSB202) Sample Depth: 0.0-1.5 FT

Matrix: Soil Field Sample Type: Field Duplicate Collected: 12/12/9

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	4.2	0.37	MG/KG		
Barium	18.2	0.09	MG/KG		
Cadmium	0.12	0.04	MG/KG	B	
Chromium	5.9	0.09	MG/KG		
Lead	4.5	0.16	MG/KG	EN	
Mercury	0.04	0.04	MG/KG	U	
Selenium	0.34	0.34	MG/KG	U	
Silver	0.21	0.21	MG/KG	U	

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Station: SB103 Background Soil Boring SB103

Sample ID: FH000-SB10412-10-96/0.0-1.5 (BKSB104) Sample Depth: 0.0-1.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/10/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	6.2	0.35	MG/KG		
Barium	28.2	0.08	MG/KG	*	J
Cadmium	0.15	0.04	MG/KG	B	
Chromium	3.1	0.08	MG/KG	E*	J
Lead	5.3	0.15	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.32	0.32	MG/KG	U	U
Silver	0.2	0.20	MG/KG	U	U

Sample ID: FH000-SB10512-10-96/4.0-6.0 (BKSB105) Sample Depth: 4.0-6.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/10/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	4.3	0.36	MG/KG		
Barium	23.4	0.09	MG/KG	*	J
Cadmium	0.11	0.04	MG/KG	B	
Chromium	4	0.09	MG/KG	E*	J
Lead	3.9	0.15	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.33	0.33	MG/KG	U	U
Silver	0.21	0.21	MG/KG	U	U

Sample ID: FH000-SB10612-10-96/9.0-9.4 (BKSB106) Sample Depth: 9.0-9.4 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/10/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	4.4	0.37	MG/KG		
Barium	43.7	0.09	MG/KG	*	J
Cadmium	0.16	0.04	MG/KG	B	
Chromium	7.6	0.09	MG/KG	E*	J
Lead	5	0.16	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.33	0.33	MG/KG	U	U
Silver	0.21	0.21	MG/KG	U	U

Sample ID: FH000-SB10712-10-96/14.0-15.0 (BKSB107) Sample Depth: 14.0-15.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/10/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	53	0.39	MG/KG		
Barium	1350	0.09	MG/KG	*	J
Cadmium	0.35	0.05	MG/KG	B	
Chromium	5.1	0.09	MG/KG	E*	J
Lead	6.1	0.17	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.36	0.36	MG/KG	U	U
Silver	0.23	0.23	MG/KG	U	U

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Station: SB104 Background Soil Boring SB104

Sample ID: FH000-SB10812-11-96/0.0-1.0 (BKSB108) Sample Depth: 0.0-1.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/11/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	6	0.40	MG/KG		
Barium	72.4	0.10	MG/KG	*	J
Cadmium	0.2	0.05	MG/KG	B	
Chromium	12.9	0.10	MG/KG	E*	J
Lead	9.8	0.17	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.37	0.37	MG/KG	U	U
Silver	0.23	0.23	MG/KG	U	U

Sample ID: FH000-SB10912-11-96/4.0-5.0 (BKSB109) Sample Depth: 4.0-5.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/11/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	3.5	0.38	MG/KG		
Barium	155	0.09	MG/KG	*	J
Cadmium	0.07	0.05	MG/KG	B	
Chromium	6.5	0.09	MG/KG	E*	J
Lead	3.2	0.16	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.34	0.34	MG/KG	U	U
Silver	0.22	0.22	MG/KG	U	U

Sample ID: FH000-SB11012-11-96/11.0-11.5 (BKSB110) Sample Depth: 11.0-11.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/11/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	4.8	0.40	MG/KG		
Barium	24.1	0.10	MG/KG	*	J
Cadmium	0.06	0.05	MG/KG	B	
Chromium	16.6	0.10	MG/KG	E*	J
Lead	7.8	0.17	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.36	0.36	MG/KG	U	U
Silver	0.23	0.23	MG/KG	U	U

Sample ID: FH000-SB11112-11-96/18.0-18.5 (BKSB111) Sample Depth: 18.0-18.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/11/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	5.2	0.38	MG/KG		
Barium	7.2	0.09	MG/KG	*	J
Cadmium	0.05	0.05	MG/KG	B	
Chromium	6.2	0.09	MG/KG	E*	J
Lead	5.3	0.16	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.35	0.35	MG/KG	U	U
Silver	0.22	0.22	MG/KG	U	U

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Station: SB105 Background Soil Boring SB105

Sample ID: FH000-SB11212-11-96/1.0-1.5 (BKSB112) Sample Depth: 1.0-1.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/11/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Dat
Arsenic	1.6	0.35	MG/KG		
Barium	6.6	0.09	MG/KG	*	J
Cadmium	0.04	0.04	MG/KG	U	U
Chromium	4	0.09	MG/KG	E*	J
Lead	1.5	0.15	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.32	0.32	MG/KG	U	U
Silver	0.2	0.20	MG/KG	U	U

Sample ID: FH000-SB11312-11-96/4.0-5.0 (BKSB113) Sample Depth: 4.0-5.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/11/9

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Da
Arsenic	5.7	0.40	MG/KG		
Barium	20.5	0.10	MG/KG	*	
Cadmium	0.07	0.05	MG/KG	B	
Chromium	8.9	0.10	MG/KG	E*	
Lead	6	0.17	MG/KG	EN*	
Mercury	0.04	0.04	MG/KG	U	
Selenium	0.36	0.36	MG/KG	U	
Silver	0.23	0.23	MG/KG	U	

Sample ID: FH000-SB11412-11-96/11.0-12.0 (BKSB114) Sample Depth: 11.0-12.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/11/9

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Da
Arsenic	5.2	0.42	MG/KG		
Barium	25.2	0.10	MG/KG	*	
Cadmium	0.05	0.05	MG/KG	U	
Chromium	20.3	0.10	MG/KG	E*	
Lead	7.7	0.18	MG/KG	EN*	
Mercury	0.04	0.04	MG/KG	U	
Selenium	0.38	0.38	MG/KG	U	
Silver	0.24	0.24	MG/KG	U	

Sample ID: FH000-SB11512-11-96/15.0-15.5 (BKSB115) Sample Depth: 15.0-15.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/11/

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers D
Arsenic	5.3	0.36	MG/KG		
Barium	10.6	0.09	MG/KG	*	
Cadmium	0.06	0.04	MG/KG	B	
Chromium	7.3	0.09	MG/KG	E*	
Lead	5.1	0.15	MG/KG	EN*	
Mercury	0.04	0.04	MG/KG	U	
Selenium	0.32	0.32	MG/KG	U	
Silver	0.2	0.20	MG/KG	U	

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Sample ID: FH000-SB11612-11-96/22.0-22.5 (BKSB116) Sample Depth: 22.0-22.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/11/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	11.6	0.37	MG/KG		
Barium	4.9	0.09	MG/KG	*	J
Cadmium	0.2	0.04	MG/KG	B	
Chromium	2.7	0.09	MG/KG	E*	J
Lead	5.6	0.16	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.33	0.33	MG/KG	U	U
Silver	0.21	0.21	MG/KG	U	U

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Station: SB106 Background Soil Boring SB106

Sample ID: FH000-SB11712-12-96/0.0-1.0 (BKSB117) Sample Depth: 0.0-1.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	4.4	0.37	MG/KG		
Barium	27.9	0.09	MG/KG	*	J
Cadmium	0.18	0.04	MG/KG	B	
Chromium	5.7	0.09	MG/KG	E*	J
Lead	8.3	0.16	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.33	0.33	MG/KG	U	U
Silver	0.21	0.21	MG/KG	U	U

Sample ID: FH000-SB11812-12-96/9.0-9.5 (BKSB118) Sample Depth: 9.0-9.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	2.6	0.37	MG/KG		
Barium	4.4	0.09	MG/KG	*	J
Cadmium	0.19	0.04	MG/KG	B	
Chromium	2.2	0.09	MG/KG	E*	J
Lead	3.7	0.16	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.34	0.34	MG/KG	U	U
Silver	0.21	0.21	MG/KG	U	U

Sample ID: FH000-SB11912-12-96/14.0-14.5 (BKSB119) Sample Depth: 14.0-14.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	0.66	0.37	MG/KG	B	
Barium	3	0.09	MG/KG		
Cadmium	0.06	0.04	MG/KG	B	
Chromium	2.1	0.09	MG/KG		
Lead	1.3	0.16	MG/KG	EN	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.33	0.33	MG/KG	U	U
Silver	0.21	0.21	MG/KG	U	U

Sample ID: FH000-SB12012-12-96/19.0-20.0 (BKSB120) Sample Depth: 19.0-20.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	0.44	0.35	MG/KG	B	
Barium	2	0.08	MG/KG		
Cadmium	0.04	0.04	MG/KG	U	U
Chromium	0.93	0.08	MG/KG	B	
Lead	0.72	0.15	MG/KG	EN	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.32	0.32	MG/KG	U	U
Silver	0.2	0.20	MG/KG	U	U

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Sample ID: FH000-SB20112-12-96/0.0-1.0 (BKSB201) Sample Depth: 0.0-1.0 FT

Matrix: Soil Field Sample Type: Field Duplicate Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	4.4	0.36	MG/KG		
Barium	17.9	0.09	MG/KG		
Cadmium	0.14	0.04	MG/KG	B	
Chromium	2.6	0.09	MG/KG		
Lead	5.9	0.15	MG/KG	EN	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.33	0.33	MG/KG	U	U
Silver	0.21	0.21	MG/KG	U	U

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Station: SB107 Background Soil Boring SB107

Sample ID: FH000-SB12412-12-96/0.0-1.0 (BKSB124) Sample Depth: 0.0-1.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	6	0.37	MG/KG		
Barium	19.3	0.09	MG/KG		
Cadmium	0.11	0.04	MG/KG	B	
Chromium	7.2	0.09	MG/KG		
Lead	4.5	0.16	MG/KG	EN	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.34	0.34	MG/KG	U	U
Silver	0.21	0.21	MG/KG	U	U

Sample ID: FH000-SB12512-12-96/4.0-4.5 (BKSB125) Sample Depth: 4.0-4.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	3.2	0.35	MG/KG		
Barium	18.1	0.09	MG/KG		
Cadmium	0.11	0.04	MG/KG	B	
Chromium	5.1	0.09	MG/KG		
Lead	1.7	0.15	MG/KG	EN	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.36	0.32	MG/KG	B	
Silver	0.2	0.20	MG/KG	U	U

Sample ID: FH000-SB12612-12-96/5.5-6.0 (BKSB126) Sample Depth: 5.5-6.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	2.5	0.36	MG/KG		
Barium	5.4	0.09	MG/KG		
Cadmium	0.06	0.04	MG/KG	B	
Chromium	5.5	0.09	MG/KG		
Lead	1.5	0.15	MG/KG	EN	
Mercury	0.04	0.04	MG/KG	U	
Selenium	0.44	0.33	MG/KG	B	
Silver	0.21	0.21	MG/KG	U	

Sample ID: FH000-SB20312-12-96/0.0-1.0 (BKSB203) Sample Depth: 0.0-1.0 FT

Matrix: Soil Field Sample Type: Field Duplicate Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	5.9	0.37	MG/KG		
Barium	39	0.09	MG/KG		
Cadmium	0.17	0.05	MG/KG	B	
Chromium	9.3	0.09	MG/KG		
Lead	6.6	0.16	MG/KG	EN	
Mercury	0.04	0.04	MG/KG	U	
Selenium	0.34	0.34	MG/KG	U	
Silver	0.21	0.21	MG/KG	U	

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Station: SB108 Background Soil Boring SB108

Sample ID: FH000-SB135/01-14-97/0.0-1.0 (BKSB135) Sample Depth: 0.0-1.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 01/14/97

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	2.7	0.36	MG/KG		
Barium	15.4	0.09	MG/KG	*	J
Cadmium	0.17	0.04	MG/KG	B*	J
Chromium	6.1	0.09	MG/KG		
Lead	2.5	0.15	MG/KG	*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	1.5	1.5	MG/KG	UWN	R
Silver	0.21	0.21	MG/KG	U	U

Sample ID: FH000-SB136/01-14-97/5.0-5.5 (BKSB136) Sample Depth: 5.0-5.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 01/14/97

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	4.3	0.38	MG/KG		
Barium	14.8	0.09	MG/KG	*	J
Cadmium	0.2	0.05	MG/KG	B*	J
Chromium	8.3	0.09	MG/KG		
Lead	3	0.16	MG/KG	*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.32	0.32	MG/KG	UWN	R
Silver	0.22	0.22	MG/KG	U	U

Sample ID: FH000-SB137/01-14-97/9.0-9.5 (BKSB137) Sample Depth: 9.0-9.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 01/14/97

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	8.2	0.36	MG/KG		
Barium	7.8	0.09	MG/KG	*	J
Cadmium	0.18	0.04	MG/KG	B*	J
Chromium	8.1	0.09	MG/KG		
Lead	2.3	0.15	MG/KG	*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.31	0.31	MG/KG	UWN	R
Silver	0.21	0.21	MG/KG	U	U

