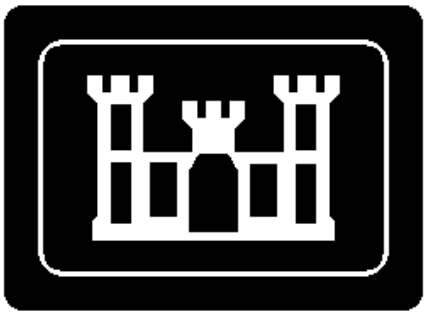
RCRA FACILITY INVESTIGATION REPORT

FOR

FH-038C (Holding Tank, Building 15023)
FORT HOOD, TEXAS

PREPARED FOR



U.S. ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT

CONTRACT NO. DACA63-96-D-0021

OCTOBER 28, 1998

SAIC Science Applications International Corporation
An Employee-Owned Company

RCRA Facility Investigation Report
For
Site FH-038C (Holding Tank, Bldg. 15023)

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

Under Contract Number
DACA63-96-D-0021

Prepared by
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October 28, 1998

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APPENDICES

ACRONYMS

AA	Atomic absorption
ATV	All-Terrain Vehicle
BEGM	Bureau of Economic Geology
BG	background
BGS	below ground surface
CQAR	Chemical Quality Assurance Report
DOT	Department of Transportation
DPW	Directorate of Public Works
EM	Electromagnetic
FH	Fort Hood
ft	feet or foot
GC/MS	Gas Chromatography/Mass Spectrometry
ICP	Inductively coupled plasma
IDW	Investigation Derived Waste
LCS	Laboratory Control Samples
MSC	medium specific concentration
msl	mean sea level
MS/MSDs	Matrix Spike/Matrix Spike Duplicate
ppb	parts per billion
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
TCLP	Toxicity Characteristic Leaching Procedure
TNRCC	Texas Natural Resource 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 1996b). 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, active 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.

This report describes the collection and analysis of soil data from SWMU FH-038C (Building 15023 Holding Tank), one of 35 SWMUs investigated during the RFI conducted November 1996 through September 1997. Building 15023 is located between North and Central Avenues and east of 41st street. FH-038C is located on the west side and adjacent to the building.

1.1 BACKGROUND

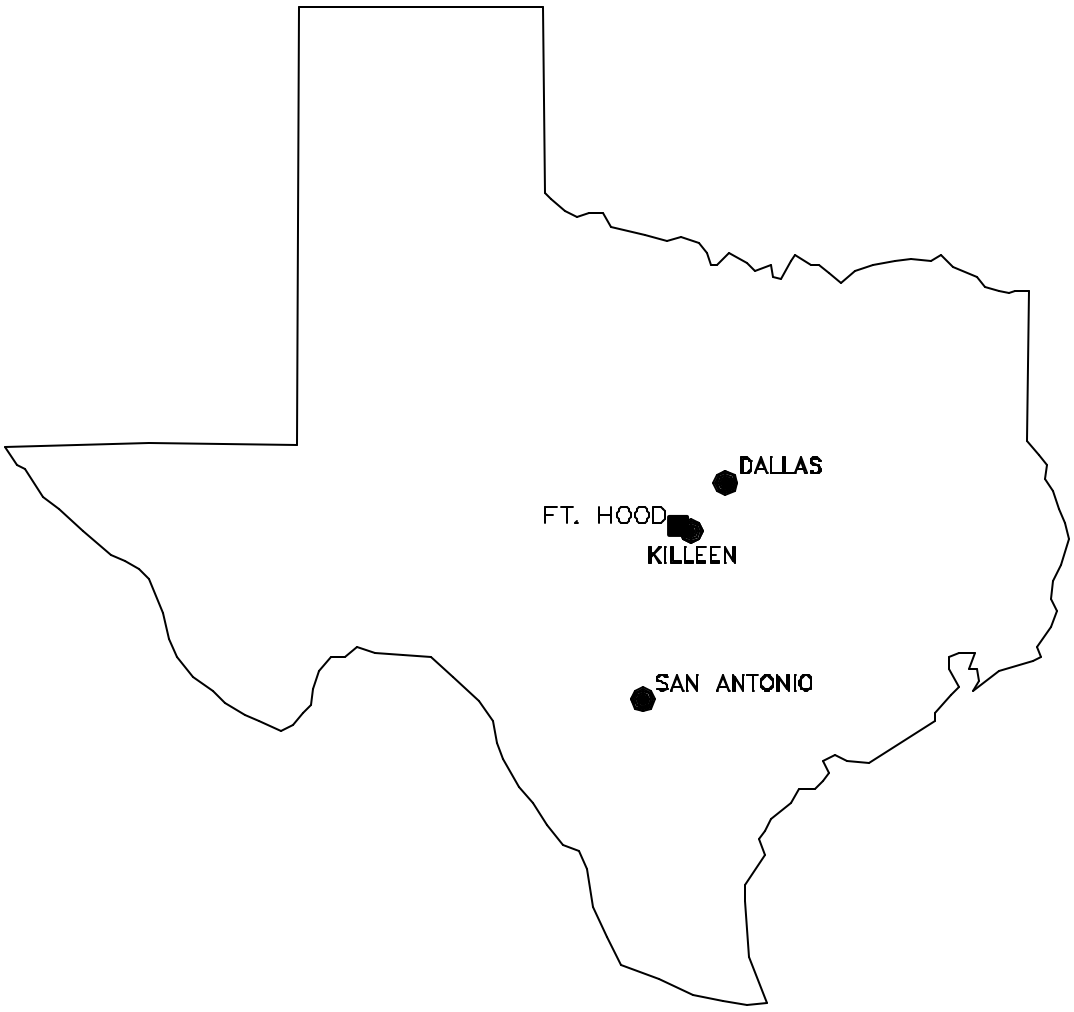
FH-038C is one of four SWMUs adjacent to battery shops. Each battery shop is a free-standing building within a tactical motor pool facility in the main cantonment. Each shop is approximately 30 ft by 30 ft in size, with an underground holding tank located adjacent to the building. According to the RFI Work Plan for 35 SWMUs (USACE 1995), these underground tanks were reported to be made of fiberglass, were installed in 1982, were used until 1992, and removed in 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-038C was to determine if a release has occurred due to spills or leakage of spent electrolyte drained to the tank. 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-038C were as follows:

- determine the presence or absence of lead contamination in the surface and subsurface soils associated with the tank and piping;
- characterize the migration potential of any contaminants identified in the surface and subsurface soils;



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RCRA FACILITY INVESTIGATION

FORT HOOD
VICINITY MAP

Science Applications International Corporation — Columbus, Ohio

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SC			NO SCALE		1.1

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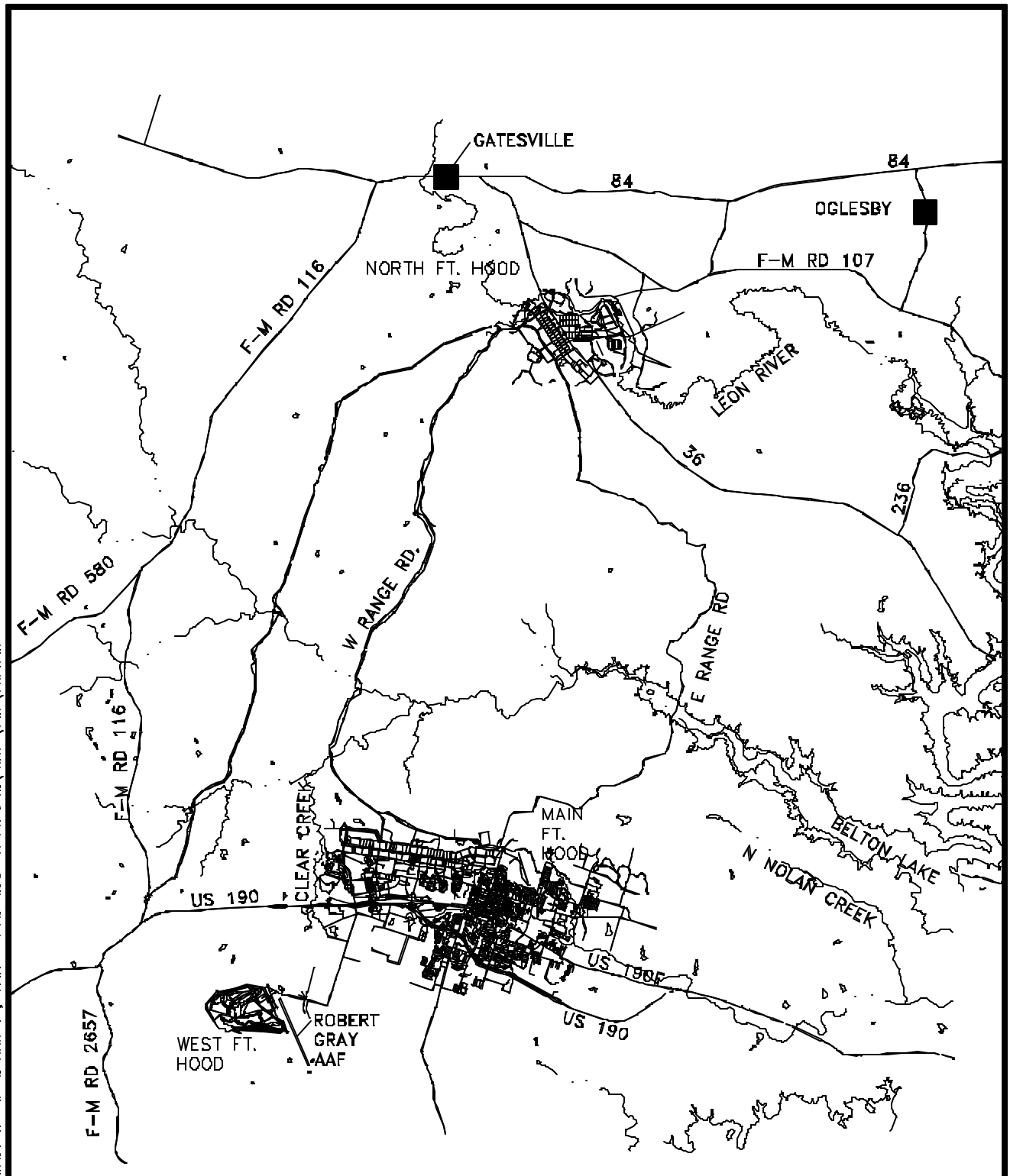

LEGEND

- MAJOR ROADS
- RIVERS/STREAMS
- WATER BODIES

U.S. ARMY
FORT HOOD, TEXAS

RCRA FACILITY INVESTIGATION

FT. HOOD INSTALLATION MAP

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			1"=7000M		1.2

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- determine if groundwater is present below the tank 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-038C.

The approach to the RFI included field sampling and laboratory analysis of surface and subsurface soils. The sampling and analysis program was conducted in accordance with the Final RCRA Facility Investigation Work Plan for Fort Hood Site FH-038C (USACE 1995).

2.0 ENVIRONMENTAL SETTING

The material presented in this section describes the physical characteristics of FH-038C 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 on 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-038C elevation is approximately 940 ft above msl.

The rivers, streams, and creeks that constitute the main surface water pathways at Fort Hood are also 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-038C 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 interbedded 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

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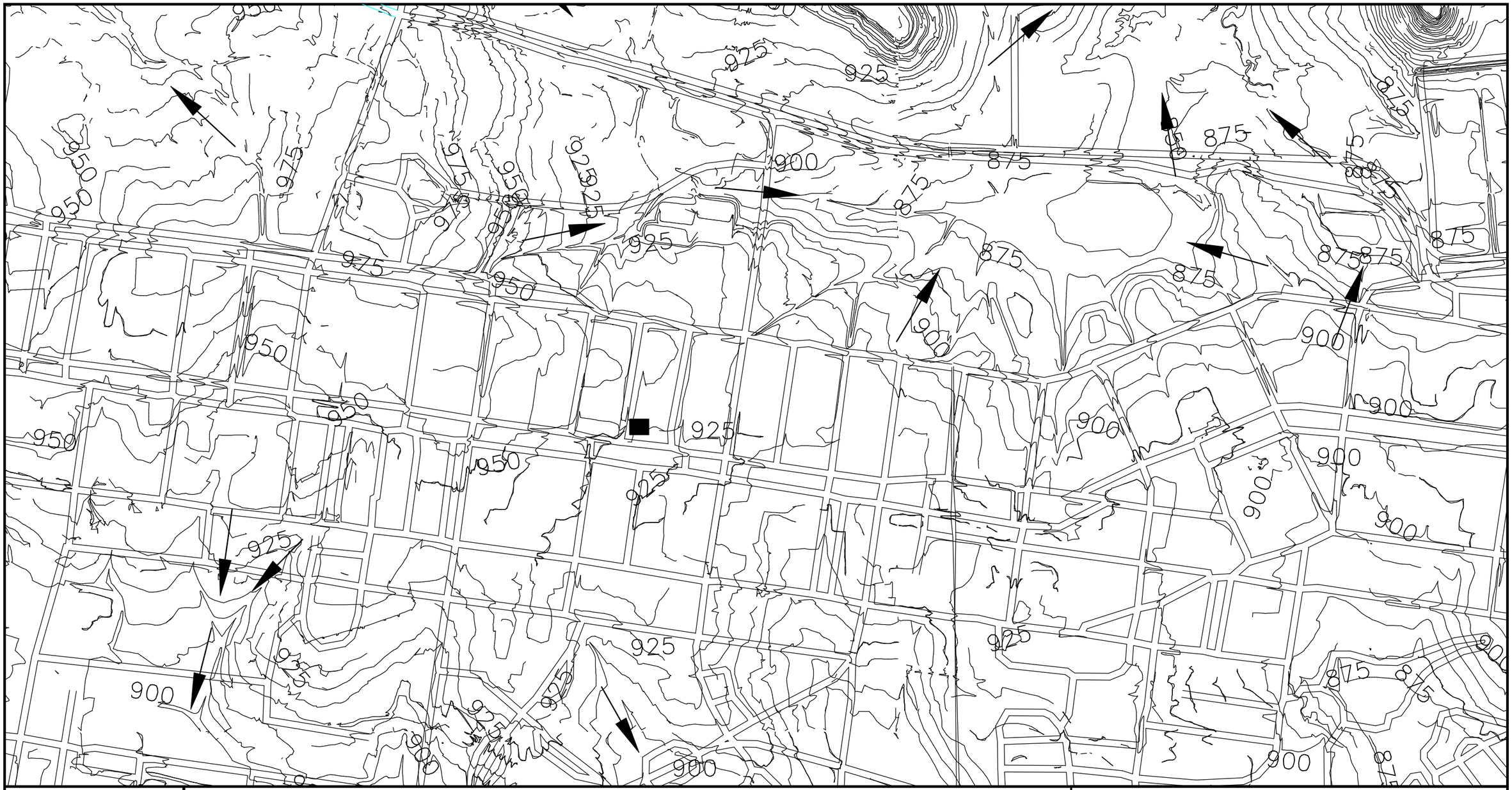

N
True
North

400 0 400 800
METERS

LEGEND

TOPOGRAPHIC CONTOUR (FT.)

DRAINAGE

SURFACE DRAINAGE FLOW

FH-038C

U.S. ARMY
FORT HOOD, TEXAS

RCRA FACILITY INVESTIGATION

TOPOGRAPHY AND DRAINAGE
OF MAIN FT. HOOD

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

along South Nolan Creek on the southern edge of the cantonment (USACE 1995). It is suspected that much alluvium and other natural surface deposits have been reworked throughout the active life of Fort Hood during construction projects.