Sample ID: FH000-SB138/01-14-97/14.0-14.5 (BKSB138) Sample Depth: 14.0-14.5 FT

Matrix: Soil Field Sample Type: Grab Collected: 01/14/97

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	9.2	0.38	MG/KG		
Barium	12.2	0.09	MG/KG	*	J
Cadmium	0.21	0.05	MG/KG	B*	J
Chromium	11.1	0.09	MG/KG		
Lead	4.1	0.16	MG/KG	*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.32	0.32	MG/KG	UWN	R
Silver	0.22	0.22	MG/KG	U	U

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Sample ID: FH000-SB139/01-14-97/16.5-17.0 (BKSB139) Sample Depth: 16.5-17.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 01/14/97

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	7.6	0.37	MG/KG		
Barium	7.3	0.09	MG/KG	•	J
Cadmium	0.2	0.04	MG/KG	B•	J
Chromium	8.4	0.09	MG/KG		
Lead	3.6	0.16	MG/KG	•	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.31	0.31	MG/KG	UWN	R*
Silver	0.21	0.21	MG/KG	U	U

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Station: SB109 Background Soil Boring SB109

Sample ID: FH000-SB140/01-15-97/0.0-1.0 (BKSB140) Sample Depth: 0.0-1.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 01/15/97

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	4.8	0.41	MG/KG		
Barium	108	0.10	MG/KG	*	J
Cadmium	0.79	0.05	MG/KG	*	J
Chromium	16.1	0.10	MG/KG		
Lead	33.2	0.17	MG/KG	*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.35	0.35	MG/KG	UWN	R
Silver	0.24	0.24	MG/KG	U	U

Sample ID: FH000-SB141/01-15-97/4.0-5.0 (BKSB141) Sample Depth: 4.0-5.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 01/15/97

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	5.6	0.43	MG/KG		
Barium	127	0.10	MG/KG	*	J
Cadmium	0.45	0.05	MG/KG	B*	J
Chromium	23.6	0.10	MG/KG		
Lead	12.1	0.18	MG/KG	*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	1.8	1.8	MG/KG	UN	R
Silver	0.25	0.25	MG/KG	U	U

Sample ID: FH000-SB142/01-15-97/9.0-10.0 (BKSB142) Sample Depth: 9.0-10.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 01/15/97

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	3.8	0.44	MG/KG		
Barium	63	0.11	MG/KG	*	
Cadmium	0.29	0.05	MG/KG	B*	
Chromium	8.4	0.11	MG/KG		
Lead	5	0.19	MG/KG	*	
Mercury	0.04	0.04	MG/KG	U	
Selenium	1.9	1.9	MG/KG	UWN	
Silver	0.25	0.25	MG/KG	U	

Sample ID: FH000-SB143/01-15-97/14.5-15.0 (BKSB143) Sample Depth: 14.5-15.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 01/15/97

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	3.8	0.41	MG/KG		
Barium	39.3	0.10	MG/KG	*	
Cadmium	0.27	0.05	MG/KG	B*	
Chromium	12.2	0.10	MG/KG		
Lead	6.6	0.17	MG/KG	*	
Mercury	0.04	0.04	MG/KG	U	
Selenium	0.35	0.35	MG/KG	UWN	
Silver	0.24	0.24	MG/KG	U	

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Sample ID: FH000-SB144/01-15-97/19.0-19.3 (BKSB144) Sample Depth: 19.0-19.3 FT

Matrix: Soil Field Sample Type: Grab Collected: 01/15/9

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Da
Arsenic	3.7	0.37	MG/KG		
Barium	36.1	0.09	MG/KG	•	
Cadmium	0.2	0.04	MG/KG	B•	
Chromium	6.5	0.09	MG/KG		
Lead	4	0.16	MG/KG	•	
Mercury	0.04	0.04	MG/KG	U	
Selenium	0.31	0.31	MG/KG	UWN	
Silver	0.21	0.21	MG/KG	U	

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Station: SB110 Background Soil Boring SB110

Sample ID: FH000-SB12712-13-96/0.0-1.0 (BKSB127) Sample Depth: 0.0-1.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/13/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Dat
Arsenic	1.9	0.36	MG/KG		
Barium	18.8	0.09	MG/KG		
Cadmium	0.04	0.04	MG/KG	U	U
Chromium	3.7	0.09	MG/KG		
Lead	3.8	0.15	MG/KG	EN	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.33	0.33	MG/KG	U	U
Silver	0.21	0.21	MG/KG	U	U

Sample ID: FH000-SB12812-13-96/4.0-6.0 (BKSB128) Sample Depth: 4.0-6.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/13/9

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Da
Arsenic	3.6	0.38	MG/KG		
Barium	36.3	0.09	MG/KG		
Cadmium	0.05	0.05	MG/KG	U	U
Chromium	8.5	0.09	MG/KG		
Lead	7.5	0.16	MG/KG	EN	
Mercury	0.04	0.04	MG/KG		
Selenium	0.35	0.35	MG/KG	U	U
Silver	0.22	0.22	MG/KG	U	U

Sample ID: FH000-SB12912-13-96/10.0-11.0 (BKSB129) Sample Depth: 10.0-11.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/13/9

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Da
Arsenic	2.6	0.36	MG/KG		
Barium	26.3	0.09	MG/KG		
Cadmium	0.04	0.04	MG/KG	U	
Chromium	4.6	0.09	MG/KG		
Lead	4.1	0.15	MG/KG	EN	
Mercury	0.04	0.04	MG/KG	U	
Selenium	0.33	0.33	MG/KG	U	
Silver	0.21	0.21	MG/KG	U	

Sample ID: FH000-SB13012-13-96/15.0-16.0 (BKSB130) Sample Depth: 15.0-16.0 FT

Matrix: Soil Field Sample Type: Grab Collected: 12/13/9

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers D.
Arsenic	1	0.35	MG/KG	B	
Barium	8.1	0.08	MG/KG		
Cadmium	0.07	0.04	MG/KG	B	
Chromium	1.8	0.08	MG/KG		
Lead	3.1	0.15	MG/KG	EN	
Mercury	0.04	0.04	MG/KG	U	
Selenium	0.32	0.32	MG/KG	U	
Silver	0.2	0.20	MG/KG	U	

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Sample ID: FH000-SB13112-13-96/20.0-21.0 (BKSB131) Sample Depth: 20.0-21.0 FT
Matrix: Soil Field Sample Type: Grab Collected: 12/13/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Dat
Arsenic	5.3	0.38	MG/KG		
Barium	65.9	0.09	MG/KG		
Cadmium	0.15	0.05	MG/KG	B	
Chromium	7.7	0.09	MG/KG		
Lead	10.1	0.16	MG/KG	EN	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.34	0.34	MG/KG	U	U
Silver	0.22	0.22	MG/KG	U	U

Sample ID: FH000-SB13212-13-96/25.0-26.0 (BKSB132) Sample Depth: 25.0-26.0 FT
Matrix: Soil Field Sample Type: Grab Collected: 12/13/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Da
Arsenic	4.2	0.37	MG/KG		
Barium	41.7	0.09	MG/KG		
Cadmium	0.04	0.04	MG/KG	U	U
Chromium	5.9	0.09	MG/KG		
Lead	7.8	0.16	MG/KG	EN	
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.34	0.34	MG/KG	U	U
Silver	0.21	0.21	MG/KG	U	U

Sample ID: FH000-SB13312-13-96/30.0-31.0 (BKSB133) Sample Depth: 30.0-31.0 FT
Matrix: Soil Field Sample Type: Grab Collected: 12/13/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Da
Arsenic	3.2	0.39	MG/KG		
Barium	68.6	0.09	MG/KG		
Cadmium	0.11	0.05	MG/KG	B	
Chromium	4.9	0.09	MG/KG		
Lead	6.3	0.17	MG/KG	EN	
Mercury	0.04	0.04	MG/KG	U	
Selenium	0.35	0.35	MG/KG	U	
Silver	0.22	0.22	MG/KG	U	

Sample ID: FH000-SB13412-13-96/34.0-34.5 (BKSB134) Sample Depth: 34.0-34.5 FT
Matrix: Soil Field Sample Type: Grab Collected: 12/13/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers D:
Arsenic	2.9	0.36	MG/KG		
Barium	20.1	0.09	MG/KG		
Cadmium	0.08	0.04	MG/KG	B	
Chromium	1.2	0.09	MG/KG		
Lead	2.3	0.15	MG/KG	EN	
Mercury	0.04	0.04	MG/KG	U	
Selenium	0.33	0.33	MG/KG	U	
Silver	0.21	0.21	MG/KG	U	

Ft. Hood RCRA Facility Investigation

FH-BKG Fort Hood Background

Analytical Results

Sample ID: FH000-SB20412-13-96/4.0-6.0 (BKSB204) Sample Depth: 4.0-6.0 FT

Matrix: Soil Field Sample Type: Field Duplicate Collected: 12/13/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	3.2	0.38	MG/KG		
Barium	31.9	0.09	MG/KG		
Cadmium	0.05	0.05	MG/KG	U	U
Chromium	6.5	0.09	MG/KG		
Lead	7.1	0.16	MG/KG	EN	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.35	0.35	MG/KG	U	U
Silver	0.22	0.22	MG/KG	U	U

APPENDIX E

Fort Hood RFI Background Soil Boring Logs

RCRA
Facilities
Investigation
Fort Hood, Texas

U. S. Army Corp of Engineers
Fort Worth District
Fort Worth, Texas

Boring FHBKG-SB101

(Page 1 of 1)

FHBKG	: Background
Start Date	: 12/10/96
End Date	: 12/10/96
Northing Coord.	: 3446458.08 m
Easting Coord.	: 61375.50 m UTM 14 North
Total Depth of Boring	: 18.5 feet

Drilling Company	: Terra-Mar
Driller	: Bill Christopher
Designation of Drill	: Mobile Drill B-59
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Jeff DeVaughn
Depth to Bedrock	: 15.0 feet
Depth Drilled Into Rock	: 3.5 feet
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. 887.80ft	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0					Topsoil. 0.0-0.5' bgs.; weathered tan limestone.	No sample recovery.
1	887	CL			CLAY; weathered limestone fragments; damp; soft; moderately plastic; 10YR5/4 yellowish brown.	
2	886					Sample BKSB101 collected 2.0-2.5' bgs.
3	885				Same as above; dry.	
4	884				Same as above; dry; more weathered limestone.	Description from soil cuttings.
5	883	CH			CLAY, fat; fewer fragments; damp; firm; highly plastic; mottled 10YR6/6 brownish yellow and 2.5Y7/1 light gray.	Sample BKSB102 collected 4.0-4.7' bgs.
6	882				Same CLAY as above; more silty; interbedded with weathered limestone; dry.	Description from soil cuttings.
7	881					
8	880					
9	879					
10	878				Same as above; dry.	
11	877	CL			Silty CLAY; dry; firm; non-plastic; 10YR6/6 brownish yellow.	Sample BKSB103 collected 10.5-11.0' bgs.
12	876				Same as above; interbedded with tan weathered limestone; dry.	
13	875					
14	874					
15	873					Description from soil cuttings.
16	872	LS			LIMESTONE, weathered; dry; blue-gray.	
17	871					
18	870					Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
19	869				Bottom of Boring @ 18.5' bgs.	
20	868					

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FHBKG	: Background
Start Date	: 12/12/96
End Date	: 12/12/96
Northing Coord.	: 3446503.40 m
Easting Coord.	: 613980.64 m UTM 14 North
Total Depth of Boring	: 19.5 feet

Drilling Company	: Terra-Mar
Driller	: Bill Christopher
Designation of Drill	: Mobile Drill B-59
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Jeff DeVaughn
Depth to Bedrock	: 16.0 feet
Depth Drilled Into Rock	: 3.5 feet
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. 912.28ft	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	912				Topsoil. 0.0-0.4' bgs.	Sample BKSB121, duplicate BKSB202, and split sample BKSB302 collected 0.0-0.5' bgs.
1	911	CL			Silty CLAY; weathered limestone fragments; dry; firm; non-plastic; mottled 10YR5/3 brown and 10YR8/2 very pale brown.	
2	910				Same as above; dry.	
3	909					Description from soil cuttings.
4	908	CL			LIMESTONE, weathered, tan; and Silty Clay interbeds; dry.	
5	907					
6	906	CL			Zones of limestone and highly indurated silty clay (weathered limestone?); shell fragments; roots; dry; very hard; 2.5Y8/2 pale yellow.	
7	905					
8	904					
9	903				Same as above; dry.	
10	902					
11	901				Same as above; dry.	
12	900					
13	899					Description from soil cuttings.
14	898					Sample BKSB122 collected 14.0-14.5' bgs.
15	897				Same as above; dry.	
16	896	LS			LIMESTONE, weathered; dry; blue-gray.	
17	895					
18	894				Same as above; dry.	
19	893				Same as above; dry.	Sample BKSB123 collected 19.0-19.5' bgs.
20					Bottom of Boring @ 19.5' bgs.	Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.

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FHBKG	: Background
Start Date	: 12/10/96
End Date	: 12/10/96
Northing Coord.	: 3447405.80 m
Easting Coord.	: 606690.49 m UTM 14 North
Total Depth of Boring	: 17.0 feet

Drilling Company	: Terra-Mar
Driller	: Bill Christopher
Designation of Drill	: Mobile Drill B-59
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Jeff DeVaughn
Depth to Bedrock	: 15.0 feet
Depth Drilled Into Rock	: 2.0 feet
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. 795.26ft	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	795				Topsoil. 0.0-0.2' bgs.; weathered tan limestone.	Sample BKSB104 collected 0.0-0.5' bgs.
1	794	CL			Interbedded Silty and pebbly CLAY; 40% coarse sand to pebble sized angular to subrounded fragments; dry; moderately plastic; thin layers of 10YR8/4 very pale brown and 10YR3/2 very dark grayish brown.	
2	793				Same as above; no pebbles; dry.	
3	792					Description from soil cuttings.
4	791	CL			Same as above; weathered, tan limestone fragments; dry.	Sample BKSB105 collected 4.0-4.5' bgs.
5	790					
6	789	CL			Same as above; interbeds of limestone; dry.	
7	788				Same as above; dry.	
8	787					
9	786				Same as above; dry.	Sample BKSB106 collected 9.0-9.5' bgs.
10	785					
11	784				Same as above; except more medium to coarse sand; dry; soft; non-plastic.	
12	783					
13	782				Same as above; dry.	Description from soil cuttings.
14	781	CL			Silty CLAY; weathered limestone fragments; damp; firm; moderately plastic; mottled 10YR8/2 very pale brown and 10YR6/4 light yellowish brown.	Sample BKSB107 collected 14.0-15.0' bgs.
15	780	LS			LIMESTONE, weathered; dry; blue-gray.	
16	779					
17	778				Bottom of Boring @ 17.0' bgs.	
18	777					
19	776					
20						Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.

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FHBKG	: Background
Start Date	: 12/11/96
End Date	: 12/11/96
Northing Coord.	: 3447780.16 m
Easting Coord.	: 613523.75 m UTM 14 North
Total Depth of Boring	: 24.0 feet

Drilling Company	: Terra-Mar
Driller	: Bill Christopher
Designation of Drill	: Mobile Drill B-59
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Jeff DeVaughn
Depth to Bedrock	: 24.0 feet
Depth Drilled Into Rock	: NA
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. 896.29	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	896				Topsoil. 0.0-1.0' bgs.; weathered tan limestone.	Sample BKSB108 collected 0.0-1.0' bgs.
1	895	CL			Silty CLAY; trace organics; weathered limestone fragments; damp; soft; low plasticity; 2.5Y7/6 yellow.	
2	894					
3	893				Same as above.	Description from soil cuttings.
4	892				Same as above; no organics; dry; 10YR7/8 yellow mottle.	Sample BKSB109 collected 4.0-5.0' bgs.
5	891					
6	890				Same as above; slightly more silty; dry; hard; brittle.	
7	889					Description from soil cuttings.
8	888					
9	887	LS			LIMESTONE, weathered; tan.	Description from soil cuttings. Hard drilling.
10	886				weathered limestone as above.	
11	885	CL			Silty CLAY as above; dry.	Sample BKSB110 collected 11.0-11.5' bgs.
12	884				Same as above; dry.	Geotechnical sample collected 12.0-13.0' bgs.
13	883	CL			Silty CLAY and weathered LIMESTONE interbeds.	
14	882					
15	881					Description from soil cuttings.
16	880					
17	879					
18	878	CL			Silty CLAY as above; dry.	Sample BKSB111 collected 18.0-18.5' bgs.
19	877	CL			Silty CLAY and weathered LIMESTONE interbeds.	
20	876					
21	875					Description from soil cuttings.
22	874					
23	873				Same as above; dry. Blue-gray weathered limestone fragments; dry.	
24	872	LS			Bottom of Boring at 24.0' bgs.	Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
25						

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FHBKG	: Background
Start Date	: 12/11/96
End Date	: 12/11/96
Northing Coord.	: Not
Easting Coord.	: Surveyed
Total Depth of Boring	: 24.0 feet

Drilling Company	: Terra-Mar
Driller	: Bill Christopher
Designation of Drill	: Mobile Drill B-59
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Jeff DeVaughn
Depth to Bedrock	: 24.0 feet
Depth Drilled Into Rock	: NA
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. NS	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	0	GP			GRAVEL (graded area).	
1	-1	CL			Silty CLAY; weathered limestone fragments; dry; firm; non-plastic; 2.5Y6/4 light yellowish brown.	Sample BKSB112 collected 1.0-1.5' bgs.
2	-2					
3	-3				Same as above; dry.	Description from soil cuttings.
4	-4	CH			CLAY, fat; dry; firm; highly plastic; mottled 2.5Y6/4 light yellowish brown and 10YR6/6 brownish yellow.	Sample BKSB113 collected 4.0-5.0' bgs.
5	-5	CL			Silty CLAY and LIMESTONE interbeds; dry; firm; 2.5Y6/4 light yellowish brown.	
6	-6					
7	-7					
8	-8					Description from soil cuttings.
9	-9					
10	-10				Same as above; dry.	
11	-11				Same as above; dry; moderately plastic.	Sample BKSB114 collected 11.0-12.0' bgs.
12	-12					
13	-13				Same as above; dry.	Description from soil cuttings.
14	-14					
15	-15	CL			Same as above; more silt; dry; hard; brittle; non-plastic.	Sample BKSB115 collected 15.0-15.5' bgs.
16	-16	CL			Same as above with weathered limestone interbeds.	
17	-17					
18	-18					Description from soil cuttings.
19	-19					
20	-20					
21	-21					
22	-22				Same as above; dry.	Sample BKSB116 collected 22.0-22.5' bgs.
23	-23					
24	-24				Blue-gray weathered limestone; dry; hard drilling to 24.0'.	Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
25		LS			Bottom of Boring at 24.0' bgs.	

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FHBKG	: Background
Start Date	: 12/12/96
End Date	: 12/12/96
Northing Coord.	: Not
Easting Coord.	: Surveyed
Total Depth of Boring	: 25.5 feet

Drilling Company	: Terra-Mar
Driller	: Bill Christopher
Designation of Drill	: Mobile Drill B-59
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Jeff DeVaughn
Depth to Bedrock	: 25.5 feet
Depth Drilled Into Rock	: NA
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. NS	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	0	CL			Silty CLAY; weathered limestone fragments; dry; firm; non-plastic; mottled 2.5Y7/6 yellow and 10YR6/6 brownish yellow.	Sample BKSB117 collected 0.0-1.0' bgs.
1	-1					
2	-2					
3	-3				Same as above; dry.	Geotechnical sample collected 3.0-4.0' bgs.
4	-4	CL			Same as above with weathered limestone interbeds.	
5	-5					
6	-6					Description from soil cuttings.
7	-7				Same as above with trace sand; dry.	
8	-8					
9	-9	SM			Silty SAND, fine; dry; non-plastic; carbonate (HCL fizz); 2.5Y8/4 pale yellow.	Sample BKSB118 collected 9.0-9.5' bgs.
10	-10					
11	-11				Same as above; dry.	
12	-12				Same as above except color change to 19YR8/2 very pale brown.	
13	-13					
14	-14	SP			Same as above SAND, fine; except no silt.	Sample BKSB119 collected 14.0-14.5' bgs.
15	-15					
16	-16					
17	-17				Same as above; dry.	Description from soil cuttings.
18	-18					
19	-19	SW			SAND, fine; dry; soft; non-carbonate; 2.5Y8/4 pale yellow.	Sample BKSB120 collected 19.0-20.0' bgs.
20	-20					
21	-21					
22	-22				Same as above; dry.	
23	-23	LS			LIMESTONE, weathered; dry; tan.	Description from soil cuttings.
24	-24					
25	-25					
26	-26				Blue-gray weathered limestone; dry. Bottom of Boring at 25.5' bgs.	
27	-27					
28	-28					Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
29	-29					
30						

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FHBKG	: Background
Start Date	: 12/12/96
End Date	: 12/12/96
Northing Coord.	: 3438421.71 m
Easting Coord.	: 612222.83 m UTM 14 North
Total Depth of Boring	: 6.0 feet

Drilling Company	: Terra-Mar
Driller	: Bill Christopher
Designation of Drill	: Mobile Drill B-59
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Jeff DeVaughn
Depth to Bedrock	: 1.7 feet
Depth Drilled Into Rock	: 4.3 feet
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. NS	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	0	CL			Silty CLAY; weathered limestone fragments; dry; hard; non-plastic; mottled 10YR6/8 brownish yellow and 10YR6/2 light brownish gray.	Sample BKSB124 collected 0.0-1.0' bgs.
1	-1					
2	-2	LS			LIMESTONE, weathered, fossiliferous; Blue-Gray; 2.5Y6/1 gray.	
3	-3					Description from soil cuttings.
4	-4				Same as above	Sample BKSB125 collected 4.0-4.5' bgs.
5	-5					Description from soil cuttings.
					Same as above	Sample BKSB126 collected 5.5-6.0' bgs.
6	-6				Bottom of Boring at 6.0' bgs.	
7	-7					
8	-8					Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
9	-9					
10						

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FHBKG	: Background
Start Date	: 01/14/97
End Date	: 01/14/97
Northing Coord.	: Not
Easting Coord.	: Surveyed
Total Depth of Boring	: 17.0 feet

Drilling Company	: Terra-Mar
Driller	: Bill Christopher
Designation of Drill	: Mobile Drill B-59
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Jeff DeVaughn
Depth to Bedrock	: 15.0 feet
Depth Drilled Into Rock	: 2.0 feet
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. NS	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	0				Topsoil 0.0-0.4'	Sample BKSB135 collected 0.0-1.0' bgs.
1	-1	CL			Silty CLAY; weathered limestone fragments; dry; firm; non-plastic; 10YR6/8 brownish yellow.	
2	-2					
3	-3				Same as above; dry.	Description from soil cuttings.
4	-4					
5	-5				Same as above; dry; mottled with 2.5Y7/3 pale yellow.	Sample BKSB136 collected 5.0-5.5' bgs.
6	-6					
7	-7				Same as above; dry.	Description from soil cuttings.
8	-8					
9	-9				Same as above; dry.	Sample BKSB137 collected 9.0-9.5' bgs.
10	-10					
11	-11					
12	-12				Same as above; dry.	Description from soil cuttings.
13	-13					
14	-14				Same as above; less silty; dry. Same as above; dry.	Sample BKSB138 collected 14.0-14.5' bgs.
15	-15	LS			LIMESTONE, weathered; blue-gray.	
16	-16				Same as above; dry.	Sample BKSB139 collected 16.5-17.0' bgs.
17	-17				Bottom of Boring at 17.0' bgs.	
18	-18					Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
19	-19					
20						

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FHBKG	: Background
Start Date	: 01/15/97
End Date	: 01/15/97
Northing Coord.	: 3471041.79 m
Easting Coord.	: 626015.26 m UTM 14 North
Total Depth of Boring	: 24.0 feet

Drilling Company	: Terra-Mar
Driller	: Bill Christopher
Designation of Drill	: Mobile Drill B-59
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Jeff DeVaughn
Depth to Bedrock	: Not Encountered
Depth Drilled Into Rock	: NA
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. 730.62ft	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0	730	CL			Silty CLAY; trace roots; trace rock fragments <1cm, angular to subrounded; damp; highly plastic; 5YR2.5/1 black.	Sample BKSB140 collected 0.0-1.0' bgs.
1	729				Same as above; damp.	
2	728					
3	727					Description from soil cuttings.
4	726				Same as above; damp.	Sample BKSB141 collected 4.0-5.0' bgs.
5	725					
6	724	CL			Silty CLAY; trace weathered limestone fragments; dry; stiff; non-plastic; 7.5YR6/4 light brown.	
7	723					
8	722				Some sand, fine, from 8-9' bgs.	Description from soil cuttings.
9	721				Same as above; dry.	Sample BKSB142 collected 9.0-10.0' bgs.
10	720					
11	719				Same as above except rock fragments (mostly weathered limestone) up to 20% of total matrix.	
12	718					
13	717				Same as above; dry.	Description from soil cuttings.
14	716					
15	715				Same as above; with limestone fragments up to 40%; also 10% fine sand; dry.	Sample BKSB143 collected 14.5-15.0' bgs.
16	714					
17	713				Same as above; dry.	Description from soil cuttings.
18	712					
19	711				Same as above; dry.	Sample BKSB144 collected 19.0-19.3' bgs.
20	710					
21	709					Description from soil cuttings.
22	708				Same as above; dry.	
23	707	SM			Silty SAND, fine to medium; moist; soft; moderately plastic; 7.5Y6/8 reddish yellow and 7.5 YR7/1 light gray.	Water in hole, attempted sample, no recovery in gravel at 24'
24	706	GP			Bottom of boring at 24.0' bgs. GRAVEL,angular;saturated	Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
25						

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FHBKG	: Background
Start Date	: 12/13/96
End Date	: 12/13/96
Northing Coord.	: 3472081.13 m
Easting Coord.	: 626432.83 m UTM 14 North
Total Depth of Boring	: 34.5 feet

Drilling Company	: Terra-Mar
Driller	: Bill Christopher
Designation of Drill	: Mobile Drill B-59
Type of Drill Rig	: Hollow Stem Auger
Geologist	: Jeff DeVaughn
Depth to Bedrock	: Not Encountered
Depth Drilled Into Rock	: NA
Borehole Diameter	: 8 inches
Sampling Equipment	: 4.25" Augers
	: CME Sampler 5' long