2.3 CHARACTERIZATION OF SOILS

In many areas of the main cantonment, silty 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.

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° F. The normal daily temperature range for summer is 75 to 95° F. The average daily temperature in Killeen is 68.1° 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. During the five-month period in which the field program of the RFI was conducted, precipitation was higher than the historical monthly averages. Severe weather in the form of heavy rain, hail storms, and ice storms is common in the winter months.

3.0 UNIT CHARACTERIZATION

FH-038C is in an industrial area of the main cantonment where the ground surface is covered with a thick concrete hardstand. The tank was located on the west side of Building 15023 and was surrounded by gravel and a chain-link fence. Photographs of the site taken on September 10, 1997 are presented in Figure 3.1. The only known material handled at this and the other three FH-038 SWMUs was spent lead-acid battery electrolyte. Based on interviews with operating personnel at the site, electrolyte from batteries was poured into a stainless steel sink, diluted with water, and neutralized with sodium bicarbonate. 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 fiberglass storage tank. The tank was constructed with a grated top, allowing another port for pH testing before the effluent was discharged to the sanitary sewer. Sludge or sediment may also have settled in the bottom of the tank.

The holding tank system consisted of the fiberglass neutralization tank, concrete vault, and associated piping. Battery acid flowed from the building through a 6 inch ductile iron pipe into the first chamber of the fiberglass tank where a neutralizing agent was added. The neutralized liquid passed over a V-notch weir into the second chamber and the effluent discharged through a submerged 6 inch ductile iron pipe to a sanitary sewer manhole. The fiberglass holding tank had a 300 gallon capacity and was 4 feet in diameter and 4 feet high. The holding tank was contained in a reinforced concrete vault that was 8 feet by 10 feet and 8 feet deep with 6 inch thick walls. Sand was placed in the bottom of the vault to level the holding tank with the influent and effluent lines.

The tank and associated piping were removed in May 1998. Soil samples from the walls below the inlet and outlet piping locations and the floor below the excavated tank were collected as part of this investigation. No other construction details or historical operational data about the site have been discovered. No previous investigations have been performed at any of the electrolyte tank sites to determine if a release has occurred.

Figure 3.1 Photographs of FH-038C

4.0 CHARACTERIZATION OF UNIT CONTAMINATION

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

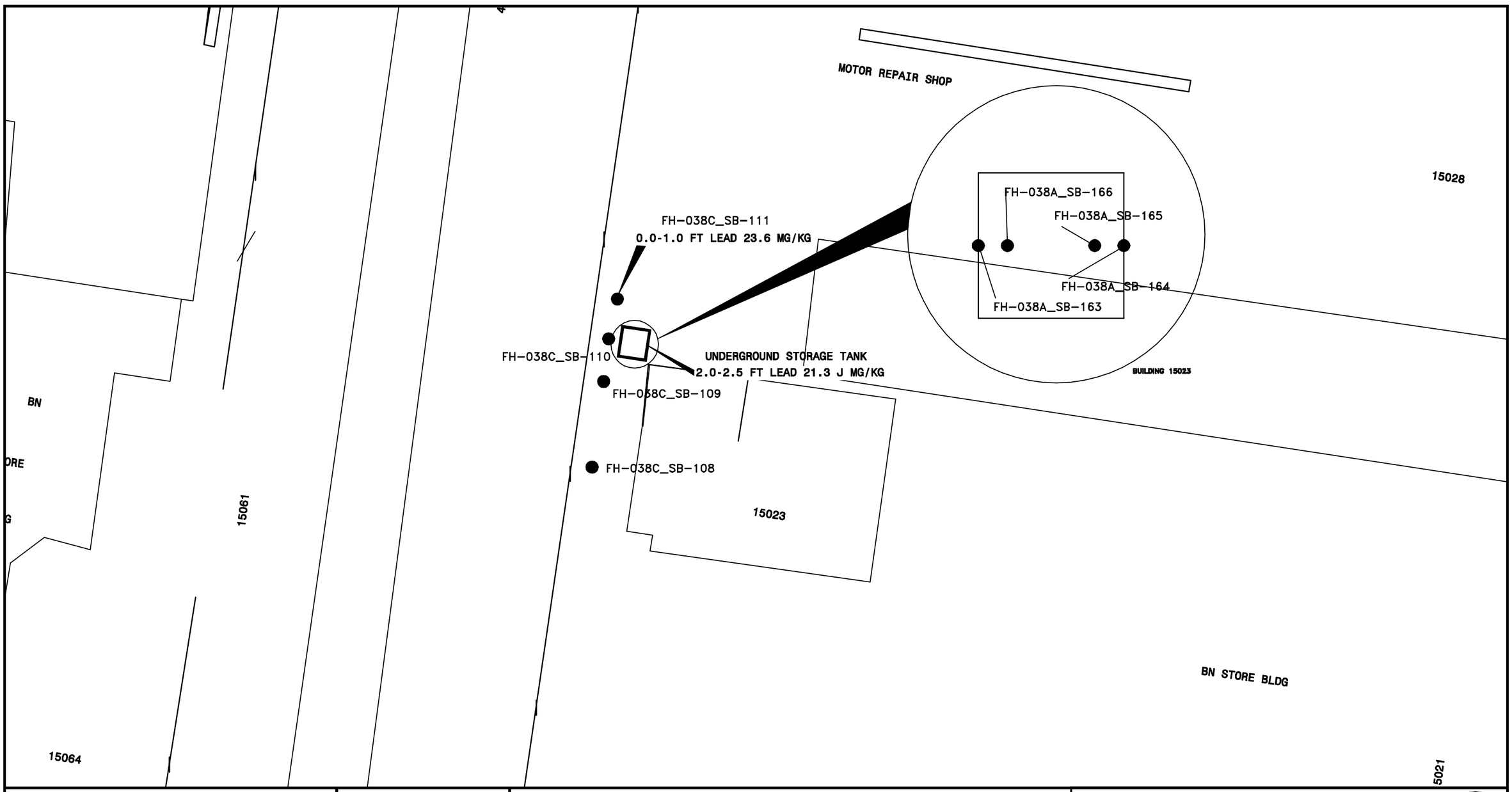
- determine the presence or absence of lead contamination in the surface and subsurface soils associated with the tank and piping;
- characterize the migration potential of any contaminants identified in the surface and subsurface soils;
- determine if groundwater is present below the tank and if present,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

4.1 TECHNICAL APPROACH

Both surface (0 - 2ft BGS) and subsurface soils (> 2ft BGS) were sampled at FH-038C. The different soil depths were sampled in order to provide data necessary to evaluate the potential human health risks associated with contaminants present at the site and to better characterize the potential contamination present in different soil strata. 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). Concentrations at the surface of the soil may differ greatly from subsurface levels. In addition, analysis of different soil levels is necessary in order to accurately evaluate the human health risks associated with the contaminants. Exposures based on surface, or direct, contact will differ from exposure, if any, associated with contaminants in deeper soils. Combining surface and subsurface data may result in a database that is not truly representative of actual exposure at the site.

Initially four soil borings were drilled and surface and subsurface soils were sampled in February and April, 1997. Boring SB111 was drilled and soil samples were taken on February 7th, borings SB108 and SB109 were sampled February 13th, and SB110 was sampled in April. A geoprobe was used at SB110 to collect the soil samples. A hollow stem auger with split spoons mounted on an all-terrain vehicle (ATV) was used to collect the soil samples from the other three borings FH-038C. The locations of the sampling points at FH-038C are shown in Figure 4.1. The borings were sited along the fence along the western perimeter of the site, with three boreholes within 20 ft of the underground tank, and one boring located about 40 ft south of the tank. There were no signs of visual contamination noted during sampling. All soil samples were analyzed for lead. Downhole, breathing zone, and headspace organic vapors were monitored during sampling activities. 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). All boring locations have been surveyed by a licensed surveyor.

The initial soil borings at FH-038C were sampled at the surface and every five feet. Total depths were from shallowest to deepest, 6 ft at SB110, 12 ft at SB111, 18 ft at SB108, and 20 ft at SB109. Bedrock was encountered at 18.5 ft in SB109 and at 12 ft in SB111. A water interface was encountered at 11 ft BGS during drilling of SB111. However, it was not possible to obtain water to yield a sample for analysis. The borehole was revisited the following week, and a sample was collected from a depth of 11ft BGS. The boring logs for FH-038C are presented in Appendix A.



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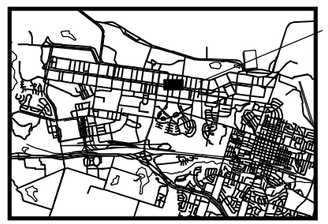


FH-038C

MAIN FT. HOOD LOCATION MAP

N
True North

10 0 5 10
METERS

LEGEND

- TOPOGRAPHIC CONTOUR (FT.)
- DRAINAGE
- SAMPLING LOCATION

U.S. ARMY
FORT HOOD, TEXAS

RCRA FACILITY INVESTIGATION

FH-038C SAMPLING LOCATIONS

SAIC® Science Applications International Corporation — Columbus, Ohio

DRAWN	CHECKED	DATE	SCALE	PROJECT NO.	FIGURE NO.
SC			AS SHOWN		4.1

The tank and associated piping were removed at FH-038C in May 1998. Additional confirmatory sampling was conducted at the site to evaluate environmental conditions under and around the site of the former tank. Four soil samples were taken after excavation of the tank. The samples were taken from 6 inches below the influent and effluent piping formerly located on the east and west walls, respectively, and at two locations ten feet below the excavated tank. These samples were analyzed for lead.

4.2 UNIT INVESTIGATION AND ANALYTICAL RESULTS

Appendix B provides a summary of analytical results for soils and groundwater at SWMU FH-038C. Table 4.1 summarizes the soil samples that contained lead at concentrations above practical quantitation limits (PQLs). Samples with lead detected above PQLs were screened against background screening criteria as described in Section 4.3 and Section 5.0. Figure 4.1 describes the sampling locations for FH-038C.

4.2.1 Surface Soil Analytical Results

Lead was present at concentrations above PQLs in all four of the initial soil borings. Concentrations ranged from 2.3 ppm at SB108 to 23.6 ppm at SB111. Of these occurrences, one surface soil sample was found to be above the background criterion for lead in soils (19.0 ppm).

4.2.2 Subsurface Soil Analytical Results

Lead was present in subsurface soils in all four initial borings and the four sample locations collected after tank excavation at concentrations generally consistent with the background criterion of 19.0 ppm. Concentrations of lead in the subsurface soils ranged from 1.5 ppm at 4 to 5 ft BGS in SB108 to 21.3 ppm at 2.0-2.5 ft BGS in the sample collected below the former location of the influent pipe. This maximum value was qualified as an estimated valued based on validation procedures, and exceeds the background 95% UTL criterion of 19.0 ppm for lead in soils.

4.2.3 Disposition of Investigation Derived Waste (IDW)

All IDW generated during drilling at FH-038C 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. Drums were staged in the SAIC compound pending disposition. Analytical results from the corresponding soil samples were used to determine whether a drum's contents were hazardous or non-hazardous. Contaminant levels were screened against the TNRCC "20 times" rule for the Toxicity Characteristic Leaching Procedure (TCLP). When a site soil sample concentration for a hazardous constituent is twenty times or greater than its respective leachate concentration listed in 30 TAC Chapter 335, Subchapter R, Appendix 1, Table 1, the IDW will be regarded as potentially hazardous and handled as hazardous waste. The solid IDW consisted of four 55-gallon drums containing wastes such as soil cuttings, PPE, sampling wastes. Solid IDW in one drum from SB111 generated at FH-038C was determined to be potentially hazardous due to the results of a duplicate soil sample. This drum containing wastes from SB111 was delivered to the Fort Hood Directorate of Public Works (DPW) Classification Unit with the accompanying characterization data. The remaining three drums of solid IDW were determined to be non-hazardous and were transported to the Fort Hood Sanitary Landfill for disposal.

All liquid IDW generated for this SWMU resulted from the decontamination of the drill and geoprobe rigs and other sampling equipment. Four drums of liquid IDW were generated. To be conservative the drum of

liquid IDW associated with SB111was handled as potentially hazardous and was disposed of at the DPW Classification Unit. The other three drums of liquid IDW were non-hazardous and were disposed of in the 1st Cavalary 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.

Table 4.1 FH-038C Analytes Detected Above Practical Quantitation Limits (PQLs)

Location	Sample ID	Depth (ft)	Analysis Type	Parameter	Result	PQL	Units
SB108	38SB116	0.0-1.0	Metals	Lead	2.3	0.21	mg/kg
SB108	38SB117	4.0-5.0	Metals	Lead	1.5	0.2	mg/kg
SB108	38SB118	11.0-12.0	Metals	Lead	3.2	0.21	mg/kg
SB108	38SB119	16.0-17.0	Metals	Lead	4.2	0.21	mg/kg
SB108	38SB120	17.0-18.0	Metals	Lead	4	0.2	mg/kg
SB109	38SB112	0.0-1.0	Metals	Lead	4.5	0.21	mg/kg
SB109	38SB113	4.0-5.0	Metals	Lead	4.5	0.2	mg/kg
SB109	38SB114	14.0-15.0	Metals	Lead	3.1	0.2	mg/kg
SB109	38SB115	17.5-18.5	Metals	Lead	2.9	0.2	mg/kg
SB110	38SB143	0.0-1.0	Metals	Lead	2.1 J	0.21	mg/kg
SB110	38SB144	5.0-6.0	Metals	Lead	12.6 J	0.21	mg/kg
SB111	38SB101	0.0-1.0	Metals	Lead	23.6	0.17	mg/kg
SB111	38SB102	4.0-5.0	Metals	Lead	2.1	0.16	mg/kg
SB111	38SB103	9.0-10.0	Metals	Lead	1.8	0.15	mg/kg
SB111	38SB104	11.0-12.0	Metals	Lead	2.2	0.15	mg/kg
UST	38SB163	2.0-2.5	Metals	Lead	21.3 J	0.16	mg/kg
UST	38SB164	2.0-2.5	Metals	Lead	6.6 J	0.17	mg/kg
UST	38SB165	8.0-11.0	Metals	Lead	14.4 J	0.17	mg/kg
UST	38SB166	8.0-11.0	Metals	Lead	17	0.18	mg/kg

J - Estimated value due to either laboratory and/or data validation qualification. The qualifier is applied to the result due to deviation(s) from laboratory or from data validation quality control criteria (i.e., calibration, surrogate recoveries, matrix spike/matrix spike duplicates, etc).