Depth in feet	Surf. Elev. 729.66ft	USCS	GRAPHIC	Water Levels	DESCRIPTION	REMARKS
0						
1	729	SM			SAND, fine to medium; some silt; damp; soft; non-plastic; 7.5YR5/6 strong brown.	Sample BKSB127 collected 0.0-1.0' bgs.
2	728				Same as above; damp to moist.	
3	727					
4	726	SC			Clayey SAND; damp; firm; moderately plastic; 2.5YR4/6 red.	
5	725				Same as above; damp.	Sample BKSB128 collected 4.0-6.0' bgs.
6	724					
7	723				Same as above; damp.	
8	722					
9	721				Same as above; damp.	Geotechnical sample collected 8.0-9.0' bgs.
10	720					
11	719				Same as above; slightly less clay; dry.	Sample BKSB129 collected 10.0-11.0' bgs.
12	718					
13	717				Same as above; dry.	
14	716					
15	715				Same as above; less clay; dry; color change 5YR5/6 yellowish red.	
16	714				Same as above; dry.	Sample BKSB130 collected 15.0-16.0' bgs.
17	713				Same as above; dry;	
18	712					
19	711				Same as above; more clay; dry.	
20	710	CL			Silty CLAY; trace sand; trace tan weathered limestone fragments; dry; hard; 7.5YR6/6 reddish yellow.	Sample BKSB131 collected 20.0-21.0' bgs.
21	709				Same as above; dry.	
22	708					
23	707				Same as above; dry.	
24	706					
25	705				Same as above; dry.	
26	704					Sample BKSB132 collected 25.0-26.0' bgs.
27	703				Same as above; dry.	
28	702					
29	701				Same as above; with more silt; moist; softer.	
30	700					
31	699				Same as above; except very silty; damp; soft.	Sample BKSB133 collected 30.0-31.0' bgs.
32	698					
33	697					
34	696	SM			Silty SAND, fine; trace gravel and coarse sand at bottom; saturated; non-plastic; 7.5Y6/6 reddish yellow.	Sample BKSB134 collected 34.0-34.5' bgs.
35	695	GW			SAND, coarse, and GRAVEL, poorly sorted, angular to round; saturated; 1.5 water in hole.	
36	694					
37	693				Bottom of boring at 34.5' bgs.	
38	692					
39	691					Soil colors from Munsell Soil Color Chart, 1992 Revised Edition.
40	690					

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APPENDIX F

Statistical Calculations

Formulas for Shapiro Wilk or W test

1. Compute the denominator *d* of the W test statistic, using the n data;

$$d=\sum(x_i-x)^2$$

2. Order the n data form smallest to largest to obtain the sample order statistics

$$x_1 \leq x_2 \leq x_3 \leq etc$$

3. Compute *k*, where *k*= n/2 if n is even or

$$k=(n-1)/2 \text{ if n is odd}$$

4. Turn to Table A6 in *Statistical Methods for Environmental Pollution Monitoring*, by Richard Gilbert, and for the observed n find the coefficients $a_1, a_2, \ldots, a_k$.

5. Then compute *W*

$$W= 1/d\{\sum a_1(x_{[n-i+1]} - x_{[i]})\}^2$$

6. Reject H0 at the α significance level if W is less than the quantile given in Table A7 of *Statistical Methods for Environmental Pollution Monitoring*, by Richard Gilbert.

This procedure is used on the logrithms of data to test if distribution is lognormal.

95% UTL Calculations

1. Determine distribution. If normal use the data as is and 1/2 of the value for nondetects. If lognormal distribution calculate the 95% UTL on the log values.

2. Find the mean of the data set.

3. Find the standard deviation of data set

4. Based on the n of the data set look up the K value from *Statistical Methods for Environmental Pollution Monitoring*, by Richard Gilbert, Table A3.

5. Calculate the 95% UTL =mean+K(standard deviation)

For lognormal distribution, need to take the exponent of the 95%UTL of the log.

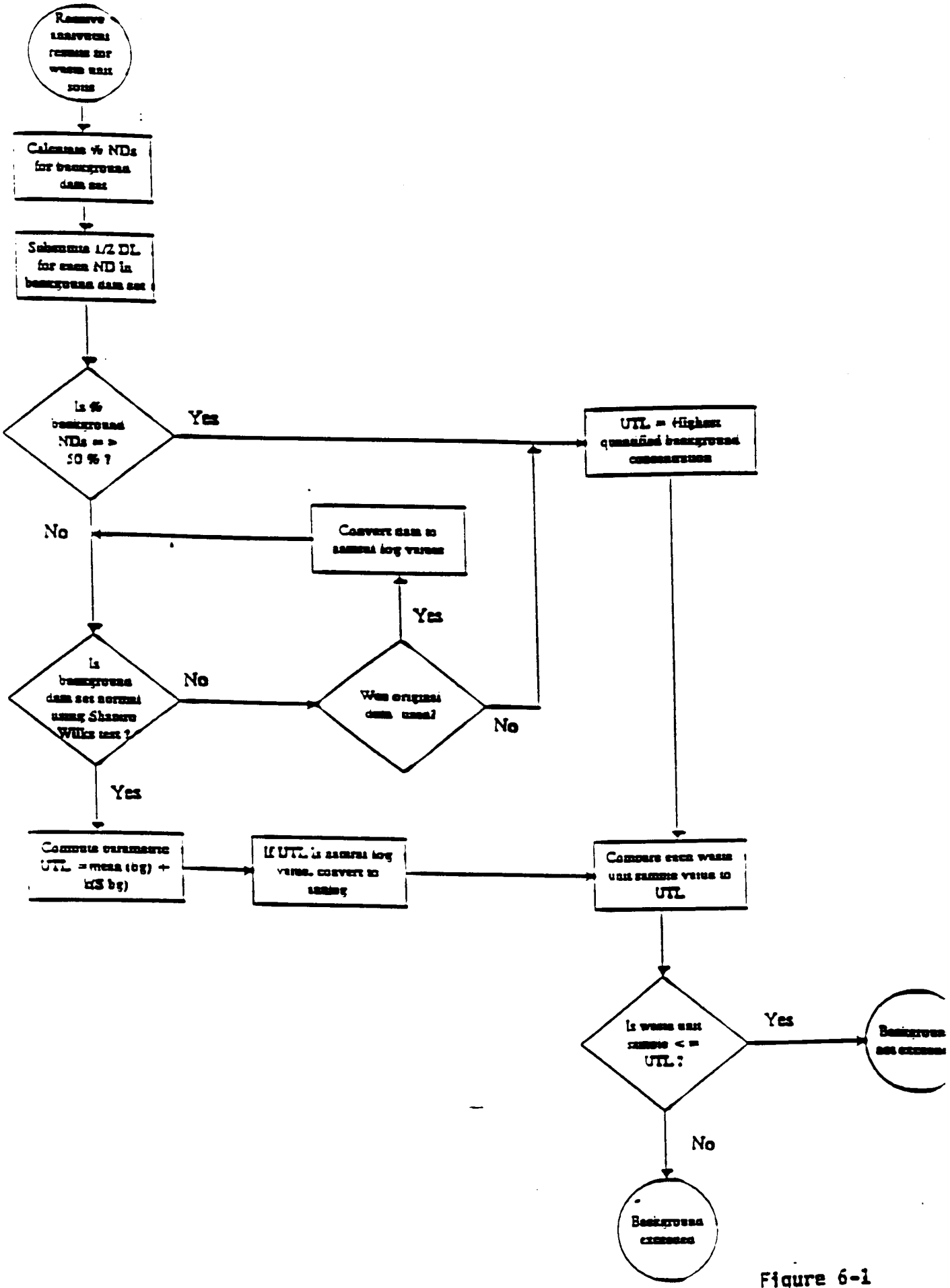
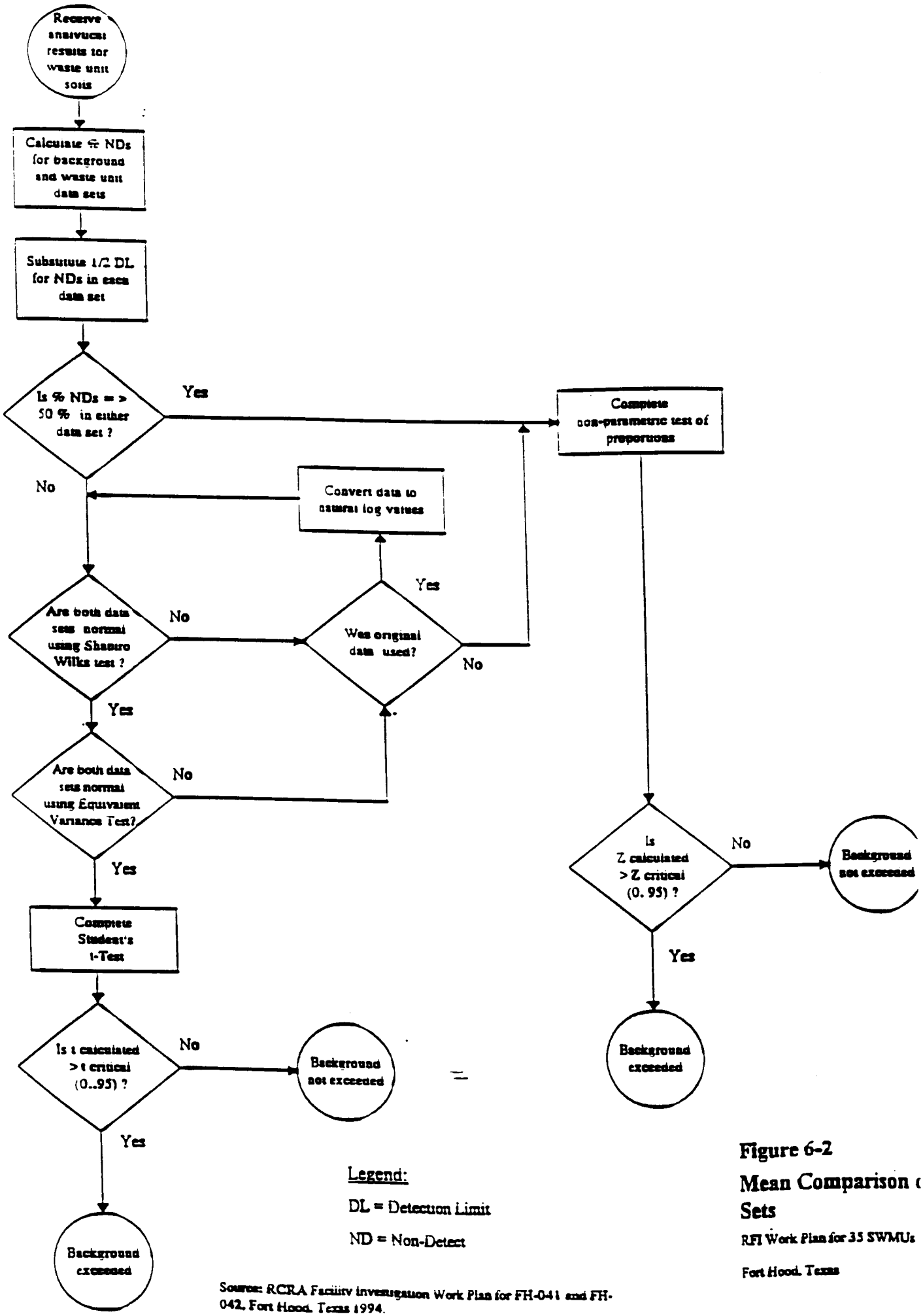


Figure 6-1
95% Upper Tolerance
RFI Work Plan for 35
Fort Hood, Texas



Legend:

DL = Detection Limit

ND = Non-Detect

Source: RCRA Facility Investigation Work Plan for FH-041 and FH-042, Fort Hood, Texas 1994.

Figure 6-2

Mean Comparison (
Sets

RFI Work Plan for 35 SWMUs

Fort Hood, Texas

Soil Background 95% UTLs NO DUPLICATES						
smp_id	Mercury		Arsenic	Barium		
	Result (x)	Qual	Result (x)	Result	Qual	Ln(x)
BKSB101	0.04	U	3	21.3	J	3.05870707
BKSB102	0.04	U	2	8	J	2.07944154
BKSB103	0.04	U	9.1	14.7	J	2.68784749
BKSB105	0.04	U	4.3	23.4	J	3.15273602
BKSB106	0.04	U	4.4	43.7	J	3.7773481
BKSB107	0.04	U				
BKSB109	0.04	U	3.5	155	J	5.04342512
BKSB110	0.04	U	4.8	24.1	J	3.18221184
BKSB111	0.04	U	5.2	7.2	J	1.97408103
BKSB113	0.04	U	5.7	20.5	J	3.02042489
BKSB114	0.04	U	5.2	25.2	J	3.22684399
BKSB115	0.04	U	5.3	10.6	J	2.360854
BKSB116	0.04	U	11.6	4.9	J	1.58923521
BKSB118	0.04	U	2.6	4.4	J	1.48160454
BKSB119	0.04	U	0.66	3		1.09861229
BKSB120	0.04	U	0.44	2		0.69314718
BKSB122	0.04	U	3.2	6.1		1.80828877
BKSB123	0.04	U	3.8	5.5		1.70474809
BKSB125	0.04	U	3.2	18.1		2.89591194
BKSB126	0.04	U	2.5	5.4		1.68639895
BKSB128	0.04		3.6	36.3		3.59181774
BKSB129	0.04	U	2.6	26.3		3.26956894
BKSB130	0.04	U	1	8.1		2.09186406
BKSB131	0.04	U	5.3	65.9		4.18813844
BKSB132	0.04	U	4.2	41.7		3.73050113
BKSB133	0.04	U	3.2	68.6		4.22829253
BKSB134	0.04	U	2.9	20.1		3.00071982
BKSB136	0.04	U	4.3	14.8	J	2.69462718
BKSB137	0.04	U	8.2	7.8	J	2.05412373
BKSB138	0.04	U	9.2	12.2	J	2.50143595
BKSB139	0.04	U	7.6	7.3	J	1.98787435
BKSB141	0.04	U	5.6	127	J	4.84418709
BKSB142	0.04	U	3.8	63	J	4.14313473
BKSB143	0.04	U	3.8	39.3	J	3.67122452
BKSB144	0.04	U	3.7	36.1	J	3.58629287
BKSB104	0.04	U	6.2	28.2	J	3.33932198
BKSB108	0.04	U	6	72.4	J	4.2822063
BKSB112	0.04	U	1.6	6.6	J	1.88706965
BKSB117	0.04	U	4.4	27.9	J	3.32862669
BKSB121	0.04	U	4.1	24		3.17805383
BKSB124	0.04	U	6	19.3		2.9601051
BKSB127	0.04	U	1.9	18.8		2.93385687
BKSB135	0.04	U	2.7	15.4	J	2.73436751
BKSB140	0.04	U	4.8	108	J	4.68213123
%nondetects=	0.04	0.95744681			0	
Distribution	D		N			L
Mean	0.04		4.35348837	30.1906977		2.91700954
std dev	0		2.29920368	33.4734423		1.01859487
n	44		43	43		43
K	2.097		2.102	2.102		2.102
UTL	0.04		**9.1864145**	100.55187		5.058096
UTL(ln)=exp(mean + K(std d						**157.29074**

Soil Background							
smp_id	Cadmium				Chromium		
	Result (x)	Qual	1/2 nondetects	Ln(x)	Result (x)	Qual	Ln(x)
BKSB101	0.12		0.12	-2.1202635	5.1	J	1.62924054
BKSB102	0.05		0.05	-2.9957323	10.3	J	2.3321439
BKSB103	0.05	U	0.025	-3.6888795	10.1	J	2.31253542
BKSB105	0.11		0.11	-2.2072749	4	J	1.38629436
BKSB106	0.16		0.16	-1.8325815	7.6	J	2.02814825
BKSB107	0.35		0.35	-1.0498221	5.1	J	1.62924054
BKSB109	0.07		0.07	-2.65926	6.5	J	1.87180218
BKSB110	0.06		0.06	-2.8134107	16.6	J	2.8094027
BKSB111	0.05		0.05	-2.9957323	6.2	J	1.82454929
BKSB113	0.07		0.07	-2.65926	8.9	J	2.18605128
BKSB114	0.05	U	0.025	-3.6888795	20.3	J	3.01062089
BKSB115	0.06		0.06	-2.8134107	7.3	J	1.98787435
BKSB116	0.2		0.2	-1.6094379	2.7	J	0.99325177
BKSB118	0.19		0.19	-1.6607312	2.2	J	0.78845736
BKSB119	0.06		0.06	-2.8134107	2.1		0.74193734
BKSB120	0.04	U	0.02	-3.912023	0.93		-0.0725707
BKSB122	0.06		0.06	-2.8134107	4.9		1.58923521
BKSB123	0.08		0.08	-2.5257286	4.3		1.45861502
BKSB125	0.11		0.11	-2.2072749	5.1		1.62924054
BKSB126	0.06		0.06	-2.8134107	5.5		1.70474809
BKSB128	0.05	U	0.025	-3.6888795	8.5		2.14006616
BKSB129	0.04	U	0.02	-3.912023	4.6		1.5260563
BKSB130	0.07		0.07	-2.65926	1.8		0.58778666
BKSB131	0.15		0.15	-1.89712	7.7		2.04122033
BKSB132	0.04	U	0.02	-3.912023	5.9		1.77495235
BKSB133	0.11		0.11	-2.2072749	4.9		1.58923521
BKSB134	0.08		0.08	-2.5257286	1.2		0.18232156
BKSB136	0.2	J	0.2	-1.6094379	8.3		2.11625551
BKSB137	0.18	J	0.18	-1.7147984	8.1		2.09186406
BKSB138	0.21	J	0.21	-1.5606477	11.1		2.40694511
BKSB139	0.2	J	0.2	-1.6094379	8.4		2.12823171
BKSB141	0.45	J	0.45	-0.7985077	23.6		3.16124671
BKSB142	0.29	J	0.29	-1.2378744	8.4		2.12823171
BKSB143	0.27	J	0.27	-1.3093333	12.2		2.50143595
BKSB144	0.2	J	0.2	-1.6094379	6.5		1.87180218
BKSB104	0.15		0.15	-1.89712	3.1	J	1.13140211
BKSB108	0.2		0.2	-1.6094379	12.9	J	2.55722731
BKSB112	0.04	U	0.02	-3.912023	4	J	1.38629436
BKSB117	0.18		0.18	-1.7147984	5.7	J	1.74046617
BKSB121	0.18		0.18	-1.7147984	6.3		1.84054963
BKSB124	0.11		0.11	-2.2072749	7.2		1.97408103
BKSB127	0.04	U	0.02	-3.912023	3.7		1.30833282
BKSB135	0.17	J	0.17	-1.7719568	6.1		1.80828877
BKSB140	0.79	J	0.79	-0.2357223	16.1		2.77881927
%nondetects=		0.19148936				0	
Distribution				L			L
Mean	0.14545455			-2.343338	7.31886364		1.78668026
std dev	0.13475999			0.92656476	4.7817999		0.68062712
n	44			44	44		44
K	2.097			2.097	2.097		2.097
UTL	0.4280462			-0.400332	17.346298		3.2139553
UTL(ln)=exp(me				**0.6700977**			**24.87729**

Soil Background							
smp_id	Lead			Selenium		Silver	
	Result (x)	Qual	Ln(x)	Result (x)	Qual	Result (x)	Qual
BKSB101	6	J	1.79175947	0.37	U	0.24	U
BKSB102	5	J	1.60943791	0.36	U	0.23	U
BKSB103	9.5	J	2.2512918	0.38	U	0.24	U
BKSB105	3.9	J	1.36097655	0.33	U	0.21	U
BKSB106	5	J	1.60943791	0.33	U	0.21	U
BKSB107	6.1	J	1.80828877	0.36	U	0.23	U
BKSB109	3.2	J	1.16315081	0.34	U	0.22	U
BKSB110	7.8	J	2.05412373	0.36	U	0.23	U
BKSB111	5.3	J	1.66770682	0.35	U	0.22	U
BKSB113	6	J	1.79175947	0.36	U	0.23	U
BKSB114	7.7	J	2.04122033	0.38	U	0.24	U
BKSB115	5.1	J	1.62924054	0.32	U	0.2	U
BKSB116	5.6	J	1.7227666	0.33	U	0.21	U
BKSB118	3.7	J	1.30833282	0.34	U	0.21	U
BKSB119	1.3	J	0.26236426	0.33	U	0.21	U
BKSB120	0.72	J	-0.3285041	0.32	U	0.2	U
BKSB122	4.1	J	1.41098697	0.33	U	0.21	U
BKSB123	3.8	J	1.33500107	0.33	U	0.21	U
BKSB125	1.7	J	0.53062825	0.36		0.2	U
BKSB126	1.5	J	0.40546511	0.44		0.21	U
BKSB128	7.5	J	2.01490302	0.35	U	0.22	U
BKSB129	4.1	J	1.41098697	0.33	U	0.21	U
BKSB130	3.1	J	1.13140211	0.32	U	0.2	U
BKSB131	10.1	J	2.31253542	0.34	U	0.22	U
BKSB132	7.8	J	2.05412373	0.34	U	0.21	U
BKSB133	6.3	J	1.84054963	0.35	U	0.22	U
BKSB134	2.3	J	0.83290912	0.33	U	0.21	U
BKSB136	3	J	1.09861229	0.32	R	0.22	U
BKSB137	2.3	J	0.83290912	0.31	R	0.21	U
BKSB138	4.1	J	1.41098697	0.32	R	0.22	U
BKSB139	3.6	J	1.28093385	0.31	R	0.21	U
BKSB141	12.1	J	2.49320545	1.8	R	0.25	U
BKSB142	5	J	1.60943791	1.9	R	0.25	U
BKSB143	6.6	J	1.88706965	0.35	R	0.24	U
BKSB144	4	J	1.38629436	0.31	R	0.21	U
BKSB104	5.3	J	1.66770682	0.32	U	0.2	U
BKSB108	9.8	J	2.28238239	0.37	U	0.23	U
BKSB112	1.5	J	0.40546511	0.32	U	0.2	U
BKSB117	8.3	J	2.11625551	0.33	U	0.21	U
BKSB121	10.2	J	2.32238772	0.34	U	0.22	U
BKSB124	4.5	J	1.5040774	0.34	U	0.21	U
BKSB127	3.8	J	1.33500107	0.33	U	0.21	U
BKSB135	2.5	J	0.91629073	1.5	R	0.21	U
BKSB140	33.2	J	3.50254988	0.35	R	0.24	U
%nondetects=		0					
Distribution			L	D		D	
Mean	5.77318182		1.52441844	— 0.345		0.21795455	
std dev	4.99838289		0.67810106	0.02427744		0.01390659	
n	44		44				
K	2.097		2.097				
UTL	16.254791		2.9463964				
UTL(ln)=exp(me			19.037227				

Shapiro Wilk for Barium

	Bkgd Conc (xi) (mg/kg)	Ordered Conc. x(i)	Reverse Ordered x(n-i+1)	Difference x(n-i+1)-x(i)	a(n-i+1)	b(i)
BKSB101	21.3	2	155	153	0.3894	59.5782
BKSB102	8	3	127	124	0.2684	33.2816
BKSB103	14.7	4.4	108	103.6	0.2334	24.18024
BKSB105	23.4	4.9	72.4	67.5	0.2078	14.0265
BKSB106	43.7	5.4	68.6	63.2	0.1871	11.82472
BKSB107		5.5	65.9	60.4	0.1695	10.2378
BKSB109	155	6.1	63	56.9	0.1539	8.75691
BKSB110	24.1	6.6	43.7	37.1	0.1398	5.18658
BKSB111	7.2	7.2	41.7	34.5	0.1269	4.37805
BKSB113	20.5	7.3	39.3	32	0.1149	3.6768
BKSB114	25.2	7.8	36.3	28.5	0.1035	2.94975
BKSB115	10.6	8	36.1	28.1	0.0927	2.60487
BKSB116	4.9	8.1	28.2	20.1	0.0824	1.65624
BKSB118	4.4	10.6	27.9	17.3	0.0724	1.25252
BKSB119	3	12.2	26.3	14.1	0.0628	0.88548
BKSB120	2	14.7	25.2	10.5	0.0534	0.5607
BKSB122	6.1	14.8	24.1	9.3	0.0442	0.41106
BKSB123	5.5	15.4	24	8.6	0.0352	0.30272
BKSB125	18.1	18.1	23.4	5.3	0.0263	0.13939
BKSB126	5.4	18.8	21.3	2.5	0.0175	0.04375
BKSB128	36.3	19.3	20.5	1.2	0.0087	0.01044
BKSB129	26.3	20.1	20.1	0	0	0
BKSB130	8.1	20.5	19.3	-1.2		0
BKSB131	65.9	21.3	18.8	-2.5		0
BKSB132	41.7	23.4	18.1	-5.3		
BKSB133	68.6	24	15.4	-8.6	sum Bi=	185.94432
BKSB134	20.1	24.1	14.8	-9.3		
BKSB136	14.8	25.2	14.7	-10.5	W(0.05,43)	0.943
BKSB137	7.8	26.3	12.2	-14.1	W=	0.73470973
BKSB138	12.2	27.9	10.6	-17.3		
BKSB139	7.3	28.2	8.1	-20.1		
BKSB141	127	36.1	8	-28.1		
BKSB142	63	36.3	7.8	-28.5		
BKSB143	39.3	39.3	7.3	-32		
BKSB144	36.1	41.7	7.2	-34.5		
BKSB104	28.2	43.7	6.6	-37.1		
BKSB108	72.4	63	6.1	-56.9		
BKSB112	6.6	65.9	5.5	-60.4		
BKSB117	27.9	68.6	5.4	-63.2		
BKSB121	24	72.4	4.9	-67.5		
BKSB124	19.3	108	4.4	-103.6		
BKSB127	18.8	127	3	-124		
BKSB135	15.4	155	2	-153		
BKSB140	108			0		
Sum of xi	1298.2					
Mean	30.19069767					
n=	43					
sum of xi^2	86253.36					
1/n=	0.023255814					
xi=(sum xi)^2	1685323.24					
d=	47059.79628					
W=	0.734709728					
W(0.05,43)=	0.943					
W<W(0.5,43), distribution is not Normal						