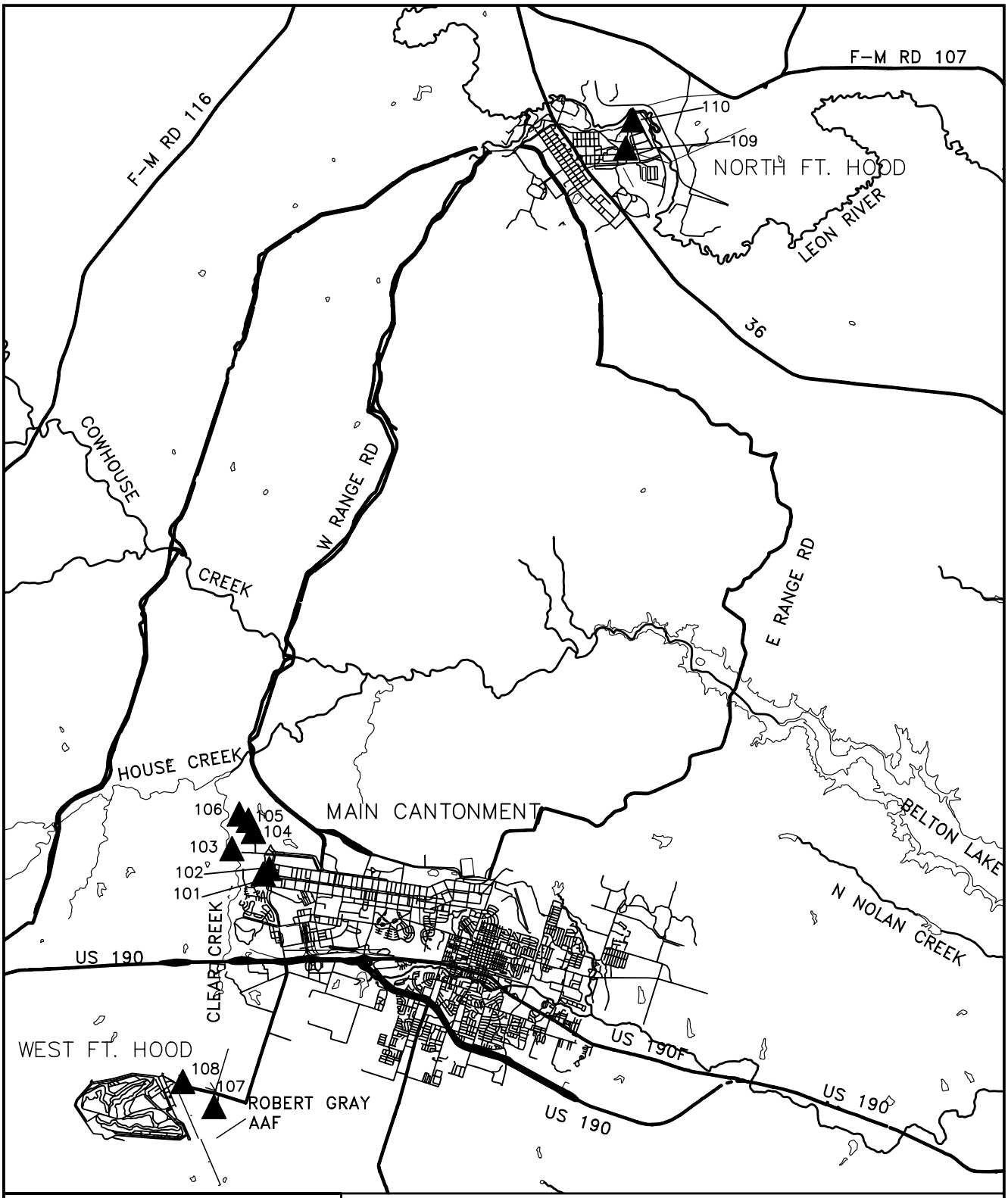
4.3 BACKGROUND CHARACTERIZATION AND COMPARISONS WITH WASTE UNIT SAMPLING RESULTS

In order to characterize naturally occurring constituents in soils at Fort Hood, samples were located and collected at 10 separate locations within the facility boundaries in the north, west, and main cantonments. Sampling locations are believed 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 4.2. 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. Mercury was detected in only 1 of 44 soil samples and selenium in 2 of 30 valid background soil samples. Silver was not detected in any background soil sample. 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-038C samples. Background statistical calculations were determined based on metal results from the combined data set of surface soil (0 - 2 ft) and subsurface soil (> 2 ft) results and excluded duplicates 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 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 4.2) and is used as the background screening value.

The second statistical method determines the mean concentration for lead detected in background concentrations and compares it against the mean concentration for lead in FH-038C soils. Two soil sample results out of 19 from FH-038C exceeded the 95% UTL for lead at concentrations near the 95% UTL. Based on this information and professional judgement FH-038C results are consistent with background,and the mean comparisons of background statistics for this SWMU was not conducted.

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



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

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Table 4.2 Statistical Analysis of 95% UTL Concentrations
Background Soils

Analyte (units)	Mean	95% UTL	Maximum Detect	Results > Detection Limit	Distribution
Subsurface Soils: Lead (mg/kg)	5.77	19.0	33	44/44	L

Results less than the detection limit were set to ½ the reported detection limit.

L - distribution most similar to lognormal.

N - distribution most similar to normal.

5.0 SOIL 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 background concentrations or analytical practical quantitation limit (PQL) values. The TNRCC RRSs Number 1 are used to determine if there has been a release of hazardous constituents from a site. A site is in compliance with the TNRCC RRSs Number 1 if constituents meet the criteria defined above. In order to determine whether a release has occurred at the unit, soil sample results for lead were compared to the 95% UTL and mean background lead concentration levels. Background soil levels for lead were determined based on the methods presented in Section 4.3. Analytes detected above background levels are considered a potential release. Results of the background soil screening analysis are provided in their entirety in Appendix F. Lead was present in a surface soil sample at a concentration (23.6 ppm) above the 95% UTL background concentration (19.0 ppm). One out of 15 subsurface soil samples contained lead at a concentration of 21.3 ppm that is above the background concentration of 19.0 ppm. The lead concentrations in the surface and subsurface samples do not represent a statistically significant increase above the corresponding background concentrations and indicate that no release has occurred.

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-038C 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 Chemical Quality Assurance Report (CQAR).

According to the CQAR, a total of four sample pairs (primary and QC/QA spilts) 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 boing 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 boing locations numbers SB129 through SB148 (FH-038A, FH-038B and FH-038C) due to high variation in matrix duplicate results; and
- no potential weaknesses in groundwater data collected from location SB111.

These findings were based on the review of the data packages by the Corps and would not result in rejection of the data, but qualification of the data as estimated detects (J) or estimated non-detects (UJ) and does not impact the useability of the data for this RFI. 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 useability 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. 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 that 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-038C data that were reviewed as a function of the data validation task met project data quality objectives, and are useable data with the exception of the selenium results for 10 background soil samples. The selenium results were rejected due to unacceptable matrix spike recoveries and were therefore excluded from background calculations. The rejected background data had no impact on the FH-038 results. No other problems with the data were encountered that would have resulted in rejection of the data.

6.2 INVESTIGATION RESULTS

The data set for surface and subsurface soils at FH-038C and the quality of the data are useable to meet the objectives of the RFI as described in Section 4.0 of this report. A total of four surface soil samples and fifteen subsurface soil samples were collected from the initial four soil boring locations and the four excavated tank confirmatory soil samples, 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. Results of the soil analyses indicate that there has been no release of contamination to the environment as a result of waste treatment activities at FH-038C. Results of soil analysis indicated that lead is present in surface and subsurface soils at concentrations consistent with naturally occurring background values. Two of samples exhibited a lead concentration slightly above the 95% UTL background concentration. However, the concentrations do not indicate that the soils represent a statistically significant increase above background values.

7.0 TANK REMOVAL AND CONFIRMATORY SAMPLING

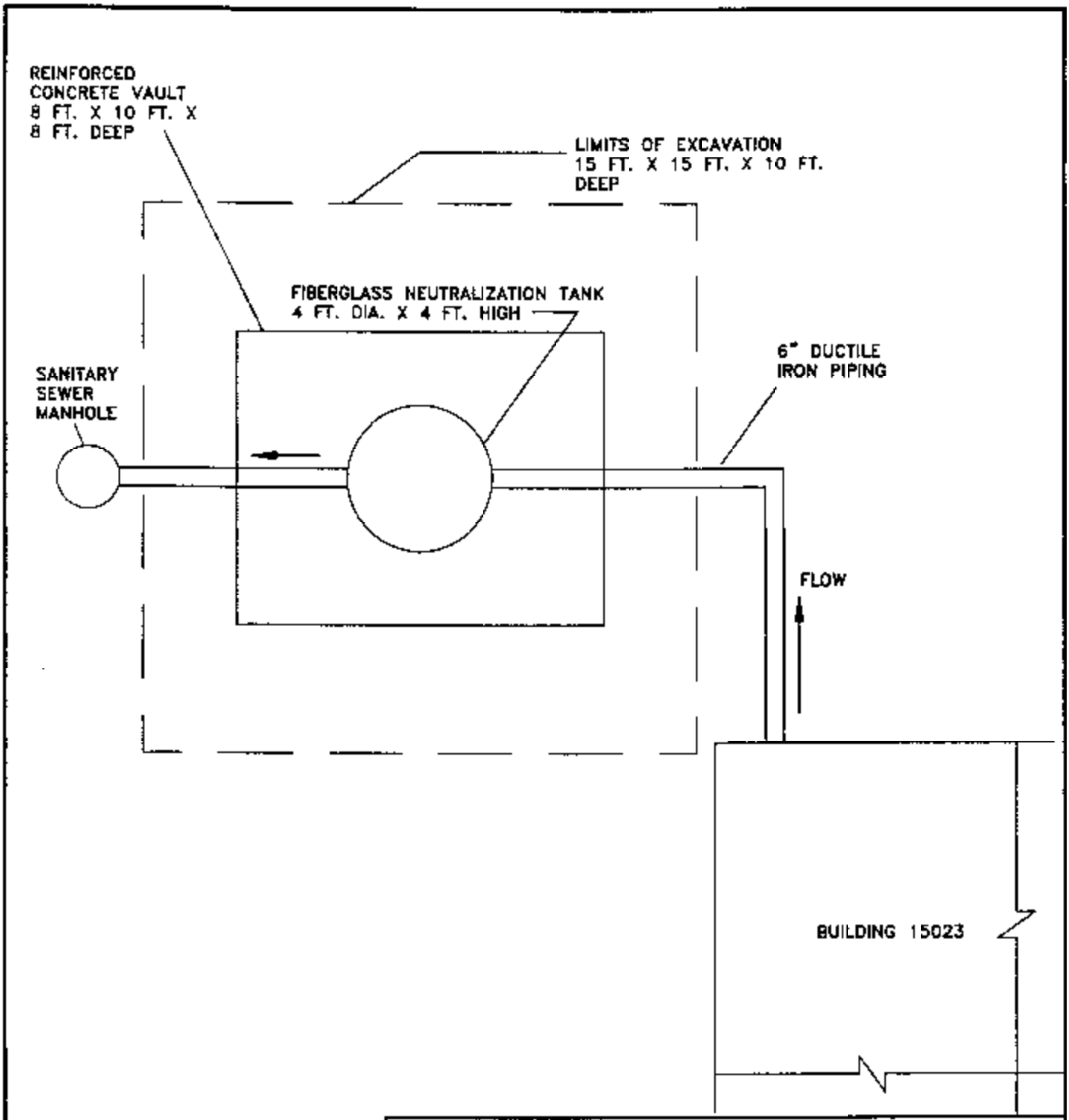
This section describes the activities associated with removal of the neutralization holding tank system and confirmatory sampling of the excavated area following the tank removal. The holding tank system consists of the fiberglass neutralization tank, concrete vault, and associated piping. Battery acid flowed from the building through a 6 inch ductile iron pipe into the first chamber of the fiberglass tank where a neutralizing agent was added. The neutralized liquid passed over a V-notch weir into the second chamber and the effluent discharged through a submerged 6 inch ductile iron pipe to a sanitary sewer manhole. Figure 7.1 shows a schematic of the neutralization system. The fiberglass holding tank has a 300 gallon capacity and is 4 feet in diameter and 4 feet high. The holding tank is contained in a reinforced concrete vault that is 8 feet by 10 feet and 8 feet deep with 6 inch thick walls. Sand was placed in the bottom of the vault to level the holding tank with the influent and effluent lines.

7.1 TANK REMOVAL PROCEDURES

The neutralization holding tank system was removed by a contractor to Fort Hood during the period of May 18 to 29, 1998. Figures 7.2 is a photograph of holding tank removed from FH-038C. The area prior to excavation of the vault is shown in Figure 7.3. The contractor pumped any liquid from the holding tank and removed the tank from the vault. The vault was demolished in-place. A backhoe was used to remove the tank debris, piping, and the structural fill material around the vault. The excavation plan was to remove all material to the limits of the natural soil. No water was encountered in the excavation.

7.2 CONFIRMATORY SAMPLING

Soil samples were collected from 0-6 inches into the native soils of the excavation on May 27, 1998. All samples were collected using hand tools. Two soil samples were collected from the base of the excavation and two soil samples were collected from the end walls. There were no visual signs of contamination in the excavation. Sampling locations are shown on Figure 7.4. Samples SB163 and SB164 were collected from the side walls approximately 6 inches below the effluent and influent pipes respectively, and a total depth of 2.0-2.5 feet BGS. Samples SB165 and SB166 were collected along the centerline of the base of the excavation 3 feet from the endwalls. All soil sampling, sample handling, chain-of-custody, and other field activities were conduced in accordance with the RCRA Facility Investigation Work Plan for 35 SWMUs (USACE 1995). Soil samples were analyzed for lead only.



N

2 0 2 4

FEET

U.S. ARMY
FORT HOOD, TEXAS

RCRA FACILITY INVESTIGATION

FH-038C NEUTRALIZATION TANK AND VAULT

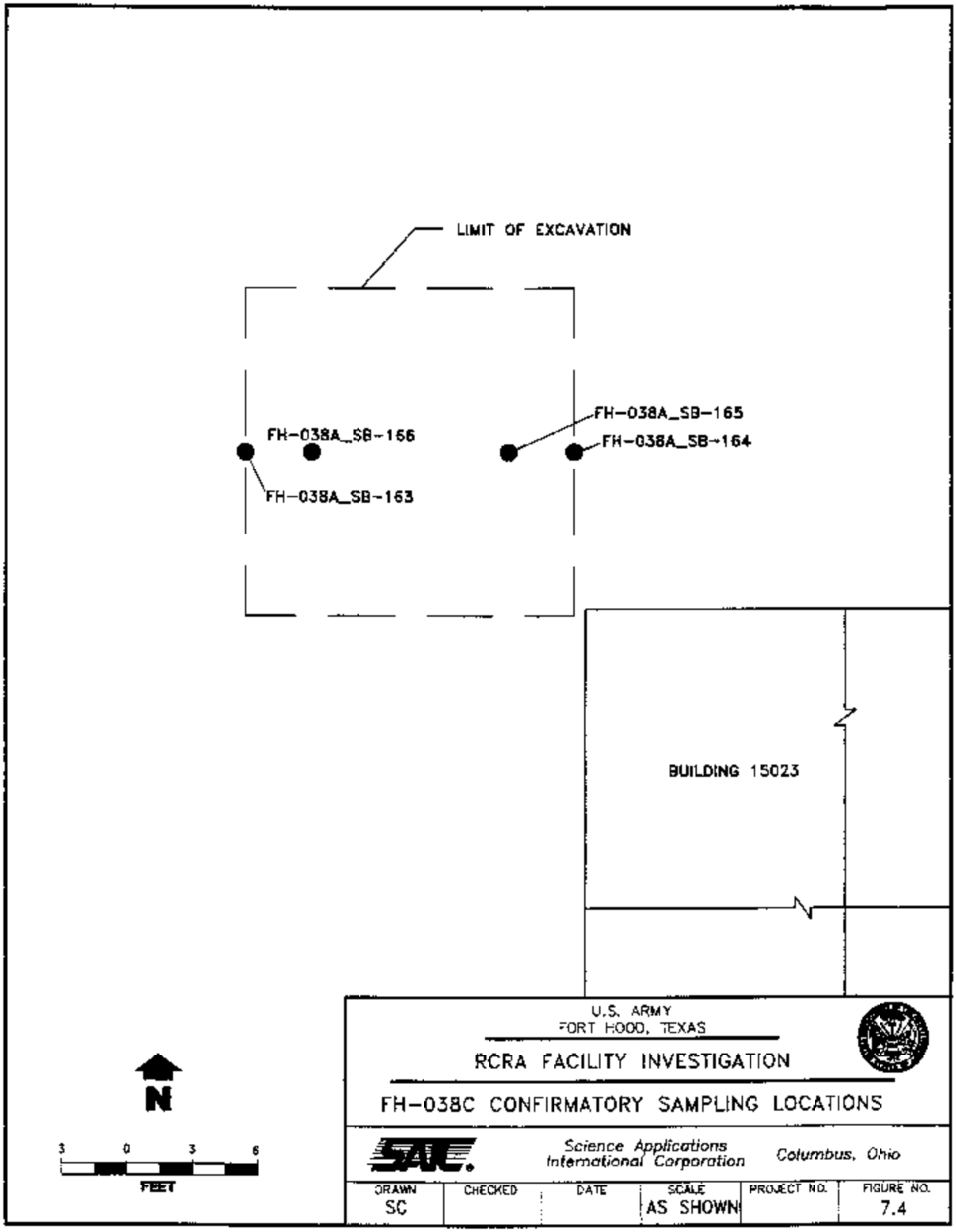
SAIC. Science Applications International Corporation Columbus, Ohio

DRAWN	CHECKED	DATE	SCALE	PROJECT NO.	FIGURE NO.
SC			AS SHOWN		7.1

NAME: S:\HOOD\P2\TANK38C.DWG DATE: OCT 13, 1998 TIME: 7:14 AM PCP: S:\HOOD\PCP\FRP.PCP

FIGURE 7.2 PHOTOGRAPH OF FH-038C HOLDING TANK

FIGURE 7.3 PHOTOGRAPH OF AREA PRIOR TO TANK EXCAVATION


LIMIT OF EXCAVATION
FH-038A_SB-166
FH-038A_SB-165
FH-038A_SB-164
FH-038A_SB-163
BUILDING 15023
N
3 0 3 6
FEET
U.S. ARMY
FORT HOOD, TEXAS
RCRA FACILITY INVESTIGATION
FH-038C CONFIRMATORY SAMPLING LOCATIONS
Science Applications International Corporation
Columbus, Ohio
DRAWN SC
CHECKED
DATE
SCALE AS SHOWN
PROJECT NO.
FIGURE NO. 7.4
NAME: S:\HOOD\P2\38CCONF.DWG DATE: OCT 13, 1998 TIME: 7:24 AM PCP: S:\HOOD\PCP\FRP.PCP

8.0 CONCLUSIONS AND RECOMMENDATIONS

The analytical results from the initial sampling and from confirmatory sampling after excavation indicate that site FH-038C did not cause a release of lead contamination into the environment. Lead is present in FH-038C soils at concentrations consistent with corresponding background concentrations. Two of samples contained lead at a concentration greater than the background 95% UTL. However, the lead concentrations and frequency of detection are not statistically significant compared to background. The analytical results indicate that unit FH-038C has not caused a release of hazardous materials into the environment. Based on the RFI results, it is recommended that no further action be taken at FH-038C.

9.0 REFERENCES

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EPA 1989. Guidance Document on the Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, (EPA/530-SW-89-026).

30 TAC 335. Industrial Solid Waste and Municipal Hazardous Waste, Subchapter K. Hazardous Substance Facilities Assessment and Remediation.

U.S. Army. 1996a. Fort Hood 1996 Public Affairs Document. 72p.

U.S. Army. 1996b. Fort Hood Command Information Summary, 2nd Quarter 1996. Public Affairs Office, 21p. (leaflet).

U.S. Army. 1992 "History of Fort Hood: The First Fifty Years 1942-1992." III Mobile Army Corps, 7p. (leaflet).

USACE. 1995. Final RCRA Facility Investigation Work Plan. 35 Solid Waste Management Units, Fort Hood, Texas. December 1995.

USACE. 1996. RCRA Facility Investigation Chemical Data Acquisition Plan, Fort Hood, Texas (Draft). October 1996.

USDA 1985a. Soil Survey of Coryell County, Texas. Soil Conservation Service.

USDA 1985b. Soil Survey of Bell County, Texas. Soil Conservation Service.

USEPA, SW-846. Test Methods for Evaluating Solid Waste. Physical/Chemical. Second Edition, Rev. 0, September, 1986, and Third Edition, Rev. 1, November 1990.

USEPA, 1989. Guidance Document on the Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, EPA/530-SW-89-026.

APPENDIX A

FH-038C Soil Boring Logs

HTRW DRILLING LOG

DIVISION: FORT WORTH COE | INSTALLATION: FORT HOOD | SHEET 1 OF 2 SHEETS

1. PROJECT: FORT HOOD RFI
2. LOCATION/STATION: FH038C
3. DRILLING AGENCY: TERRA MAR
4. HOLE NUMBER: FH038C SB108
5. NAME OF DRILLER: BILL CHRISTOPHER
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN: NA
8. DEPTH DRILLED INTO ROCK: NA
9. TOTAL DEPTH OF HOLE: 18 ft
10. SIZE AND TYPE OF BIT: NA
11. DATUM FOR ELEVATION SHOWN: NA
12. MANUFACTURER'S DESIGNATION OF DRILL: EARTHPROBE 200 ATV.
13. TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: NA | DISTURBED: | UNDISTURBED:
14. TOTAL NUMBER OF CORE BOXES: NA
15. GROUNDWATER ELEVATION: NA
16. DATE HOLE: STARTED 2/13/97 | COMPLETED 2/13/97
17. ELEVATION TOP OF HOLE: NA
18. TOTAL CORE RECOVERY FOR HOLE: NA ____ PERCENT

ELEVATION (+)	DEPTH (m)	LEGEND (r)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
			COARSE GRAVEL OVER BLACK LINER			
			5Y 7/2 MOIST PLASTIC CLAY			38SB116
	2.0		5Y6/1 FINE MOIST PLAST. CLAY 80% 5Y8/1 VERY FINE CLAY 5% 10YR5/8 STREAKS OF CLAY 15% PLASTIC. MOIST. WEATHERED <5% FOSSILS			S. TUBE
	4.0		MOTTLED 10YR 5/8 : 30% 5Y6/1 FINE CLAY DRY. HARD.			38 SB117
	5		5Y6/1 DRY HARD CLAY			
	6.0					
			← SIGNS OF MOISTURE ON TOOLS			
	8.0					
			3" SEAM OF LS 5Y 7/2 MATRIX AMOUNT 80% FOSSILHASH. VERY HARD			
			2.5Y5/6 CLAY (60%) FOSSIL HASH.			

SIGNATURE OF INSPECTOR/DATE: 2/13/97
PROJECT:
HOLE NO.: FH038C SB108

SAIC 1006 after ENG FORM 1836

HTRW DRILLING LOG (continued)

HOLE NUMBER: FH038 SB108

PROJECT:

INSPECTOR: SAIC 40204

SHEET 2 OF 2 SHEETS

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	11		SAME AS ABOVE			
	12		2.5Y7/6 CLAY AND WEATHERED LS W/FOSSIL CASTS. OYST. DRY. HARD			38 SB118
	13		5Y6/3 DRY HARD CLAY: 30% AROUND OYST. HASH			
	14		5Y6/3 POOR LS. W/OYST.			
	15		SAME AS ABOVE			
	16		5Y5/4 HARD DRY FINE CLAY			38 SB119
	17		5Y2.5/1 FINE ~~CLAY~~ WITH 1"-1.5" OYSTER SHELL 40% LS. VERY HARD			38 SB120
	18		TD = 18 BGS			

SIGNATURE OF INSPECTOR/DATE: 2/13/97

PROJECT:

HOLE NO.: FH038 SB108

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG

DIVISION: FORT WORTH COE | INSTALLATION: FORT HOOD | SHEET 1 OF 2 SHEETS

1. PROJECT: FORT HOOD RFI
2. LOCATION/STATION: FH-038C
3. DRILLING AGENCY: TERRA MAR
4. HOLE NUMBER: FH038C SB109
5. NAME OF DRILLER: BILL CHRISTOPHER
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN: NA
8. DEPTH DRILLED INTO ROCK: NA
9. TOTAL DEPTH OF HOLE: 20ft
10. SIZE AND TYPE OF BIT: NA
11. DATUM FOR ELEVATION SHOWN: NA
12. MANUFACTURER'S DESIGNATION OF DRILL: EARTHPROBE 200 ATV
13. TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: NA | DISTURBED | UNDISTURBED
14. TOTAL NUMBER OF CORE BOXES: NA
15. GROUNDWATER ELEVATION: NA
16. DATE HOLE: STARTED 2/13/97 | COMPLETED 2/13/97
17. ELEVATION TOP OF HOLE: NA
18. TOTAL CORE RECOVERY FOR HOLE: NA ____ PERCENT

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
			CRUSHED LS GRAVEL OVER BLACK LINER			
	2.0		5Y 6/2 LT. OLIVE GRAY FINE SILTY CLAY. SLIGHT MOIST. STIFF			38SB112
	4.0		5Y 8/2 LT. OLIVE GRAY DRY FIRM CLAY W/ 1/2" FOSSILS 10%			S.TUBE
	5.		5Y 8/2 DRY FIRM CLAY. SOFT TO MED. SLIGHT MOIST. LOW PLASTIC. 20% MOTTLED W/10YR 6/6 CLAY			38SB113
	6.0		SAME AS ABOVE			S.TUBE
	8.0		1" LENS OF LS 2.5Y 6/4 WITH 4" CLAY FROM ABOVE. LS. VERY WEATHERED NO RETURN. ROCK			CUTTINGS

SIGNATURE OF INSPECTOR/DATE: 2/13/97 | PROJECT | HOLE NO. FH038C SB109

SAIC 1006 after ENG FORM 1836

HTRW DRILLING LOG (continued)

HOLE NUMBER: FH038C SB109

PROJECT:

INSPECTOR: SAIC 90704

SHEET 2 OF 2 SHEETS

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	11		ALT LAYERS OF CLAY FROM ABOVE AND 2.5Y7/3 HARD LS W/FOSSILS IN 6" LENS.			S. TUBE
	12					
	13					
	14					
	15		5Y8/2 CLAY FROM ABOVE			6 SB114
	16		2.5Y8/5 HARD DRY CLAY. MARINE FOSSILS 20%			
	17		2.5Y8/4 HARD CLAY W/WEATHERED LS. 30% FOSSIL HASH			S TUBE
	18		SHALE. GRAY 2.5Y 5/1. FINE. DK GRAY.			38 SB115
	19		LS 5Y 7/1 INTERBEDDED LS W/ SHALE FROM ABOVE. ABUN. DIST. VERY HARD			NO RETURN
	20		TD = 20' BGS.			

SIGNATURE OF INSPECTOR/DATE: 2/13/99

PROJECT:

HOLE NO.: FH038C SB109

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG

DIVISION: FORT WORTH COE | INSTALLATION: FORT HOOD | SHEET 1 OF 1 SHEETS

1. PROJECT: Ft. Hood RFI
2. LOCATION/STATION: FH-038C
3. DRILLING AGENCY: TERRANAR
4. HOLE NUMBER: FH038-SB110 (C)
5. NAME OF DRILLER: BILL CHRISTOPHER
6. DIRECTION OF HOLE: [x] VERTICAL [ ] INCLINED ____ DEGREES FROM VERTICAL
7. THICKNESS OF OVERBURDEN: NA
8. DEPTH DRILLED INTO ROCK: NA
9. TOTAL DEPTH OF HOLE: 6.0'
10. SIZE AND TYPE OF BIT: NA
11. DATUM FOR ELEVATION SHOWN: NA
12. MANUFACTURER'S DESIGNATION OF DRILL: Earthprobe 200 ATV
13. TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: NA | DISTURBED | UNDISTURBED
14. TOTAL NUMBER OF CORE BOXES: NA
15. GROUNDWATER ELEVATION: NA
16. DATE HOLE: STARTED 4-3-97 | COMPLETED 4-3-97
17. ELEVATION TOP OF HOLE: NA
18. TOTAL CORE RECOVERY FOR HOLE: NA ____ PERCENT

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	1.0		silty clay 2.5Y7/3 pale yellow and 2.5Y6/8 olive yellow, limestone fragments, highly plastic, firm, damp			38SB143
	2.0		NO recovery			
	4.0					
	5.0		Same, wet			
	6.0		TD (refusal)			38SB144
	8.0					
	10.0					

SIGNATURE OF INSPECTOR/DATE: J. Christopher 4-3-97 | PROJECT: Ft. Hood RFI | HOLE NO.: FH038-SB110

SAIC [illegible]6 after ENG FORM 1836

HTRW DRILLING LOG

DIVISION: FORT WORTH COE
INSTALLATION: FORT HOOD
SHEET 1 OF SHEETS 2

1. PROJECT: FORT HOOD RFI	10. SIZE AND TYPE OF BIT: NA
2. LOCATION/STATION: FH-038C	11. DATUM FOR ELEVATION SHOWN: NA
3. DRILLING AGENCY: TERRAMAR	12. MANUFACTURER'S DESIGNATION OF DRILL: EARTHPROBE 200 ATV
4. HOLE NUMBER: FH038C SB111	13. TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: NA; DISTURBED: ; UNDISTURBED:
5. NAME OF DRILLER: BILL CHRISTOPHER	14. TOTAL NUMBER OF CORE BOXES: NA
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL	15 GROUNDWATER ELEVATION: NA
7. THICKNESS OF OVERBURDEN: NA	16. DATE HOLE: STARTED 2/7/97; COMPLETED 2/7/97
8. DEPTH DRILLED INTO ROCK: NA	17. ELEVATION TOP OF HOLE: NA
9. TOTAL DEPTH OF HOLE: 12'	18. TOTAL CORE RECOVERY FOR HOLE: NA ____ PERCENT

ELEVATION (ft)	DEPTH (ft)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	.5		6" CRUSHED LS GRAVEL OVER BLACK LINER			
			7.5YR3/1 VERY DARK, PLASTIC CLAY			38SB101 FHSB213 FHSB313
	2.0		2.5Y 8/2 PALE YELLOW PLASTIC, MOIST CLAY. MOTTLED W/ 10YR 8/1 WHITE FINE PLASTIC CLAY.			S. TUBE
			LESS MOIST W/ DEPTH			
	4.0		2.5YR 7/6 LT. RED HARD RECRYSTALLIZED LS. SLIGHTLY MOIST.			38SB102
			CLAY SAME AS ABOVE			S. TUBE
	6.0		2.5YR 7/6 LT. RED HARD XTL LS.			
			2.5Y6/3 LT. YELLOW BRN STIFF, FINE CLAY			
	8.0					S TUBE
	9		2.5Y7/2 DRY STIFF CLAY W/ SHATTERED 2.5YR 7/6 LT. RED LS IN LOWER 3"			38SB103

SIGNATURE OF INSPECTOR/DATE: 2/7/97
PROJECT:
HOLE NO.: FH038C SB111

SAIC 1006 after ENG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT

INSPECTOR SAIC 40704

HOLE NUMBER FA038C SB111

SHEET 2 OF 2 SHEETS

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	11		2.5Y 7/4 DRY STIFF CLAY W/ FINE GRAVEL SIZE OYST. SHELL: 30%.			
			2.5YR 7/6 LS. 3"			
	12		2.5Y 6/3 CLAY. DRY W/ MOTTLED 2.5Y 5/4 CLAY			38SB104
			2.5YR 7/6 WEATHERED LS.			
			TD = 12.0 BGS			