Shapiro Wilk for Barium

	ln of ordered Conc. x(i)		ln of Reverse Order x(n-i+1)	Difference x(n-i+1)-x(i)	a(n-i+1)	b(i)
	0.693147181	0.48045301	5.043425117	4.35027794	0.3894	1.693998228
	1.098612289	1.20694896	4.844187086	3.7455748	0.2684	1.005312276
	1.481604541	2.19515202	4.682131227	3.20052669	0.2334	0.747002929
	1.589235205	2.52566854	4.282206299	2.69297109	0.2078	0.559599393
	1.686398954	2.84394143	4.228292535	2.54189358	0.1871	0.475588289
	1.704748092	2.90616606	4.188138442	2.48339035	0.1695	0.420934664
	1.808288771	3.26990828	4.143134726	2.33484596	0.1539	0.359332793
	1.887069649	3.56103186	3.777348102	1.89027845	0.1398	0.264260928
	1.974081026	3.8969959	3.730501129	1.7564201	0.1269	0.222889711
	1.987874348	3.95164442	3.671224519	1.68335017	0.1149	0.193416935
	2.054123734	4.21942431	3.591817741	1.53769401	0.1035	0.15915133
	2.079441542	4.32407713	3.586292865	1.50685132	0.0927	0.139685118
	2.091864062	4.37589525	3.339321978	1.24745792	0.0824	0.102790532
	2.360854001	5.57363161	3.328626689	0.96777269	0.0724	0.070066743
	2.501435952	6.25718182	3.269568939	0.76813299	0.0628	0.048238752
	2.687847494	7.22452415	3.226843995	0.5389965	0.0534	0.028782413
	2.694627181	7.26101564	3.18221184	0.48758466	0.0442	0.021551242
	2.734367509	7.47676568	3.17805383	0.44368632	0.0352	0.015617758
	2.895911938	8.38630595	3.152736022	0.25682408	0.0263	0.006754473
	2.93385687	8.60751613	3.058707073	0.1248502	0.0175	0.002184879
	2.960105096	8.76222218	3.020424886	0.06031979	0.0087	0.000524782
	3.000719815	9.00431941	3.000719815	0		0
	3.020424886	9.12296649	2.960105096	-0.0603198		0
	3.058707073	9.35568896	2.93385687	-0.1248502		0
	3.152736022	9.93974443	2.895911938	-0.2568241		
	3.17805383	10.1000261	2.734367509	-0.4436863		6.537684167
	3.18221184	10.1264722	2.694627181	-0.4875847		
	3.226843995	10.4125222	2.687847494	-0.5389965	W(0.05.43)	0.943
	3.269568939	10.690081	2.501435952	-0.768133	W(ln)=	0.98083423
	3.328626689	11.0797556	2.360854001	-0.9677727		
	3.339321978	11.1510713	2.091864062	-1.2474579		
	3.586292865	12.8614965	2.079441542	-1.5068513		
	3.591817741	12.9011547	2.054123734	-1.537694		
	3.671224519	13.4778895	1.987874348	-1.6833502		
	3.730501129	13.9166387	1.974081026	-1.7564201		
	3.777348102	14.2683587	1.887069649	-1.8902785		
	4.143134726	17.1655654	1.808288771	-2.334846		
	4.188138442	17.5405036	1.704748092	-2.4833903		
	4.228292535	17.8784578	1.686398954	-2.5418936		
	4.282206299	18.3372908	1.589235205	-2.6929711		
	4.682131227	21.9223528	1.481604541	-3.2005267		
	4.844187086	23.4661485	1.098612289	-3.7455748		
	5.043425117	25.4361369	0.693147181	-4.3502779		
Sum of xi	125.4314103		125.4314103			
Mean	2.917009542					
n=	43					
sum of xi^2	409.4611119					
1/n=	0.023255814					
xi=(sum xi)^	15733.03869					
d=	43.57649126					
W(ln)=	0.98083423					
W(0.05,43)	0.943					
W>W(0.5,43), distribution is lognormal						

Shapiro Wilk for Cadmium

smp_id	Cadmium	(xi)^2	Ordered Conc. x(i)	Reverse Ordered x(n-i+1)	Difference x(n-i+1)-x(i)	a(n-i+1)	b(i)	smp_id
BKSB101	0.12	0.0144	0.02	0.79	0.77	0.3872	0.298144	BKSB101
BKSB102	0.05	0.0025	0.02	0.45	0.43	0.2667	0.114681	BKSB102
BKSB103	0.025	0.00063	0.02	0.35	0.33	0.2323	0.076659	BKSB103
BKSB104	0.15	0.0225	0.02	0.29	0.27	0.2072	0.055944	BKSB104
BKSB105	0.11	0.0121	0.02	0.27	0.25	0.1868	0.0467	BKSB105
BKSB106	0.16	0.0256	0.025	0.21	0.185	0.1695	0.031358	BKSB106
BKSB107	0.35	0.1225	0.025	0.2	0.175	0.1542	0.026985	BKSB107
BKSB108	0.2	0.04	0.025	0.2	0.175	0.1405	0.024588	BKSB108
BKSB109	0.07	0.0049	0.05	0.2	0.15	0.1278	0.01917	BKSB109
BKSB110	0.06	0.0036	0.05	0.2	0.15	0.116	0.0174	BKSB110
BKSB111	0.05	0.0025	0.06	0.2	0.14	0.1049	0.014686	BKSB111
BKSB112	0.02	0.0004	0.06	0.19	0.13	0.0943	0.012259	BKSB112
BKSB113	0.07	0.0049	0.06	0.18	0.12	0.0842	0.010104	BKSB113
BKSB114	0.025	0.00063	0.06	0.18	0.12	0.0745	0.00894	BKSB114
BKSB115	0.06	0.0036	0.06	0.18	0.12	0.0651	0.007812	BKSB115
BKSB116	0.2	0.04	0.07	0.17	0.1	0.056	0.0056	BKSB116
BKSB117	0.18	0.0324	0.07	0.16	0.09	0.0471	0.004239	BKSB117
BKSB118	0.19	0.0361	0.07	0.15	0.08	0.0383	0.003064	BKSB118
BKSB119	0.06	0.0036	0.08	0.15	0.07	0.0296	0.002072	BKSB119
BKSB120	0.02	0.0004	0.08	0.12	0.04	0.0211	0.000844	BKSB120
BKSB121	0.18	0.0324	0.11	0.11	0	0.0126	0	BKSB121
BKSB122	0.06	0.0036	0.11	0.11	0	0.0042	0	BKSB122
BKSB123	0.08	0.0064	0.11	0.11	0	0	0	BKSB123
BKSB124	0.11	0.0121	0.11	0.11	0		0	BKSB124
BKSB125	0.11	0.0121	0.12	0.08	-0.04			BKSB125
BKSB126	0.06	0.0036	0.15	0.08	-0.07	Sum of b=	0.781248	BKSB126
BKSB127	0.02	0.0004	0.15	0.07	-0.08			BKSB127
BKSB128	0.025	0.00063	0.16	0.07	-0.09	W=	0.744801	BKSB128
BKSB129	0.02	0.0004	0.17	0.07	-0.1	W(0.05,44)	0.944	BKSB129
BKSB130	0.07	0.0049	0.18	0.06	-0.12			BKSB130
BKSB131	0.15	0.0225	0.18	0.06	-0.12			BKSB131
BKSB132	0.02	0.0004	0.18	0.06	-0.12			BKSB132
BKSB133	0.11	0.0121	0.19	0.06	-0.13			BKSB133
BKSB134	0.08	0.0064	0.2	0.06	-0.14			BKSB134
BKSB135	0.17	0.0289	0.2	0.05	-0.15			BKSB135
BKSB136	0.2	0.04	0.2	0.05	-0.15			BKSB136
BKSB137	0.18	0.00063	0.2	0.025	-0.175			BKSB137
BKSB138	0.21	0.0225	0.2	0.025	-0.175			BKSB138
BKSB139	0.2	0.0121	0.21	0.025	-0.185			BKSB139
BKSB140	0.79	0.0256	0.27	0.02	-0.25			BKSB140
BKSB141	0.45	0.1225	0.29	0.02	-0.27			BKSB141
BKSB142	0.29	0.04	0.35	0.02	-0.33			BKSB142
BKSB143	0.27	0.0049	0.45	0.02	-0.43			BKSB143
BKSB144	0.2	0.0036	0.79	0.02	-0.77			BKSB144
Sum of xi	6.225							Sum of xi
Mean	0.14147727							Mean
n=	44							n=
sum of xi^2	1.700175							sum of xi^2
1/n=	0.02272727							1/n=
xi=(sum xi)^2	38.750625							xi=(sum xi)^2
d=	0.81947898							d=
W=	0.7448006							W=
W(0.05,44)=	0.944							W(0.05,44)=
W<W(0.5,44), the distribution is not normal								W<W(0.5,44),

Shapiro Wilk for Cadmium

ln of ordered Conc. x(i)	ln(xi)^2	ln of Reverse Order x(n-i+1)	Difference x(n-i+1)-x(i)	a(n-i+1)	b(i)
-3.912023005	15.303924	-0.2357223	3.67630067	0.3872	1.42346362
-3.912023005	15.303924	-0.7985077	3.11351531	0.2667	0.83037453
-3.912023005	15.303924	-1.0498221	2.86220088	0.2323	0.66488926
-3.912023005	15.303924	-1.2378744	2.67414865	0.2072	0.5540836
-3.912023005	15.303924	-1.3093333	2.60268969	0.1868	0.48618243
-3.688879454	13.607832	-1.5606477	2.12823171	0.1695	0.36073527
-3.688879454	13.607832	-1.6094379	2.07944154	0.1542	0.32064989
-3.688879454	13.607832	-1.6094379	2.07944154	0.1405	0.29216154
-2.995732274	8.9744119	-1.6094379	1.38629436	0.1278	0.17716842
-2.995732274	8.9744119	-1.6094379	1.38629436	0.116	0.16081015
-2.813410717	7.9152799	-1.6094379	1.2039728	0.1049	0.12629675
-2.813410717	7.9152799	-1.6607312	1.15267951	0.0943	0.10869768
-2.813410717	7.9152799	-1.7147984	1.09861229	0.0842	0.09250315
-2.813410717	7.9152799	-1.7147984	1.09861229	0.0745	0.08184662
-2.813410717	7.9152799	-1.7147984	1.09861229	0.0651	0.07151966
-2.659260037	7.0716639	-1.7719568	0.8873032	0.056	0.04968898
-2.659260037	7.0716639	-1.8325815	0.82667857	0.0471	0.03893656
-2.659260037	7.0716639	-1.89712	0.76214005	0.0383	0.02918996
-2.525728644	6.3793052	-1.89712	0.62860866	0.0296	0.01860682
-2.525728644	6.3793052	-2.1202635	0.40546511	0.0211	0.00855531
-2.207274913	4.8720625	-2.2072749	0	0.0126	0
-2.207274913	4.8720625	-2.2072749	0	0.0042	0
-2.207274913	4.8720625	-2.2072749	0	0	0
-2.207274913	4.8720625	-2.2072749	0		0
-2.120263536	4.4955175	-2.5257286	-0.40546511		
-1.897119985	3.5990642	-2.5257286	-0.62860866	Sum of b=	5.8963602
-1.897119985	3.5990642	-2.65926	-0.76214005		
-1.832581464	3.3583548	-2.65926	-0.82667857	W=	0.94177684
-1.771956842	3.139831	-2.65926	-0.8873032	W(0.05,44)	0.944
-1.714798428	2.9405336	-2.8134107	-1.09861229		
-1.714798428	2.9405336	-2.8134107	-1.09861229		
-1.714798428	2.9405336	-2.8134107	-1.09861229		
-1.660731207	2.7580281	-2.8134107	-1.15267951		
-1.609437912	2.5902904	-2.8134107	-1.2039728		
-1.609437912	2.5902904	-2.9957323	-1.38629436		
-1.609437912	2.5902904	-2.9957323	-1.38629436		
-1.609437912	2.5902904	-3.6888795	-2.07944154		
-1.609437912	2.5902904	-3.6888795	-2.07944154		
-1.560647748	2.4356214	-3.6888795	-2.12823171		
-1.30933332	1.7143537	-3.912023	-2.60268969		
-1.237874356	1.5323329	-3.912023	-2.67414865		
-1.049822124	1.1021265	-3.912023	-2.86220088		
-0.798507696	0.6376145	-3.912023	-3.11351531		
-0.235722334	0.055565	-3.912023	-3.67630067		
-103.106874					
-2.343338046					
44					
278.5307172					
0.022727273					
10631.02747					
36.91645655					
0.941776836					
0.944					
he distribution is approximately lognormal					