SIGNATURE OF INSPECTOR/DATE

2/7/97

PROJECT

HOLE NO. FA038C SB111

SAIC 1996 after ENG FORM 1836

APPENDIX B

FH-038C Analytical Results

FH-038C Analytical Results

Location	Sample ID	COE Sample ID	Date Collected	Depth	CAS Number	Parameter	Result	Detection Limit	Units of Measure	Lab * Qual	Data** Qual	Method
SB108	38SB116	FH038-SB116/02-13-97/0.0-1.0	19970213	0.0-1.0	7439-92-1	Lead	2.3	0.21	mg/kg			SW846 6010
SB108	38SB117	FH038-SB117/02-13-97/4.0-5.0	19970213	4.0-5.0	7439-92-1	Lead	1.5	0.20	mg/kg			SW846 6010
SB108	38SB118	FH038-SB118/02-13-97/11.0-12.0	19970213	11.0-12.0	7439-92-1	Lead	3.2	0.21	mg/kg			SW846 6010
SB108	38SB119	FH038-SB119/02-13-97/16.0-17.0	19970213	16.0-17.0	7439-92-1	Lead	4.2	0.21	mg/kg			SW846 6010
SB108	38SB120	FH038-SB120/02-13-97/17.0-81.0	19970213	17.0-18.0	7439-92-1	Lead	4	0.20	mg/kg			SW846 6010
SB109	38SB112	FH038-SB112/02-13-97/0.0-1.0	19970213	0.0-1.0	7439-92-1	Lead	4.5	0.21	mg/kg			SW846 6010
SB109	38SB113	FH038-SB113/02-13-97/4.0-5.0	19970213	4.0-5.0	7439-92-1	Lead	4.5	0.20	mg/kg			SW846 6010
SB109	38SB114	FH038-SB114/02-13-97/14.0-15.0	19970213	14.0-15.0	7439-92-1	Lead	3.1	0.20	mg/kg			SW846 6010
SB109	38SB115	FH038-SB115/02-13-97/17.5-18.5	19970213	17.5-18.5	7439-92-1	Lead	2.9	0.20	mg/kg			SW846 6010
SB110	38SB143	FH038-SB143/04-03-97/0.0-1.0	19970403	0.0-1.0	7439-92-1	Lead	2.1	0.21	mg/kg	N*	J	SW846 6010
SB110	38SB144	FH038-SB144/04-03-97/5.0-6.0	19970403	5.0-6.0	7439-92-1	Lead	12.6	0.21	mg/kg	N*	J	SW846 6010
SB111	38SB101	FH038-SB101/02-07-97/0.0-1.0	19970207	0.0-1.0	7439-92-1	Lead	23.6	0.17	mg/kg			SW846 6010
SB111	38SB102	FH038-SB102/02-07-97/4.0-5.0	19970207	4.0-5.0	7439-92-1	Lead	2.1	0.16	mg/kg			SW846 6010
SB111	38SB103	FH038-SB103/02-07-97/9.0-10.0	19970207	9.0-10.0	7439-92-1	Lead	1.8	0.15	mg/kg			SW846 6010
SB111	38SB104	FH038-SB104/02-07-97/11.0-12.0	19970207	11.0-12.0	7439-92-1	Lead	2.2	0.15	mg/kg			SW846 6010
SB111	FHGW129	FH038-GW129/02-13-97	19970213		7439-92-1	Lead	0.9	0.90	ug/l	U		SW846 6010
UST	38SB163	FH038-SB163/05-27-98/2.0-2.5	19980527	2.0-2.5	7439-92-1	Lead	21.3	0.16	mg/kg	*	J	SW846 6010
UST	38SB164	FH038-SB164/05-27-98/2.0-2.5	19980527	2.0-2.5	7439-92-1	Lead	6.6	0.17	mg/kg	*	J	SW846 6010
UST	38SB165	FH038-SB165/05-27-98/8.0-10.0	19980527	8.0-10.0	7439-92-1	Lead	14.4	0.17	mg/kg	*	J	SW846 6010
UST	38SB166	FH038-SB166/05-27-98/8.0-10.0	19980527	8.0-10.0	7439-92-1	Lead	17	0.18	mg/kg	*	J	SW846 6010

APPENDIX C

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

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

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	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

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 Data
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: 12/11/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	5.7	0.40	MG/KG		
Barium	20.5	0.10	MG/KG	*	J
Cadmium	0.07	0.05	MG/KG	B	
Chromium	8.9	0.10	MG/KG	E*	J
Lead	6	0.17	MG/KG	EN*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.36	0.36	MG/KG	U	U
Silver	0.23	0.23	MG/KG	U	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: 12/11/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	5.2	0.42	MG/KG		
Barium	25.2	0.10	MG/KG	*	J
Cadmium	0.05	0.05	MG/KG	U	U
Chromium	20.3	0.10	MG/KG	E*	J
Lead	7.7	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

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: 12/11/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	5.3	0.36	MG/KG		
Barium	10.6	0.09	MG/KG	*	J
Cadmium	0.06	0.04	MG/KG	B	
Chromium	7.3	0.09	MG/KG	E*	J
Lead	5.1	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-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	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	0.44	0.33	MG/KG	B	
Silver	0.21	0.21	MG/KG	U	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	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

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	*	J
Cadmium	0.29	0.05	MG/KG	B*	J
Chromium	8.4	0.11	MG/KG		
Lead	5	0.19	MG/KG	*	J
Mercury	0.04	0.04	MG/KG	U	U
Selenium	1.9	1.9	MG/KG	UWN	R
Silver	0.25	0.25	MG/KG	U	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	*	J
Cadmium	0.27	0.05	MG/KG	B*	J
Chromium	12.2	0.10	MG/KG		
Lead	6.6	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

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: 01/15/97

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	3.7	0.37	MG/KG		
Barium	36.1	0.09	MG/KG	*	J
Cadmium	0.2	0.04	MG/KG	B*	J
Chromium	6.5	0.09	MG/KG		
Lead	4	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: 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 Data
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: 12/13/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
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	J
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: 12/13/96

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
Arsenic	2.6	0.36	MG/KG		
Barium	26.3	0.09	MG/KG		
Cadmium	0.04	0.04	MG/KG	U	U
Chromium	4.6	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-SB13012-13-96/15.0-16.0 (BKSB130) Sample Depth: 15.0-16.0 FT

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

Metals	Result	Detection Limit	Units	Qualifiers Lab	Qualifiers Data
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	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-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 Data
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 Data
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	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-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 Data
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	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

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 Data
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	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

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 D

Fort Hood RFI Background Soil Boring Logs

HTRW DRILLING LOG

1. PROJECT: FORT HOOD RFI	2. DIVISION: FORT WORTH DIST.	3. INSTALLATION: FORT HOOD	4. SHEET 1 OF 2 SHEETS
5. LOCATION/STATION: FHBKG	10. SIZE AND TYPE OF BIT: 4¼" HSA		
6. DRILLING AGENCY: TERRA MAR	11. DATUM FOR ELEVATION SHOWN: NA		
7. HOLE NUMBER: FHBKG-SB102	12. MANUFACTURER'S DESIGNATION OF DRILL: MOBILE B-50		
8. NAME OF DRILLER: BILL CHRISTOPHER	13. TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: NA	DISTURBED	UNDISTURBED
9. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL	14. TOTAL NUMBER OF CORE BOXES: NA		
7. THICKNESS OF OVERBURDEN: NA	15. GROUNDWATER ELEVATION: NA		
8. DEPTH DRILLED INTO ROCK	16. DATE HOLE	STARTED: 12-12-96	COMPLETED: 12-12-96
9. TOTAL DEPTH OF HOLE	17. ELEVATION TOP OF HOLE: NA		
	18. TOTAL CORE RECOVERY FOR HOLE: NA ____ PERCENT		

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
			(Upper 0.4 topsoil) Silty clay, mottled 10YR5/3 brown and 10YR8/2 vy. pale brown, not plastic, firm, dry, weathered limestone fragments			BKSB121
	1.5					
	2.0		same, dry			cuttings
	3.5					
	4.0		tan, weathered limestone and silty clay interbeds, dry			cuttings
	6.0					
			Zones of limestone and highly indurated silty clay (weathered limestone) very hard, shell fragments, roots, 2.5Y8/2 pale yellow, dry			
	8.0					
			same, dry			cuttings
	9.0					
			same, dry			

SIGNATURE OF INSPECTOR/DATE: 12-17-96

PROJECT

HOLE NO: FHBKG-SB102

SAIC 1998 after EMG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT

HOLE NUMBER: FHBKG-SB102

INSPECTOR: J. DeVaughn SAIC

SHEET 2 OF 2 SHEETS

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE / RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
			same, dry			cuttings
	12.0					
	14.0					
	14.5		same, dry			BKSB122
			same, dry			
	16.0					
			Blue-grey weathered limestone, dry			Geotechnical Sample
	17.0					
			same, dry			
	18.0					cuttings
	19.0					
	19.5		same, dry			BKSB123
			TD			
	20.0					

SIGNATURE OF INSPECTOR/DATE: J. DeVaughn 12-12-96

PROJECT

HOLE NO. FHBKG-SB102

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG

1. PROJECT: Fort Hood RFI	DIVISION: Ft. Worth Dist.	INSTALLATION: Fort Hood	SHEET 1 OF 2 SHEETS
2. LOCATION/STATION: FHBKG	10. SIZE AND TYPE OF BIT: 4¼" HSA		
3. DRILLING AGENCY: TERRA MAR	11. DATUM FOR ELEVATION SHOWN: NA		
4. HOLE NUMBER: FHBKG-SB103	12. MANUFACTURER'S DESIGNATION OF DRILL: MOBILE B-50		
5. NAME OF DRILLER: BILL CHRISTOPHER	13. TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: NA	DISTURBED	UNDISTURBED
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL	14. TOTAL NUMBER OF CORE BOXES: NA		
7. THICKNESS OF OVERBURDEN: NA	15. GROUNDWATER ELEVATION: NA		
8. DEPTH DRILLED INTO ROCK	16. DATE HOLE	STARTED: 12-10-96	COMPLETED: 12-10-96
9. TOTAL DEPTH OF HOLE	17. ELEVATION TOP OF HOLE: NA		
	18. TOTAL CORE RECOVERY FOR HOLE: NA ____ PERCENT		

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	0.5		(Topsoil upper 0.2) weathered tan limestone			BKSB104
	2.0		Interbedded silty and pebbly clay, thin layers of 10YR8/4 vy. pale brown and 10YR3/2 vy. dk. grayish brown, 40% coarse sand to pebble sized angular to subrounded rock fragments, dry, med. plastic			
	2.5		same, dry, no pebbles			cuttings
	4.0					
	4.5		same, weathered tan limestone fragments, dry			BKSB105
	6.0		same, dry, interbeds of limestone			
	8.0		same, dry			
	9.0					
	9.5		same, dry			BKSB106
			same, dry			

SIGNATURE OF INSPECTOR/DATE: 12-10-96

PROJECT

HOLE NO.: FHBKG-SB103

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT

INSPECTOR — DeVaughn, SAIC

HOLE NUMBER FHRKG-SB103

SHEET 2 OF 2 SHEETS

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	10.5		same, dry			cuttings
	12.0		Same except more medium to coarse sand, silt, non plastic, dry			
	14.0		same, dry			cuttings
	15.0		Silty clay, mottled 10YR 8/2 vy. pale brown and 10YR 6/4 lt. yellowish brown, weathered limestone fragments, mod. plastic, damp, firm		BKSB107	
	16.0		Blue-gray weathered limestone fragments			cuttings
	17.0		TD			
	18.0					
	20.0					

SIGNATURE OF INSPECTOR/DATE 12-16-91

PROJECT

HOLE NO. FHRKG-SB103B

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG

1. DIVISION: Fort Worth Dist.	2. INSTALLATION: Fort Hood		3. SHEET 1 OF 3 SHEETS
4. PROJECT: Fort Hood RFI	10. SIZE AND TYPE OF BIT: 4¼" HSA		
5. LOCATION/STATION: FHBKG	11. DATUM FOR ELEVATION SHOWN: NA		
6. DRILLING AGENCY: TERRA VAR	12. MANUFACTURER'S DESIGNATION OF DRILL: MOBILE B-50		
7. HOLE NUMBER: FHBKG-SB104	13. TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: NA	DISTURBED	UNDISTURBED
8. NAME OF DRILLER: Bill Christopher	14. TOTAL NUMBER OF CORE BOXES: NA		
9. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL	15. GROUNDWATER ELEVATION: NA		
7. THICKNESS OF OVERBURDEN: NA	16. DATE HOLE	STARTED: 12-11-96	COMPLETED: 12-11-96
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE: NA		
8. TOTAL DEPTH OF HOLE: 24.0'	18. TOTAL CORE RECOVERY FOR HOLE: NA ____ PERCENT		

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	1.0		Topsoil			BKSB108
	2.0		Silty clay, 2.5Y7/6 yellow, damp, low plasticity, trace organics, soft, weathered limestone fragments			
	4.0		same			cuttings
	5.0		same with 10YR7/8 yellow mottle, no organics, dry			BKSB109
	6.0		same, slightly more silty, brittle, hard, dry			cuttings
	8.0					
	9.0		tan, weathered limestone			hard drilling/ cuttings

SIGNATURE OF INSPECTOR/DATE: 12-11-96

PROJECT

HOLE NO.: FHBKG-SR104

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT

INSPECTOR: T. DeVaughn, SAIC

HOLE NUMBER: FHBK6-SB104

SHEET 2 OF 3 SHEETS

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
			weathered limestone as above			cuttings
	11.0					
	11.5		silty clay as above, dry			BKSB110
	12.0		same, dry			cuttings
			same, dry			Geotechnical Sample
	13.0					
	14.0		silty clay and weathered limestone interbeds			cuttings
	16.0					
	18.0					
	18.5		silty clay as above, dry			BKSB111
	20.0		silty clay and weathered limestone interbeds			cuttings

SIGNATURE OF INSPECTOR/DATE: T. DeVaughn 12-11-96

PROJECT

HOLE NO. FHBK6-SB104

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT

HOLE NUMBER: FHBKG SB104

INSPECTOR: E. DeVaughn SAIC

SHEET 3 OF 3 SHEETS

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
			same, dry			
	24.0		TD			
			Blue-gray weathered limestone fragments, dry			
	26.0					
	28.0					
	30.0					
	32.0					

SIGNATURE OF INSPECTOR/DATE: [signature] 12-11-96

PROJECT

HOLE NO. FHBKG-SB104

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG

1. PROJECT: Fort Hood RFI	2. DIVISION: Fort Worth Dist.	3. INSTALLATION: Fort Hood	SHEET 3 OF 3
4. LOCATION/STATION: FHBKG	10. SIZE AND TYPE OF BIT: 4 1/4" HSA		
5. DRILLING AGENCY: TERRA MAR	11. DATUM FOR ELEVATION SHOWN: NA		
6. HOLE NUMBER: FHBKG-SB105	12. MANUFACTURER'S DESIGNATION OF DRILL: MOBILE B-50		
7. NAME OF DRILLER: BILL CHRISTOPHER	13. TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: NA	DISTURBED:	UNDISTURBED:
8. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL	14. TOTAL NUMBER OF CORE BOXES: NA		
9. THICKNESS OF OVERBURDEN: NA	15. GROUNDWATER ELEVATION: NA		
10. DEPTH DRILLED INTO ROCK:	16. DATE HOLE	STARTED: 12-11-96	COMPLETED: 12-11-96
11. TOTAL DEPTH OF HOLE: 24.0'	17. ELEVATION TOP OF HOLE: NA		
	18. TOTAL CORE RECOVERY FOR HOLE: NA ____ PERCENT		

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
			Gravel (graded area)			cuttings
	1.0					
	1.5		Silty clay, 2.5Y6/4 lt. yellowish brown, firm not plastic, dry, weathered limestone fragments			BKSB112
	2.0		Same, dry			cuttings
	4.0		Fat mottled clay, 2.5Y6/4 lt. yellowish brown and 10YR6/6 brownish yellow, high plastic, dry, firm			BKSB113
	5.0					
	6.0		same as above except new silty clay, limestone interbeds, dry			cuttings
	8.0					

SIGNATURE OF INSPECTOR/DATE: 12-11-96

PROJECT:

HOLE NO.: FHBKG-SB105

SWC 1996 after ENG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT

HOLE NUMBER: FHBKG-SB105

INSPECTOR: E. DeVaughn, SAIC

SHEET OF SHEETS

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
			same, dry			cuttings
	11.0					
			same, mod. plastic, dry			BKSB114
	12.0					
			same, dry			cuttings
	14.0					
	15.0					
			same with more silt, brittle, dry, hard, not plastic			BKSB115
	15.5					
	16.0					
			same with weathered limestone interbeds			
	18.0					cuttings
	20.0					

SIGNATURE OF INSPECTOR/DATE: E. DeVaughn 12-11-96

PROJECT

HOLE NO.: FHBKG-SB105

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT

HOLE NUMBER: FHRKG-SB105

INSPECTOR: C. Dellaquila SAIC

SHEET 3 OF 3 SHEETS

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	22.5		same. dry			BKSB116
			same, dry			cuttings
	24.0		TD			
			Blue-gray weathered limestone, dry, hard drilling to 24.0			
	26.0					
	28.0					
	30.0					
	32.0					

SIGNATURE OF INSPECTOR/DATE: 12-11-96

PROJECT

HOLE NO. FHRKG-SB105

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG

1. PROJECT: Fort Hood RFI	DIVISION: Fort Worth Dist.	INSTALLATION: Fort Hood	SHEET 1 OF 3 SHEETS
2. LOCATION/STATION: FHBKG		10. SIZE AND TYPE OF BIT: 4 1/4" HSA	
3. DRILLING AGENCY: TERRA MAR		11. DATUM FOR ELEVATION SHOWN: NA	
4. HOLE NUMBER: FHBKG-SB106		12. MANUFACTURER'S DESIGNATION OF DRILL: MOBILE B-50	
5. NAME OF DRILLER: Bill CHRISTOPHER		13. TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: NA	DISTURBED:	UNDISTURBED:
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL		14. TOTAL NUMBER OF CORE BOXES: NA	
7. THICKNESS OF OVERBURDEN: NA		15. GROUNDWATER ELEVATION: NA	
8. DEPTH DRILLED INTO ROCK:		16. DATE HOLE: STARTED 12-12-96	COMPLETED 12-12-96
9. TOTAL DEPTH OF HOLE: 25.5'		17. ELEVATION TOP OF HOLE: NA	
		18. TOTAL CORE RECOVERY FOR HOLE: NA ____ PERCENT	

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	1.0		Silty clay, mottled 2.5Y7/6 yellow and 10YR6/6 brownish yellow, dry, firm, not plastic, weathered limestone fragments			BKSB117
	2.0		same, dry			
	3.0		same, dry			Geotechnical Sample
	4.0		same with weathered limestone interbeds			cuttings
	6.0					
	7.0		same with trace fine sand, dry			
	8.0					
	9.0					
	9.5		Silty fine sand, 2.5Y8/4 pale yellow, dry, carbonate (HCl fizz), not plastic			BKSB118
			same, dry			

SIGNATURE OF INSPECTOR/DATE: J. Bill Christopher 12-12-96

PROJECT:

HOLE NO: FHBKG-SB106

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT

HOLE NUMBER: FHBKG-SB106

INSPECTOR: E. DeVaughn SAIC

SHEET 2 OF 3 SHEETS

ELEVATION (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS
			same, dry			cuttings
	12.0					
			same except color change to 10YR 8/2 vy. pale brown			cuttings
	14.0					
	14.5		same as above fine sand except no silt			BKSB119
			same, dry			cuttings
	16.0					
	18.0					
	19.0		fine sand, 2.5Y 8/4 pale yellow, non carbonate, soft, dry			BKSB120
	20.0					
			same, dry			cuttings

SIGNATURE OF INSPECTOR/DATE: E. DeVaughn 12-12-96

PROJECT

HOLE NO.: FHBKG-SB106

(SAIC 1996 after ENG FORM 1836)

HTRW DRILLING LOG (continued)

PROJECT

HOLE NUMBER: FHBKG-SB106

INSPECTOR: C. DeVaughn, SAIC

SHEET 3 OF 3

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	23.0		same, dry			cuttings
	24.0		tan weathered limestone, dry			cuttings
	25.5		TD			
	26.0		blue-gray weathered limestone, dry			
	28.0					
	30.0					
	32.0					

SIGNATURE OF INSPECTOR/DATE: 12-12-96

PROJECT

HOLE NO. FHBKG-SB106

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG

1. PROJECT: Fort Hood RFI	9. DIVISION: Fort Worth Dist.	10. INSTALLATION: Fort Hood	SHEET 1 OF SHEETS
2. LOCATION/STATION: FHBKG	10. SIZE AND TYPE OF BIT: 4¼" HSA		
3. DRILLING AGENCY: TERRA VAR	11. DATUM FOR ELEVATION SHOWN: NA		
4. HOLE NUMBER: FHBKG-SB107	12. MANUFACTURER'S DESIGNATION OF DRILL: MOBILE B-50		
5. NAME OF DRILLER: BILL CHRISTOPHER	13. TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: NA	DISTURBED	UNDISTURBED
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED ____ DEGREES FROM VERTICAL	14. TOTAL NUMBER OF CORE BOXES: NA		
7. THICKNESS OF OVERBURDEN: NA	15. GROUNDWATER ELEVATION: NA		
8. DEPTH DRILLED INTO ROCK:	16. DATE HOLE	STARTED: 12-12-96	COMPLETED: 12-12-96
9. TOTAL DEPTH OF HOLE: 6.0'	17. ELEVATION TOP OF HOLE: NA		
	18. TOTAL CORE RECOVERY FOR HOLE: NA ____ PERCENT		

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	1.0		Silty clay, mottled 10YR6/8 brownish yellow and 10YR6/2 lt. brownish gray, hard, not plastic, dry, weathered limestone fragments			BKSB124
	1.7		Same			
	2.0		Blue-gray weathered limestone, 2.5Y6/1 gray, fossiliferous			cuttings
	4.0					
	4.5		Same			BKSB125
	5.5		Same			cuttings
	6.0		Same			BKSB126
			TD			
	8.0					

SIGNATURE OF INSPECTOR/DATE: A. Williamson 12-12-96

PROJECT:

HOLE NO: FHBKG-SB107

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG

PROJECT: Ft Hood RFI	Fort Worth Dist. Fort Hood		SHEET 2 SHEETS
HOLE NO./LOCATION: FHBKG	SIZE AND TYPE OF BIT: 4¼" HSA		
NAME OF DRILLING CONTRACTOR: TERRA MAR	DATUM FOR ELEVATION SHOWN: NA		
NAME OF DRILLER: FHBKG-SB108	MANUFACTURER'S DESIGNATION OF DRILL: MOBILE B-50		
DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL	TOTAL NUMBER OF SAMPLES TAKEN: NA	UNDISTURBED:	DISTURBED:
THICKNESS OF OVERBURDEN: NA	TOTAL NUMBER OF CORE BOXES: NA		
DEPTH DRILLED INTO ROCK:	GROUNDWATER ELEVATION: NA		
TOTAL DEPTH OF HOLE: 17.0'	DATE HOLE: STARTED 1-14-97	COMPLETED 1-14-97	
	ELEVATION TOP OF HOLE: NA		
	TOTAL CORE RECOVERY FOR HOLE: NA	PERCENT	

ELEVATION	DEPTH	LEGEND	BASIC DESCRIPTION OF MATERIALS	CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS
	1.0		Upper 0.4 topsoil, Silty clay, 7.5YR6/8 brown, firm, yellowish weathered limestone fragments, firm, not plastic, dry			BKSB135
	2.0		same, dry			
	3.0		same, dry			cuttings
	5.0		same, mottled with 2.5Y7/3 pale yellow, dry			BKSB136
	6.0		same, dry			
	7.0		same, dry			cuttings
	9.0		same, dry			BKSB137
	10		same, dry			cuttings

SIGNATURE OF PERSON PREPARING LOG: D. Williams DATE: 1-14-97 PROJECT: Ft. Hood RFI HOLE NO.: FHBKG-SB108

SAVE/RECORD after END FORM 1836

HTRW DRILLING LOG (continued)

PROJECT: F. Hood RF

HOLE NUMBER: FHBKG-SB108

SHEET 2 OF 2 SHEETS

ELEVATION (FT)	DEPTH (FT)	LEGEND	CLASSIFICATION OF MATERIALS	% CORE RECOVERY	BOX OR SAMPLE NO	REMARKS
			same, dry			cuttings
	12.0					
	14.0		same, less silty, dry			BKSB138
	15.0		same, dry			
			Blue-grey weathered limestone			
	16.0					
	16.5		same, dry			
	17.0		TD			BKSB139
	18.0					
	20.0					

SIGNATURE OF INSPECTOR/DATE: J. W. Vaughn 1-14-97

PROJECT: F. Hood RF

HOLE NO.: FHBKG-SB108

SAIC/1836 after ENG FORM 1836

DRILLING LOG

Fort Worth Dist | Fort Hood | SHEET 3 OF 3

PROJECT: Ft. Hood RFI

SIZE AND TYPE OF: 4¼" HSA

LOCATION: FHBKG

DATUM FOR ELEVATIONS SHOWN: NA

DRILLING AGENCY: TERRA MAR

MANUFACTURER'S DESIGNATION OF DRILL: MOBILE B-50

PROJECT NO.: FHBKG-SB109

TOTAL NUMBER OF CORE BOXES: NA

NAME OF DRILLER: BILL CHRISTOPHER

TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: NA | DISTURBED | UNDISTURBED

DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL

GROUNDWATER ELEVATION: NA

THICKNESS OF OVERBURDEN: NA

DATE HOLE: STARTED 1-15-97 | COMPLETED 1-15-97

DEPTH DRILLED INTO ROCK:

ELEVATION OF TOP OF HOLE: NA

TOTAL DEPTH OF HOLE: 24.0'

TOTAL CORE RECOVERY FOR HOLE: NA ____ PERCENT

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS
	1.0		Silty clay 5 YR 2.5/1 black, slightly plastic, damp, trace roots, trace angular to subrounded rock fragments < 1 cm			BKSB140
	2.0		Same, damp			
	3.0		Same, damp			
	4.0					cuttings
	5.0		Same, damp			BKSB141
	6.0		Same, damp			
	7.0		Silty clay - 5 YR 6/4 lt. brown, not plastic, dry, trace weathered limestone fragments, stiff, some fine sand from 8.0' bgs.			
	8.0					
	9.0					
	10.0		Same, dry			BKSB142

SIGNATURE OF INSPECTOR/DATE: J. D. Waughtal 1-15-97

PROJECT: Ft. Hood RFI

NAME NO.: FHBKG-SB109

SAIC 1000 after ENG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT: Ft. Hood RFI | INSPECTOR: [illegible] | HOLE NUMBER: FTBKG-SB109 | SHEET 2 OF 3

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% CORE RECOVERY	BOX OR SAMPLE NO	REMARKS
	10		same except rock fragments - mostly weathered limestone, up to 20% total			
	12.0					
	13.0		same, dry			cuttings
	14.0		D1.5.97			
	14.5		same, dry, with limestone frags up to 40%, also 20% lime sand			BKSB143
	15.0		same, dry			
	16.0					
	18.0					
	19.0		same, dry			
	19.5		same, dry			BKSB144
	20.0					cuttings

SIGNATURE OF INSPECTOR/DATE: [signature] 1-15-97 | PROJECT: Ft. Hood RFI | HOLE NO: FTBKG-SB109

SAC 1033/after ENG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT: Ft. Hood RFI | INSPECTOR: E. DeVaughn SAIC | HOLE NUMBER: FHBKG-SB109 | SHEET 3 OF 3 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% CORE / RECOVERY	BOX OR SAMPLE NO.	REMARKS
			same as above			cuttings
	23.0					
			Silty fine to med. sand, moderate 7.5YR 6/6 reddish yellow and 7.5YR 7/1 light gray, mica, plastic, moist, soft			
	24.0					
			TD Encountered gravel, saturated			water in hole, attempted sample, no recovery (encountered gravel at 24 bgs)
	26.0					
	28.0					
	30.0					
	32.0					

SIGNATURE OF INSPECTOR/DATE: J. Dell Sanchez 1-15-07 | PROJECT: Ft. Hood RFI | HOLE NO.: FHBKG-SB109

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG

1. PROJECT: FORT HOOD RFI	2. DIVISION: Fort Worth Dist.	3. INSTALLATION: Fort Hood	SHEET 1 OF 4
4. LOCATION/STATION: FHBKG	10. SIZE AND TYPE OF BIT: 4¼" HSA		
5. DRILLING AGENCY: TERRA MAR	11. DATUM FOR ELEVATION SHOWN: NA		
6. HOLE NUMBER: FHBKG-SB110	12. MANUFACTURER'S DESIGNATION OF DRILL: MOBILE B-50		
7. NAME OF DRILLER: BILL CHRISTOPHER	13. TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: NA	DISTURBED	UNDISTURBED
8. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEGREES FROM VERTICAL	14. TOTAL NUMBER OF CORE BOXES: NA		
9. THICKNESS OF OVERBURDEN: NA	15. GROUNDWATER ELEVATION: NA		
10. DEPTH DRILLED INTO ROCK:	16. DATE HOLE	STARTED: 12-13-96	COMPLETED: 12-13-96
11. TOTAL DEPTH OF HOLE: 34.5'	17. ELEVATION TOP OF HOLE: NA		
	18. TOTAL CORE RECOVERY FOR HOLE: NA ____ PERCENT		

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	1.0		Sand, 7.5YR5/6 strong brown, fine to medium with some silt, soft, damp, not plastic			BKSB127
	2.0		same, damp to moist			
	3.0		Clayey sand, 2.5YR4/6 red, mod. plastic, firm, damp			
	4.0		same, damp			BKSB128
	6.0		same, damp			
	8.0		same, damp			Geotechnical Sample
			same, damp			

SIGNATURE OF INSPECTOR/DATE: J. [signature] 12-13-96

PROJECT:

HOLE NO.: FHBKG-SB110

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT

INSPECTOR: E. DeVaughn, SAIC

HOLE NUMBER: FHBKG-SB110

SHEET 2 OF 4 SHEETS

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	10.0		same, slightly less clay, dry			BKSB129
	11.0		same, dry			
	12.0					
	14.0		same, color now 5YR5/6 yellowish red, dry, less clay			
	15.0		same, dry			BKSB130
	16.0		same, dry			
	18.0		same, more clay, dry			
	19.5		Silty clay, trace sand, 7.5YR6/6 reddish yellow, hard, dry, trace tan weathered limestone fragments <1 cm			
	20.0		same, dry			BKSB131
	21.0		same, dry			