Shapiro Wilk Chromium

smp_id	Chromium	Ordered Conc. x(i)	Reverse Ordered x(n-i+1)	Difference x(n-i+1)-x(i)	a(n-i+1)	b(i)
BKSB101	5.1	0.93	23.6	22.67	0.3872	8.777824
BKSB102	10.3	1.2	20.3	19.1	0.2667	5.09397
BKSB103	10.1	1.8	16.6	14.8	0.2323	3.43804
BKSB104	3.1	2.1	16.1	14	0.2072	2.9008
BKSB105	4	2.2	12.9	10.7	0.1868	1.99876
BKSB106	7.6	2.7	12.2	9.5	0.1695	1.61025
BKSB107	5.1	3.1	11.1	8	0.1542	1.2336
BKSB108	12.9	3.7	10.3	6.6	0.1405	0.9273
BKSB109	6.5	4	10.1	6.1	0.1278	0.77958
BKSB110	16.6	4	8.9	4.9	0.116	0.5684
BKSB111	6.2	4.3	8.5	4.2	0.1049	0.44058
BKSB112	4	4.6	8.4	3.8	0.0943	0.35834
BKSB113	8.9	4.9	8.4	3.5	0.0842	0.2947
BKSB114	20.3	4.9	8.30	3.4	0.0745	0.2533
BKSB115	7.3	5.1	8.1	3	0.0651	0.1953
BKSB116	2.7	5.1	7.7	2.6	0.056	0.1456
BKSB117	5.7	5.1	7.6	2.5	0.0471	0.11775
BKSB118	2.2	5.5	7.3	1.8	0.0383	0.06894
BKSB119	2.1	5.7	7.2	1.5	0.0296	0.0444
BKSB120	0.93	5.9	6.5	0.6	0.0211	0.01266
BKSB121	6.3	6.1	6.5	0.4	0.0126	0.00504
BKSB122	4.9	6.2	6.3	0.1	0.0042	0.00042
BKSB123	4.3	6.3	6.2	-0.1	0	0
BKSB124	7.2	6.5	6.1	-0.4	0.0037	-0.00148
BKSB125	5.1	6.5	5.9	-0.6	Sum of b=	29.264074
BKSB126	5.5	7.2	5.7	-1.5		
BKSB127	3.7	7.3	5.5	-1.8	W=	0.87100033
BKSB128	8.5	7.6	5.1	-2.5	W(0.05,45)	0.945
BKSB129	4.6	7.7	5.1	-2.6		
BKSB130	1.8	8.1	5.1	-3		
BKSB131	7.7	8.30	4.9	-3.4		
BKSB132	5.9	8.4	4.9	-3.5		
BKSB133	4.9	8.4	4.6	-3.8		
BKSB134	1.2	8.5	4.3	-4.2		
BKSB135	6.1	8.9	4	-4.9		
BKSB136	8.30	10.1	4	-6.1		
BKSB137	8.1	10.3	3.7	-6.6		
BKSB138	11.1	11.1	3.1	-8		
BKSB139	8.4	12.2	2.7	-9.5		
BKSB140	16.1	12.9	2.2	-10.7		
BKSB141	23.6	16.1	2.1	-14		
BKSB142	8.4	16.6	1.8	-14.8		
BKSB143	12.2	20.3	1.2	-19.1		
BKSB144	6.5	23.6	0.93	-22.67		
Sum of x_i	322.03					
Mean	7.31886364					
n=	44					
sum of x_i^2	3340.1149					
1/n=	0.02272727					
x_i-(sum xi)^2	103703.321					
d=	983.221243					
W=	0.87100033					
W(0.05,44)=	0.944					
W<W(0.5,45), the distribution is not normal						

Shapiro Wilk Chromium

smp_id	ln of ordered Conc. x(i)	ln(xi)^2	ln of Reverse Order x(n-i+1)	Difference x(n-i+1)-x(i)	a(n-i+1)	b(i)
BKSB101	-0.07257069	0.00526651	3.161246712	3.2338174	0.3872	1.2521341
BKSB102	0.182321557	0.03324115	3.010620886	2.82829933	0.2667	0.75430743
BKSB103	0.587786665	0.34549316	2.809402695	2.22161603	0.2323	0.5160814
BKSB104	0.741937345	0.55047102	2.778819272	2.03688193	0.2072	0.42204194
BKSB105	0.78845736	0.62166501	2.557227311	1.76876995	0.1868	0.33040623
BKSB106	0.993251773	0.98654908	2.501435952	1.50818418	0.1695	0.25563722
BKSB107	1.131402111	1.28007074	2.406945108	1.275543	0.1542	0.19668873
BKSB108	1.30833282	1.71173477	2.332143895	1.02381108	0.1405	0.14384546
BKSB109	1.386294361	1.92181206	2.312535424	0.92624106	0.1278	0.11837361
BKSB110	1.386294361	1.92181206	2.186051277	0.79975692	0.116	0.0927718
BKSB111	1.458615023	2.12755778	2.140066163	0.68145114	0.1049	0.07148422
BKSB112	1.526056303	2.32884784	2.128231706	0.6021754	0.0943	0.05678514
BKSB113	1.589235205	2.52566854	2.128231706	0.5389965	0.0842	0.04538351
BKSB114	1.589235205	2.52566854	2.116255515	0.52702031	0.0745	0.03926301
BKSB115	1.62924054	2.65442474	2.091864062	0.46262352	0.0651	0.03011679
BKSB116	1.62924054	2.65442474	2.041220329	0.41197979	0.056	0.02307087
BKSB117	1.62924054	2.65442474	2.028148247	0.39890771	0.0471	0.01878855
BKSB118	1.704748092	2.90616606	1.987874348	0.28312626	0.0383	0.01084374
BKSB119	1.740466175	3.02922251	1.974081026	0.23361485	0.0296	0.006915
BKSB120	1.774952351	3.15045585	1.871802177	0.09684983	0.0211	0.00204353
BKSB121	1.808288771	3.26990828	1.871802177	0.06351341	0.0126	0.00080027
BKSB122	1.824549292	3.32898012	1.840549633	0.01600034	0.0042	6.7201E-05
BKSB123	1.840549633	3.38762295	1.824549292	-0.0160003	0	0
BKSB124	1.871802177	3.50364339	1.808288771	-0.0635134		0
BKSB125	1.871802177	3.50364339	1.774952351	-0.0968498	Sum of b=	4.38784974
BKSB126	1.974081026	3.8969959	1.740466175	-0.2336149		
BKSB127	1.987874348	3.95164442	1.704748092	-0.2831263	W=	0.96653268
BKSB128	2.028148247	4.11338531	1.62924054	-0.3989077	W(0.05,45)	0.945
BKSB129	2.041220329	4.16658043	1.62924054	-0.4119798		
BKSB130	2.091864062	4.37589525	1.62924054	-0.4626235		
BKSB131	2.116255515	4.4785374	1.589235205	-0.5270203		
BKSB132	2.128231706	4.52937019	1.589235205	-0.5389965		
BKSB133	2.128231706	4.52937019	1.526056303	-0.6021754		
BKSB134	2.140066163	4.57988318	1.458615023	-0.6814511		
BKSB135	2.186051277	4.77882018	1.386294361	-0.7997569		
BKSB136	2.312535424	5.34782009	1.386294361	-0.9262411		
BKSB137	2.332143895	5.79338475	1.30833282	-1.0238111		
BKSB138	2.406945108	6.25718182	1.131402111	-1.275543		
BKSB139	2.501435952	6.53941152	0.993251773	-1.5081842		
BKSB140	2.557227311	7.72183655	0.78845736	-1.76877		
BKSB141	2.778819272	7.8927435	0.741937345	-2.0368819		
BKSB142	2.809402695	9.06383812	0.587786665	-2.221616		
BKSB143	3.010620886	9.99348077	0.182321557	-2.8282993		
BKSB144	3.161246712	#REF!	-0.072570693	-3.2338174		
Sum of x_i	78.61393132					
Mean	1.786680257					
n=	44					
sum of x_i^2	160.3778498					
1/n=	0.022727273					
x_i-(sum xi)^	6180.150197					
d=	19.91989073					
W=	0.96653268					
W(0.05,44)	0.944					
W>W(0.5,44), the distribution is lognormal						

Shapiro Wilk for Lead

smp_id	Lead	Ordered Conc. x(i)	Reverse Ordered x(n-i+1)	Difference x(n i+1)-x(i)	a(n-i+1)	b(i)
BKSB101	6	0.72	33.2	32.48	0.3872	12.57626
BKSB102	5	1.3	12.1	10.8	0.2667	2.88036
BKSB103	9.5	1.5	10.2	8.7	0.2323	2.02101
BKSB104	5.3	1.5	10.1	8.6	0.2072	1.78192
BKSB105	3.9	1.7	9.8	8.1	0.1868	1.51308
BKSB106	5	2.3	9.5	7.2	0.1695	1.2204
BKSB107	6.1	2.3	8.3	6	0.1542	0.9252
BKSB108	9.8	2.5	7.8	5.3	0.1405	0.74465
BKSB109	3.2	3.00	7.8	4.8	0.1278	0.61344
BKSB110	7.8	3.1	7.7	4.6	0.116	0.5336
BKSB111	5.3	3.2	7.5	4.3	0.1049	0.45107
BKSB112	1.5	3.6	6.6	3	0.0943	0.2829
BKSB113	6	3.7	6.3	2.6	0.0842	0.21892
BKSB114	7.7	3.8	6.1	2.3	0.0745	0.17135
BKSB115	5.1	3.8	6	2.2	0.0651	0.14322
BKSB116	5.6	3.9	6	2.1	0.056	0.1176
BKSB117	8.3	4	5.6	1.6	0.0471	0.07536
BKSB118	3.7	4.1	5.3	1.2	0.0383	0.04596
BKSB119	1.3	4.1	5.3	1.2	0.0296	0.03552
BKSB120	0.72	4.1	5.1	1	0.0211	0.0211
BKSB121	10.2	4.5	5	0.5	0.0126	0.0063
BKSB122	4.1	5	5	0	0.0042	0
BKSB123	3.8	5	5	0	0	0
BKSB124	4.5	5	4.5	-0.5		0
BKSB125	1.7	5.1	4.1	-1		
BKSB126	1.5	5.3	4.1	-1.2	Sum of b=	26.37922
BKSB127	3.8	5.3	4.1	-1.2		
BKSB128	7.5	5.6	4	-1.6	W=	0.647733
BKSB129	4.1	6	3.9	-2.1	W(0.05,45)	0.945
BKSB130	3.1	6	3.8	-2.2		
BKSB131	10.1	6.1	3.8	-2.3		
BKSB132	7.8	6.3	3.7	-2.6		
BKSB133	6.3	6.6	3.6	-3		
BKSB134	2.3	7.5	3.2	-4.3		
BKSB135	2.5	7.7	3.1	-4.6		
BKSB136	3.00	7.8	3.00	-4.8		
BKSB137	2.3	7.8	2.5	-5.3		
BKSB138	4.1	8.3	2.3	-6		
BKSB139	3.6	9.5	2.3	-7.2		
BKSB140	33.2	9.8	1.7	-8.1		
BKSB141	12.1	10.1	1.5	-8.6		
BKSB142	5	10.2	1.5	-8.7		
BKSB143	6.6	12.1	1.3	-10.8		
BKSB144	4	33.2	0.72	-32.48		
Sum of xi	254.02					
Mean	5.773182					
n=	44					
sum of xi^2	2540.808					
1/n=	0.022727					
xi=(sum xi)^2	64526.16					
d=	1074.305					
W=	0.647733					
W(0.05,44)=	0.944					
W<W(0.5,44), the distribution is not normal						