SIGNATURE OF INSPECTOR/DATE: E. DeVaughn 12-13-96

PROJECT

HOLE NO. FHBKG-SB110

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT

HOLE NUMBER: FH BKG-SB11Ø

INSPECTOR: T. DeVaughn SAIC

SHEET 3 OF 4 SHEETS

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
			same, dry			
	24.Ø					
	25.Ø		same, dry			BKSB132
	26.Ø		same, dry			
	28.Ø					
	29.Ø		same with more silt, moist, softer			
	30.Ø		same except very silty, soft, damp			BKSB133
	31.Ø		same, damp			
	32.Ø					
	33.Ø		Silty fine sand, trace gravel and coarse sand at bottom, saturated, not plastic, 7.5YR6/6 reddish yellow			

SIGNATURE OF INSPECTOR/DATE: A. DeVaughn 12-13-91

PROJECT

HOLE NO. FH BKG-SB11Ø

SAIC 1996 after ENG FORM 1836

HTRW DRILLING LOG (continued)

PROJECT

HOLE NUMBER: FHBKG-SB110

INSPECTOR: J. DeVaughn SAIC

SHEET 4 OF 4 SHEETS

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	34.0		Coarse sand / poorly sorted gravel, angular to rounded, saturated, 1.5' water in liner.			BKSB134
	34.5		TD			

SIGNATURE OF INSPECTOR/DATE: J. DeVaughn 12-13-96

PROJECT

HOLE NO. FHBKG-SB110

SAIC 1996 after ENG FORM 1836

APPENDIX E

Statistical Calculations

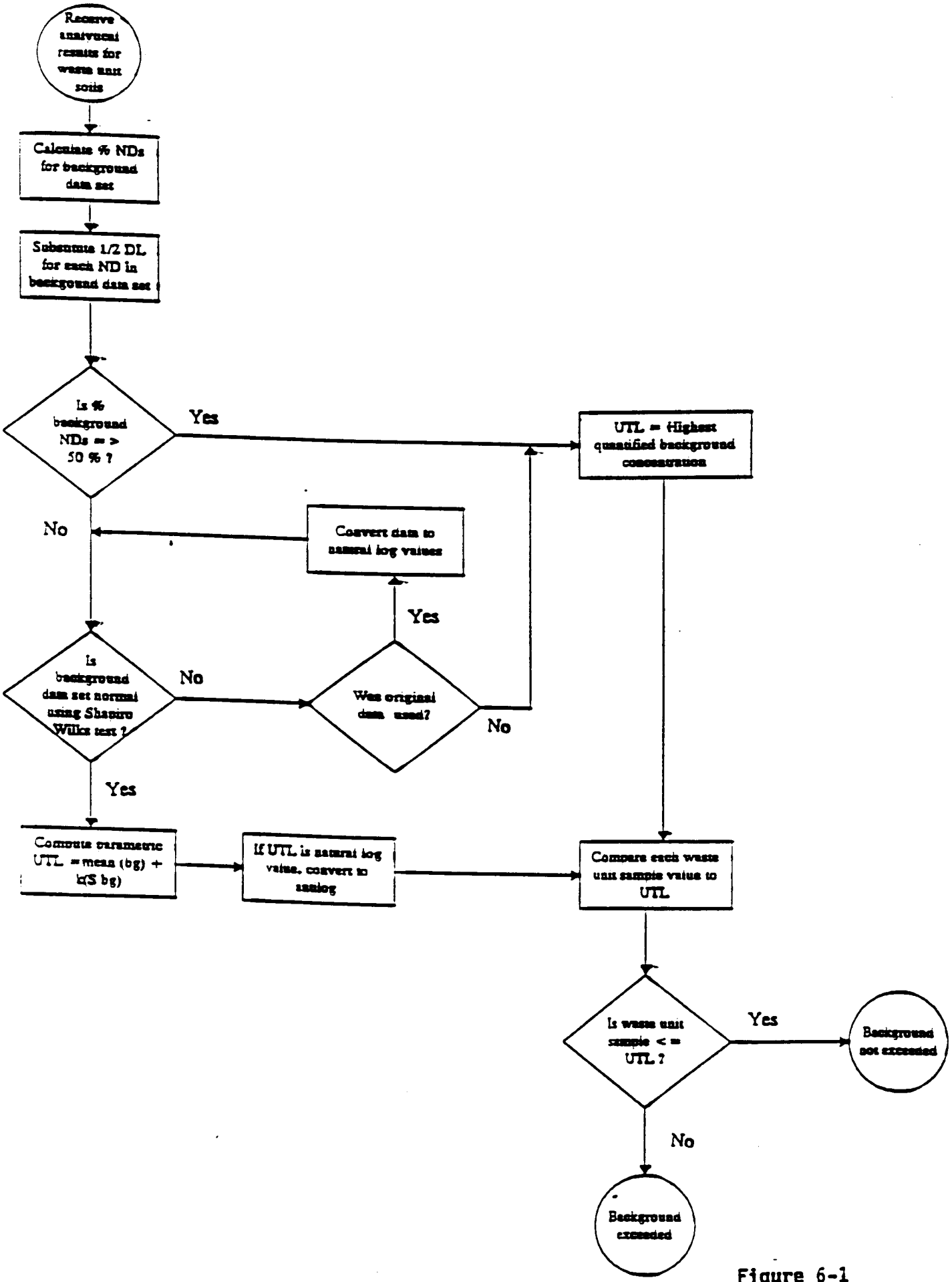
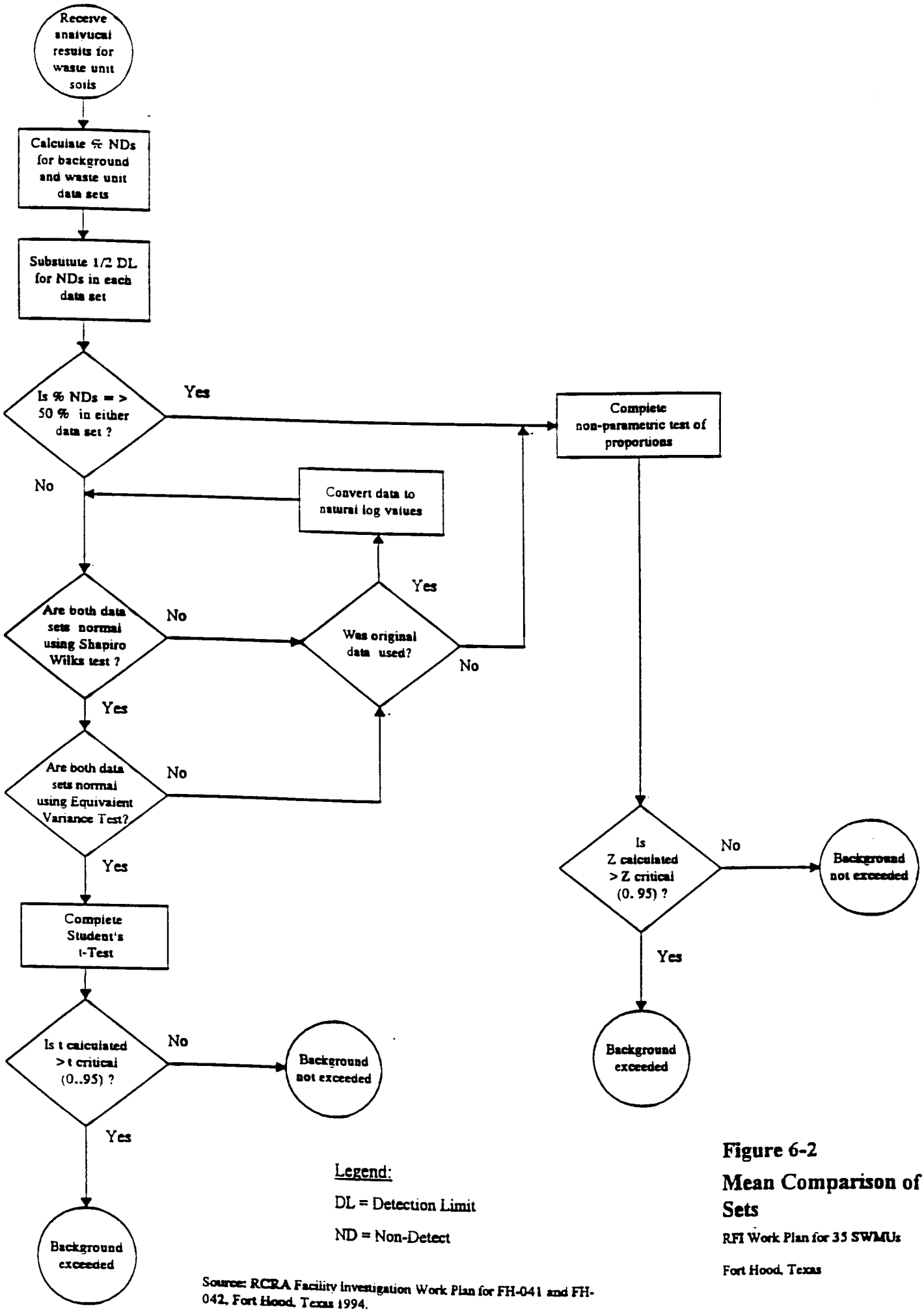


Figure 6-1
95% Upper Tolerance Limit
RFI Work Plan for 35 SWMUs
Fort Hood, Texas



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 of Data Sets

RFI Work Plan for 35 SWMUs

Fort Hood, Texas

Formulas for Shapiro Wilk or W test

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

$$d=\sum_{i}^{n}(x_i-\bar{x})^2$$

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

$$x_1 \leq x_2 \leq x_3 \leq \text{etc}$$

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

k=(n-1)/2 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*

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

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.

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	3.058707073
BKSB102	0.04	U	2	8	J	2.079441542
BKSB103	0.04	U	9.1	14.7	J	2.687847494
BKSB105	0.04	U	4.3	23.4	J	3.152736022
BKSB106	0.04	U	4.4	43.7	J	3.777348102
BKSB107	0.04	U				
BKSB109	0.04	U	3.5	155	J	5.043425117
BKSB110	0.04	U	4.8	24.1	J	3.18221184
BKSB111	0.04	U	5.2	7.2	J	1.974081026
BKSB113	0.04	U	5.7	20.5	J	3.020424886
BKSB114	0.04	U	5.2	25.2	J	3.226843995
BKSB115	0.04	U	5.3	10.6	J	2.360854001
BKSB116	0.04	U	11.6	4.9	J	1.589235205
BKSB118	0.04	U	2.6	4.4	J	1.481604541
BKSB119	0.04	U	0.66	3		1.098612289
BKSB120	0.04	U	0.44	2		0.693147181
BKSB122	0.04	U	3.2	6.1		1.808288771
BKSB123	0.04	U	3.8	5.5		1.704748092
BKSB125	0.04	U	3.2	18.1		2.895911938
BKSB126	0.04	U	2.5	5.4		1.686398954
BKSB128	0.04		3.6	36.3		3.591817741
BKSB129	0.04	U	2.6	26.3		3.269568939
BKSB130	0.04	U	1	8.1		2.091864062
BKSB131	0.04	U	5.3	65.9		4.188138442
BKSB132	0.04	U	4.2	41.7		3.730501129
BKSB133	0.04	U	3.2	68.6		4.228292535
BKSB134	0.04	U	2.9	20.1		3.000719815
BKSB136	0.04	U	4.3	14.8	J	2.694627181
BKSB137	0.04	U	8.2	7.8	J	2.054123734
BKSB138	0.04	U	9.2	12.2	J	2.501435952
BKSB139	0.04	U	7.6	7.3	J	1.987874348
BKSB141	0.04	U	5.6	127	J	4.844187086
BKSB142	0.04	U	3.8	63	J	4.143134726
BKSB143	0.04	U	3.8	39.3	J	3.671224519
BKSB144	0.04	U	3.7	36.1	J	3.586292865
BKSB104	0.04	U	6.2	28.2	J	3.339321978
BKSB108	0.04	U	6	72.4	J	4.282206299
BKSB112	0.04	U	1.6	6.6	J	1.887069649
BKSB117	0.04	U	4.4	27.9	J	3.328626689
BKSB121	0.04	U	4.1	24		3.17805383
BKSB124	0.04	U	6	19.3		2.960105096
BKSB127	0.04	U	1.9	18.8		2.93385687
BKSB135	0.04	U	2.7	15.4	J	2.734367509
BKSB140	0.04	U	4.8	108	J	4.682131227
%nondetects=	0.04	0.957446809			0	
Distribution	D		N			L
Mean	0.04		4.353488372	30.19069767		2.917009542
std dev	0		2.299203676	33.47344231		1.018594869
n	44		43	43		43
K	2.097		2.102	2.102		2.102
UTL	0.04		**9.186414498**	100.5518734		5.058095955
UTL(ln)=exp(mean + K(std dev)						**157.2907424**

Soil Background 95							
smp_id	Cadmium				Chromium		
	Result (x)	Qual	1/2 nondetects	Ln(x)	Result (x)	Qual	Ln(x)
BKSB101	0.12		0.12	-2.120263536	5.1	J	1.62924054
BKSB102	0.05		0.05	-2.995732274	10.3	J	2.332143895
BKSB103	0.05	U	0.025	-3.688879454	10.1	J	2.312535424
BKSB105	0.11		0.11	-2.207274913	4	J	1.386294361
BKSB106	0.16		0.16	-1.832581464	7.6	J	2.028148247
BKSB107	0.35		0.35	-1.049822124	5.1	J	1.62924054
BKSB109	0.07		0.07	-2.659260037	6.5	J	1.871802177
BKSB110	0.06		0.06	-2.813410717	16.6	J	2.809402695
BKSB111	0.05		0.05	-2.995732274	6.2	J	1.824549292
BKSB113	0.07		0.07	-2.659260037	8.9	J	2.186051277
BKSB114	0.05	U	0.025	-3.688879454	20.3	J	3.010620886
BKSB115	0.06		0.06	-2.813410717	7.3	J	1.987874348
BKSB116	0.2		0.2	-1.609437912	2.7	J	0.993251773
BKSB118	0.19		0.19	-1.660731207	2.2	J	0.78845736
BKSB119	0.06		0.06	-2.813410717	2.1		0.741937345
BKSB120	0.04	U	0.02	-3.912023005	0.93		-0.072570693
BKSB122	0.06		0.06	-2.813410717	4.9		1.589235205
BKSB123	0.08		0.08	-2.525728644	4.3		1.458615023
BKSB125	0.11		0.11	-2.207274913	5.1		1.62924054
BKSB126	0.06		0.06	-2.813410717	5.5		1.704748092
BKSB128	0.05	U	0.025	-3.688879454	8.5		2.140066163
BKSB129	0.04	U	0.02	-3.912023005	4.6		1.526056303
BKSB130	0.07		0.07	-2.659260037	1.8		0.587786665
BKSB131	0.15		0.15	-1.897119985	7.7		2.041220329
BKSB132	0.04	U	0.02	-3.912023005	5.9		1.774952351
BKSB133	0.11		0.11	-2.207274913	4.9		1.589235205
BKSB134	0.08		0.08	-2.525728644	1.2		0.182321557
BKSB136	0.2	J	0.2	-1.609437912	8.3		2.116255515
BKSB137	0.18	J	0.18	-1.714798428	8.1		2.091864062
BKSB138	0.21	J	0.21	-1.560647748	11.1		2.406945108
BKSB139	0.2	J	0.2	-1.609437912	8.4		2.128231706
BKSB141	0.45	J	0.45	-0.798507696	23.6		3.161246712
BKSB142	0.29	J	0.29	-1.237874356	8.4		2.128231706
BKSB143	0.27	J	0.27	-1.30933332	12.2		2.501435952
BKSB144	0.2	J	0.2	-1.609437912	6.5		1.871802177
BKSB104	0.15		0.15	-1.897119985	3.1	J	1.131402111
BKSB108	0.2		0.2	-1.609437912	12.9	J	2.557227311
BKSB112	0.04	U	0.02	-3.912023005	4	J	1.386294361
BKSB117	0.18		0.18	-1.714798428	5.7	J	1.740466175
BKSB121	0.18		0.18	-1.714798428	6.3		1.840549633
BKSB124	0.11		0.11	-2.207274913	7.2		1.974081026
BKSB127	0.04	U	0.02	-3.912023005	3.7		1.30833282
BKSB135	0.17	J	0.17	-1.771956842	6.1		1.808288771
BKSB140	0.79	J	0.79	-0.235722334	16.1		2.778819272
%nondetects=		0.191489362				0	
Distribution				L			L
Mean	0.145454545			-2.343338046	7.318863636		1.786680257
std dev	0.134759986			0.926564755	4.781799902		0.680627117
n	44			44	44		44
K	2.097			2.097	2.097		2.097
UTL	0.428046235			-0.40033175	17.34629803		3.213955322
UTL(ln)=exp(mean				**0.670097701**			**24.87728958**