Shapiro Wilk for Lead

smp_id	ln of ordered Conc. x(i)	ln(xi)^2	ln of Reverse Order x(n-i+1)	Difference x(n-i+1)-x(i)	a(n-i+1)	b(i)
BKSB101	-0.328504067	0.107914922	3.502549876	3.83105394	0.3872	1.48338409
BKSB102	0.262364264	0.068835007	2.493205453	2.23084119	0.2667	0.59496534
BKSB103	0.405465108	0.164401954	2.32238772	1.91692261	0.2323	0.44530112
BKSB104	0.405465108	0.164401954	2.312535424	1.90707032	0.2072	0.39514497
BKSB105	0.530628251	0.281566341	2.282382386	1.75175413	0.1868	0.32722767
BKSB106	0.832909123	0.693737607	2.251291799	1.41838268	0.1695	0.24041586
BKSB107	0.832909123	0.693737607	2.116255515	1.28334639	0.1542	0.19789201
BKSB108	0.916290732	0.839588705	2.054123734	1.137833	0.1405	0.15986554
BKSB109	1.098612289	1.206948961	2.054123734	0.95551145	0.1278	0.12211436
BKSB110	1.131402111	1.280070738	2.041220329	0.90981822	0.116	0.10553891
BKSB111	1.16315081	1.352919806	2.014903021	0.85175221	0.1049	0.08934881
BKSB112	1.280933845	1.640791516	1.887069649	0.6061358	0.0943	0.05715861
BKSB113	1.30833282	1.711734767	1.840549633	0.53221681	0.0842	0.04481266
BKSB114	1.335001067	1.782227848	1.808288771	0.4732877	0.0745	0.03525993
BKSB115	1.335001067	1.782227848	1.791759469	0.4567584	0.0651	0.02973497
BKSB116	1.360976553	1.852257178	1.791759469	0.43078292	0.056	0.02412384
BKSB117	1.386294361	1.921812056	1.722766598	0.33647224	0.0471	0.01584784
BKSB118	1.410986974	1.99088424	1.667706821	0.25671985	0.0383	0.00983237
BKSB119	1.410986974	1.99088424	1.667706821	0.25671985	0.0296	0.00759891
BKSB120	1.410986974	1.99088424	1.62924054	0.21825357	0.0211	0.00460515
BKSB121	1.504077397	2.262248815	1.609437912	0.10536052	0.0126	0.00132754
BKSB122	1.609437912	2.590290394	1.609437912	0	0.0042	0
BKSB123	1.609437912	2.590290394	1.609437912	0		0
BKSB124	1.609437912	2.590290394	1.504077397	-0.10536052		0
BKSB125	1.62924054	2.654424736	1.410986974	-0.21825357		
BKSB126	1.667706821	2.781246039	1.410986974	-0.25671985	Sum of b=	4.39150052
BKSB127	1.667706821	2.781246039	1.410986974	-0.25671985		
BKSB128	1.722766598	2.96792475	1.386294361	-0.33647224	W(ln)=	0.97536815
BKSB129	1.791759469	3.210401996	1.360976553	-0.43078292		
BKSB130	1.791759469	3.210401996	1.335001067	-0.4567584	W(0.05,44)	0.944
BKSB131	1.808288771	3.26990828	1.335001067	-0.4732877		
BKSB132	1.840549633	3.387622953	1.30833282	-0.53221681		
BKSB133	1.887069649	3.56103186	1.280933845	-0.6061358		
BKSB134	2.014903021	4.059834182	1.16315081	-0.85175221		
BKSB135	2.041220329	4.166580431	1.131402111	-0.90981822		
BKSB136	2.054123734	4.219424313	1.098612289	-0.95551145		
BKSB137	2.054123734	4.219424313	0.916290732	-1.137833		
BKSB138	2.116255515	4.478537404	0.832909123	-1.28334639		
BKSB139	2.251291799	5.068314762	0.832909123	-1.41838268		
BKSB140	2.282382386	5.209269354	0.530628251	-1.75175413		
BKSB141	2.312535424	5.347820087	0.405465108	-1.90707032		
BKSB142	2.32238772	5.393484723	0.405465108	-1.91692261		
BKSB143	2.493205453	6.216073429	0.262364264	-2.23084119		
BKSB144	3.502549876	12.26785563	-0.328504067	-3.83105394		
Sum of xi	67.07441138					
Mean	1.52441844		—			
n=	44					
sum of xi^2	122.0217748					
1/n=	0.022727273					
xi=(sum xi)^2	4498.976662					
d=	19.77230523					
W(ln)=	0.975368151					
W(0.05,44)=	0.944					
W>W(0.5,44), the distribution is lognormal						

Shapiro Wilk for Arsenic

smp_id	Arsenic				a(n-i+1)	b(i)
BKSB101	3	0.44	11.6	11.16	0.3894	4.345704
BKSB102	2	0.66	9.2	8.54	0.2684	2.292136
BKSB103	9.1	1	9.1	8.1	0.2334	1.89054
BKSB104	6.2	1.6	8.2	6.6	0.2078	1.37148
BKSB105	4.3	1.9	7.6	5.7	0.1871	1.06647
BKSB106	4.4	2	6.2	4.2	0.1695	0.7119
BKSB108	6	2.5	6	3.5	0.1539	0.53865
BKSB109	3.5	2.6	6	3.4	0.1398	0.47532
BKSB110	4.8	2.6	5.7	3.1	0.1269	0.39339
BKSB111	5.2	2.7	5.6	2.9	0.1149	0.33321
BKSB112	1.6	2.9	5.3	2.4	0.1035	0.2484
BKSB113	5.7	3	5.3	2.3	0.0927	0.21321
BKSB114	5.2	3.2	5.2	2	0.0824	0.1648
BKSB115	5.3	3.2	5.2	2	0.0724	0.1448
BKSB116	11.6	3.2	4.8	1.6	0.0628	0.10048
BKSB117	4.4	3.5	4.8	1.3	0.0534	0.06942
BKSB118	2.6	3.6	4.4	0.8	0.0442	0.03536
BKSB119	0.66	3.7	4.4	0.7	0.0352	0.02464
BKSB120	0.44	3.8	4.3	0.5	0.0263	0.01315
BKSB121	4.1	3.8	4.30	0.5	0.0175	0.00875
BKSB122	3.2	3.8	4.2	0.4	0.0087	0.00348
BKSB123	3.8	4.1	4.1	0	0	0
BKSB124	6	4.2	3.8	-0.4		
BKSB125	3.2	4.3	3.8	-0.5		
BKSB126	2.5	4.30	3.8	-0.5	sum Bi=	14.44529
BKSB127	1.9	4.4	3.7	-0.7		
BKSB128	3.6	4.4	3.6	-0.8	W(0.05,43)	0.943
BKSB129	2.6	4.8	3.5	-1.3	W=	0.939827935
BKSB130	1	4.8	3.2	-1.6		
BKSB131	5.3	5.2	3.2	-2		
BKSB132	4.2	5.2	3.2	-2		
BKSB133	3.2	5.3	3	-2.3		
BKSB134	2.9	5.3	2.9	-2.4		
BKSB135	2.7	5.6	2.7	-2.9		
BKSB136	4.30	5.7	2.6	-3.1		
BKSB137	8.2	6	2.6	-3.4		
BKSB138	9.2	6	2.5	-3.5		
BKSB139	7.6	6.2	2	-4.2		
BKSB140	4.8	7.6	1.9	-5.7		
BKSB141	5.6	8.2	1.6	-6.6		
BKSB142	3.8	9.1	1	-8.1		
BKSB143	3.8	9.2	0.66	-8.54		
BKSB144	3.7	11.6	0.44	-11.16		
Sum of xi	187.2					
Mean	4.3534884					
n=	43					
sum of xi^2	1036.9992					
1/n=	0.0232558					
xi=(sum xi)^2	35043.84					
d=	222.02618					
W=	0.9398279					
W(0.05,43)=	0.943					
W<W(0.5,43), the distribution is approximately normal						

Shapiro Wilk for Arsenic

	ln of ordered Conc. x(i)		ln of Reverse Order x(n-i+1)	Difference x(n-i+1)-x(i)	a(n-i+1)	b(i)
	-0.820980552	0.674009067	2.451005098	3.27198565	0.3894	1.27411121
	-0.415515444	0.172653084	2.219203484	2.63471893	0.2684	0.70715856
	0	0	2.208274414	2.20827441	0.2334	0.51541125
	0.470003629	0.220903412	2.104134154	1.63413053	0.2078	0.33957232
	0.641853886	0.411976411	2.028148247	1.38629436	0.1871	0.25937567
	0.693147181	0.480453014	1.824549292	1.13140211	0.1695	0.19177266
	0.916290732	0.839588705	1.791759469	0.87546874	0.1539	0.13473464
	0.955511445	0.913002122	1.791759469	0.83624802	0.1398	0.11690747
	0.955511445	0.913002122	1.740466175	0.78495473	0.1269	0.09961076
	0.993251773	0.986549085	1.722766598	0.72951482	0.1149	0.08382125
	1.064710737	1.133608953	1.667706821	0.60299608	0.1035	0.06241009
	1.098612289	1.206948961	1.667706821	0.56909453	0.0927	0.05275506
	1.16315081	1.352919806	1.648658626	0.48550782	0.0824	0.04000584
	1.16315081	2.781246039	1.648658626	0.48550782	0.0724	0.03515077
	1.16315081	6.007425991	1.568615918	0.40546511	0.0628	0.02546321
	1.252762968	2.195152016	1.568615918	0.31585295	0.0534	0.01686655
	1.280933845	0.913002122	1.481604541	0.2006707	0.0442	0.00886964
	1.30833282	0.172653084	1.481604541	0.17327172	0.0352	0.00609916
	1.335001067	0.674009067	1.458615023	0.12361396	0.0263	0.00325105
	1.335001067	1.99088424	1.458615023	0.12361396	0.0175	0.00216324
	1.335001067	1.352919806	1.435084525	0.10008346	0.0087	0.00087073
	1.410986974	1.782227848	1.410986974	0		0
	1.435084525	3.210401996	1.335001067	-0.1000835		0
	1.458615023	1.352919806	1.335001067	-0.123614		0
	1.458615023	0.839588705	1.335001067	-0.123614		
	1.481604541	0.411976411	1.30833282	-0.1732717		3.97638115
	1.481604541	1.640791516	1.280933845	-0.2006707		
	1.568615918	0.913002122	1.252762968	-0.3158529	W(0.05,43)	0.943
	1.568615918	0	1.16315081	-0.4054651	W(ln)=	0.91061638
	1.648658626	2.781246039	1.16315081	-0.4855078		
	1.648658626	2.059467595	1.16315081	-0.4855078		
	1.667706821	1.352919806	1.098612289	-0.5690945		
	1.667706821	1.133608953	1.064710737	-0.6029961		
	1.722766598	0.986549085	0.993251773	-0.7295148		
	1.740466175	2.127557784	0.955511445	-0.7849547		
	1.791759469	4.427380539	0.955511445	-0.836248		
	1.791759469	4.924864104	0.916290732	-0.8754687		
	1.824549292	4.113385313	0.693147181	-1.1314021		
	2.028148247	2.460555898	0.641853886	-1.3862944		
	2.104134154	2.96792475	0.470003629	-1.6341305		
	2.208274414	1.782227848	0	-2.2082744		
	2.219203484	1.782227848	-0.415515444	-2.6347189		
	2.451005098	1.711734767	-0.820980552	-3.2719857		
Sum of xi	56.26742214		56.26742214			
Mean	1.308544701					
n=	43					
sum of xi^2	90.99206827					
1/n=	0.023255814					
xi=(sum xi)^2	3166.022794					
d=	17.3636312					
W=	0.910616383					
W(0.05,43)=	0.943					
W<W(0.5,43), the distribution is not lognormal						

APPENDIX G

FH-038B Screening Results

Summary of Detected Analytical Results, Detection Limits and Screening Criteria for FH-038B Samples

Location	Sample ID	Depth	Parameter	Result	PQL	Units	Screening Criteria	Screening Value	Units
SB105	38SB136	1.0-2.0	Lead	0.87 N	0.19	mg/kg	Soil Background	19	mg/kg
	38SB137	4.0-5.0	Lead	5.8 N	0.22	mg/kg	Soil Background	19	mg/kg
SB106	38SB133	1.0-2.0	Lead	12.6 N	0.25	mg/kg	Soil Background	19	mg/kg
	38SB134	6.0-7.0	Lead	6.1 N	0.21	mg/kg	Soil Background	19	mg/kg
	38SB135	10.0-11.0	Lead	2.4 N	0.2	mg/kg	Soil Background	19	mg/kg
SB107	38SB129	1.0-2.0	Lead	7.5 N	0.24	mg/kg	Soil Background	19	mg/kg
	38SB130	5.0-6.0	Lead	2.1 N	0.2	mg/kg	Soil Background	19	mg/kg
	38SB131	10.0-11.0	Lead	1.9 N	0.19	mg/kg	Soil Background	19	mg/kg
	38SB132	15.0-16.0	Lead	2 N	0.19	mg/kg	Soil Background	19	mg/kg

Summary of Detected Analytical Results, Detection Limits and Screening Criteria for FH-038B Samples

Location	Sample ID	Depth	Parameter	Result	PQL	Units	Screening Criteria	Screening Value	Units
SB121	38SB186	0.0-2.0	Lead	3.3	0.17	mg/kg	Soil Background	19	mg/kg
	38SB187	4.0-6.0	Lead	1.2	0.16	mg/kg	Soil Background	19	mg/kg
	38SB188	6.0-6.8	Lead	1.1	0.16	mg/kg	Soil Background	19	mg/kg
SB122	38SB189	0.0-2.0	Lead	5.4	0.17	mg/kg	Soil Background	19	mg/kg
	38SB190	2.0-4.0	Lead	2.5	0.16	mg/kg	Soil Background	19	mg/kg
	38SB191	4.0-6.0	Lead	2.5	0.16	mg/kg	Soil Background	19	mg/kg
	38SB192	6.0-6.5	Lead	2.3	0.16	mg/kg	Soil Background	19	mg/kg
SB123	38SB193	0.0-2.0	Lead	1.9	0.15	mg/kg	Soil Background	19	mg/kg
	38SB194	4.0-6.0	Lead	1.5	0.17	mg/kg	Soil Background	19	mg/kg

Summary of Detected Analytical Results, Detection Limits and Screening Criteria for FH-038B Samples

Location	Sample ID	Depth	Parameter	Result	PQL	Units	Screening Criteria	Screening Value	Units
SB124	38SB195	8.0-10.0	Lead	60.9	0.16	mg/kg	Soil Background	19	mg/kg
	38SB196	10.0-10.5	Lead	2.1	0.16	mg/kg	Soil Background	19	mg/kg
SB125	38SB197	8.0-9.5	Lead	11.2	0.16	mg/kg	Soil Background	19	mg/kg
UST	38GW101	--	Lead	44.3 J	0.0075	mg/l	30 TAC 335 Groundwater	0.015	mg/l
	38SB159	2.0-2.5	Lead	13.3 J	0.18	mg/kg	Soil Background	19	mg/kg
	38SB160	2.0-2.5	Lead	1.5 J	0.16	mg/kg	Soil Background	19	mg/kg
	38SB161	8.0-10.0	Lead	816 J	0.17	mg/kg	Soil Background	19	mg/kg
	38SB162	8.0-10.0	Lead	4480 J	0.18	mg/kg	Soil Background	19	mg/kg