Soil Background 95							
smp_id	Lead			Selenium		Silver	
	Result (x)	Qual	Ln(x)	Result (x)	Qual	Result (x)	Qual
BKSB101	6	J	1.791759469	0.37	U	0.24	U
BKSB102	5	J	1.609437912	0.36	U	0.23	U
BKSB103	9.5	J	2.251291799	0.38	U	0.24	U
BKSB105	3.9	J	1.360976553	0.33	U	0.21	U
BKSB106	5	J	1.609437912	0.33	U	0.21	U
BKSB107	6.1	J	1.808288771	0.36	U	0.23	U
BKSB109	3.2	J	1.16315081	0.34	U	0.22	U
BKSB110	7.8	J	2.054123734	0.36	U	0.23	U
BKSB111	5.3	J	1.667706821	0.35	U	0.22	U
BKSB113	6	J	1.791759469	0.36	U	0.23	U
BKSB114	7.7	J	2.041220329	0.38	U	0.24	U
BKSB115	5.1	J	1.62924054	0.32	U	0.2	U
BKSB116	5.6	J	1.722766598	0.33	U	0.21	U
BKSB118	3.7	J	1.30833282	0.34	U	0.21	U
BKSB119	1.3	J	0.262364264	0.33	U	0.21	U
BKSB120	0.72	J	-0.328504067	0.32	U	0.2	U
BKSB122	4.1	J	1.410986974	0.33	U	0.21	U
BKSB123	3.8	J	1.335001067	0.33	U	0.21	U
BKSB125	1.7	J	0.530628251	0.36		0.2	U
BKSB126	1.5	J	0.405465108	0.44		0.21	U
BKSB128	7.5	J	2.014903021	0.35	U	0.22	U
BKSB129	4.1	J	1.410986974	0.33	U	0.21	U
BKSB130	3.1	J	1.131402111	0.32	U	0.2	U
BKSB131	10.1	J	2.312535424	0.34	U	0.22	U
BKSB132	7.8	J	2.054123734	0.34	U	0.21	U
BKSB133	6.3	J	1.840549633	0.35	U	0.22	U
BKSB134	2.3	J	0.832909123	0.33	U	0.21	U
BKSB136	3	J	1.098612289	0.32	R	0.22	U
BKSB137	2.3	J	0.832909123	0.31	R	0.21	U
BKSB138	4.1	J	1.410986974	0.32	R	0.22	U
BKSB139	3.6	J	1.280933845	0.31	R	0.21	U
BKSB141	12.1	J	2.493205453	1.8	R	0.25	U
BKSB142	5	J	1.609437912	1.9	R	0.25	U
BKSB143	6.6	J	1.887069649	0.35	R	0.24	U
BKSB144	4	J	1.386294361	0.31	R	0.21	U
BKSB104	5.3	J	1.667706821	0.32	U	0.2	U
BKSB108	9.8	J	2.282382386	0.37	U	0.23	U
BKSB112	1.5	J	0.405465108	0.32	U	0.2	U
BKSB117	8.3	J	2.116255515	0.33	U	0.21	U
BKSB121	10.2	J	2.32238772	0.34	U	0.22	U
BKSB124	4.5	J	1.504077397	0.34	U	0.21	U
BKSB127	3.8	J	1.335001067	0.33	U	0.21	U
BKSB135	2.5	J	0.916290732	1.5	R	0.21	U
BKSB140	33.2	J	3.502549876	0.35	R	0.24	U
%nondetects=		0					
Distribution			L	D		D	
Mean	5.773181818		1.52441844	0.345		0.217954545	
std dev	4.998382889		0.678101063	0.024277437		0.01390659	
n	44		44				
K	2.097		2.097				
UTL	16.25479074		2.94639637				
UTL(ln)=exp(mean			**19.03722684**				

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	4.353488372					
n=	43					
sum of xi^2	1036.9992					
1/n=	0.023255814					
xi=(sum xi)^2	35043.84					
d=	222.0261767					
W=	0.939827935					
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	1.274111212
	-0.415515444	0.172653084	2.219203484	2.634718928	0.2684	0.70715856
	0	0	2.208274414	2.208274414	0.2334	0.515411248
	0.470003629	0.220903412	2.104134154	1.634130525	0.2078	0.339572323
	0.641853886	0.411976411	2.028148247	1.386294361	0.1871	0.259375675
	0.693147181	0.480453014	1.824549292	1.131402111	0.1695	0.191772658
	0.916290732	0.839588705	1.791759469	0.875468737	0.1539	0.134734639
	0.955511445	0.913002122	1.791759469	0.836248024	0.1398	0.116907474
	0.955511445	0.913002122	1.740466175	0.78495473	0.1269	0.099610755
	0.993251773	0.986549085	1.722766598	0.729514825	0.1149	0.083821253
	1.064710737	1.133608953	1.667706821	0.602996084	0.1035	0.062410095
	1.098612289	1.206948961	1.667706821	0.569094532	0.0927	0.052755063
	1.16315081	1.352919806	1.648658626	0.485507816	0.0824	0.040005844
	1.16315081	2.781246039	1.648658626	0.485507816	0.0724	0.035150766
	1.16315081	6.007425991	1.568615918	0.405465108	0.0628	0.025463209
	1.252762968	2.195152016	1.568615918	0.315852949	0.0534	0.016866547
	1.280933845	0.913002122	1.481604541	0.200670695	0.0442	0.008869645
	1.30833282	0.172653084	1.481604541	0.173271721	0.0352	0.006099165
	1.335001067	0.674009067	1.458615023	0.123613956	0.0263	0.003251047
	1.335001067	1.99088424	1.458615023	0.123613956	0.0175	0.002163244
	1.335001067	1.352919806	1.435084525	0.100083459	0.0087	0.000870726
	1.410986974	1.782227848	1.410986974	0		0
	1.435084525	3.210401996	1.335001067	-0.100083459		0
	1.458615023	1.352919806	1.335001067	-0.123613956		0
	1.458615023	0.839588705	1.335001067	-0.123613956		
	1.481604541	0.411976411	1.30833282	-0.173271721		3.976381148
	1.481604541	1.640791516	1.280933845	-0.200670695		
	1.568615918	0.913002122	1.252762968	-0.315852949	W(0.05,43)=	0.943
	1.568615918	0	1.16315081	-0.405465108	W(ln)=	0.910616383
	1.648658626	2.781246039	1.16315081	-0.485507816		
	1.648658626	2.059467595	1.16315081	-0.485507816		
	1.667706821	1.352919806	1.098612289	-0.569094532		
	1.667706821	1.133608953	1.064710737	-0.602996084		
	1.722766598	0.986549085	0.993251773	-0.729514825		
	1.740466175	2.127557784	0.955511445	-0.78495473		
	1.791759469	4.427380539	0.955511445	-0.836248024		
	1.791759469	4.924864104	0.916290732	-0.875468737		
	1.824549292	4.113385313	0.693147181	-1.131402111		
	2.028148247	2.460555898	0.641853886	-1.386294361		
	2.104134154	2.96792475	0.470003629	-1.634130525		
	2.208274414	1.782227848	0	-2.208274414		
	2.219203484	1.782227848	-0.415515444	-2.634718928		
	2.451005098	1.711734767	-0.820980552	-3.27198565		
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						

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=	0.734709728
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	0.480453014	5.043425117	4.350277936	0.3894	1.693998228
	1.098612289	1.206948961	4.844187086	3.745574798	0.2684	1.005312276
	1.481604541	2.195152016	4.682131227	3.200526686	0.2334	0.747002929
	1.589235205	2.525668537	4.282206299	2.692971094	0.2078	0.559599393
	1.686398954	2.843941431	4.228292535	2.541893581	0.1871	0.475588289
	1.704748092	2.906166058	4.188138442	2.483390349	0.1695	0.420934664
	1.808288771	3.26990828	4.143134726	2.334845955	0.1539	0.359332793
	1.887069649	3.56103186	3.777348102	1.890278453	0.1398	0.264260928
	1.974081026	3.896995897	3.730501129	1.756420103	0.1269	0.222889711
	1.987874348	3.951644424	3.671224519	1.683350171	0.1149	0.193416935
	2.054123734	4.219424313	3.591817741	1.537694008	0.1035	0.15915133
	2.079441542	4.324077125	3.586292865	1.506851324	0.0927	0.139685118
	2.091864062	4.375895253	3.339321978	1.247457916	0.0824	0.102790532
	2.360854001	5.573631615	3.328626689	0.967772688	0.0724	0.070066743
	2.501435952	6.257181821	3.269568939	0.768132987	0.0628	0.048238752
	2.687847494	7.22452415	3.226843995	0.538996501	0.0534	0.028782413
	2.694627181	7.261015643	3.18221184	0.48758466	0.0442	0.021551242
	2.734367509	7.476765677	3.17805383	0.443686321	0.0352	0.015617758
	2.895911938	8.386305954	3.152736022	0.256824084	0.0263	0.006754473
	2.93385687	8.607516133	3.058707073	0.124850203	0.0175	0.002184879
	2.960105096	8.762222179	3.020424886	0.06031979	0.0087	0.000524782
	3.000719815	9.004319409	3.000719815	0		0
	3.020424886	9.122966493	2.960105096	-0.06031979		0
	3.058707073	9.355688957	2.93385687	-0.124850203		0
	3.152736022	9.939744427	2.895911938	-0.256824084		
	3.17805383	10.10002615	2.734367509	-0.443686321		6.537684167
	3.18221184	10.1264722	2.694627181	-0.48758466		
	3.226843995	10.41252216	2.687847494	-0.538996501	W(0.05,43)=	0.943
	3.269568939	10.69008105	2.501435952	-0.768132987	W(ln)=	0.98083423
	3.328626689	11.07975563	2.360854001	-0.967772688		
	3.339321978	11.15107127	2.091864062	-1.247457916		
	3.586292865	12.86149652	2.079441542	-1.506851324		
	3.591817741	12.90115469	2.054123734	-1.537694008		
	3.671224519	13.47788947	1.987874348	-1.683350171		
	3.730501129	13.91663867	1.974081026	-1.756420103		
	3.777348102	14.26835868	1.887069649	-1.890278453		
	4.143134726	17.16556536	1.808288771	-2.334845955		
	4.188138442	17.54050361	1.704748092	-2.483390349		
	4.228292535	17.87845776	1.686398954	-2.541893581		
	4.282206299	18.33729079	1.589235205	-2.692971094		
	4.682131227	21.92235283	1.481604541	-3.200526686		
	4.844187086	23.46614853	1.098612289	-3.745574798		
	5.043425117	25.43613691	0.693147181	-4.350277936		
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)^2	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)
BKSB101	0.12	0.0144	0.02	0.79	0.77	0.3872	0.298144
BKSB102	0.05	0.0025	0.02	0.45	0.43	0.2667	0.114681
BKSB103	0.025	0.000625	0.02	0.35	0.33	0.2323	0.076659
BKSB104	0.15	0.0225	0.02	0.29	0.27	0.2072	0.055944
BKSB105	0.11	0.0121	0.02	0.27	0.25	0.1868	0.0467
BKSB106	0.16	0.0256	0.025	0.21	0.185	0.1695	0.0313575
BKSB107	0.35	0.1225	0.025	0.2	0.175	0.1542	0.026985
BKSB108	0.2	0.04	0.025	0.2	0.175	0.1405	0.0245875
BKSB109	0.07	0.0049	0.05	0.2	0.15	0.1278	0.01917
BKSB110	0.06	0.0036	0.05	0.2	0.15	0.116	0.0174
BKSB111	0.05	0.0025	0.06	0.2	0.14	0.1049	0.014686
BKSB112	0.02	0.0004	0.06	0.19	0.13	0.0943	0.012259
BKSB113	0.07	0.0049	0.06	0.18	0.12	0.0842	0.010104
BKSB114	0.025	0.000625	0.06	0.18	0.12	0.0745	0.00894
BKSB115	0.06	0.0036	0.06	0.18	0.12	0.0651	0.007812
BKSB116	0.2	0.04	0.07	0.17	0.1	0.056	0.0056
BKSB117	0.18	0.0324	0.07	0.16	0.09	0.0471	0.004239
BKSB118	0.19	0.0361	0.07	0.15	0.08	0.0383	0.003064
BKSB119	0.06	0.0036	0.08	0.15	0.07	0.0296	0.002072
BKSB120	0.02	0.0004	0.08	0.12	0.04	0.0211	0.000844
BKSB121	0.18	0.0324	0.11	0.11	0	0.0126	0
BKSB122	0.06	0.0036	0.11	0.11	0	0.0042	0
BKSB123	0.08	0.0064	0.11	0.11	0	0	0
BKSB124	0.11	0.0121	0.11	0.11	0		0
BKSB125	0.11	0.0121	0.12	0.08	-0.04		
BKSB126	0.06	0.0036	0.15	0.08	-0.07	Sum of b=	0.781248
BKSB127	0.02	0.0004	0.15	0.07	-0.08		
BKSB128	0.025	0.000625	0.16	0.07	-0.09	W=	0.7448006
BKSB129	0.02	0.0004	0.17	0.07	-0.1	W(0.05,44)=	0.944
BKSB130	0.07	0.0049	0.18	0.06	-0.12		
BKSB131	0.15	0.0225	0.18	0.06	-0.12		
BKSB132	0.02	0.0004	0.18	0.06	-0.12		
BKSB133	0.11	0.0121	0.19	0.06	-0.13		
BKSB134	0.08	0.0064	0.2	0.06	-0.14		
BKSB135	0.17	0.0289	0.2	0.05	-0.15		
BKSB136	0.2	0.04	0.2	0.05	-0.15		
BKSB137	0.18	0.000625	0.2	0.025	-0.175		
BKSB138	0.21	0.0225	0.2	0.025	-0.175		
BKSB139	0.2	0.0121	0.21	0.025	-0.185		
BKSB140	0.79	0.0256	0.27	0.02	-0.25		
BKSB141	0.45	0.1225	0.29	0.02	-0.27		
BKSB142	0.29	0.04	0.35	0.02	-0.33		
BKSB143	0.27	0.0049	0.45	0.02	-0.43		
BKSB144	0.2	0.0036	0.79	0.02	-0.77		
Sum of xi	6.225						
Mean	0.141477273						
n=	44						
sum of xi^2	1.700175						
1/n=	0.022727273						
xi=(sum xi)^2	38.750625						
d=	0.819478977						
W=	0.744800604						
W(0.05,44)=	0.944						
W<W(0.5,44), the distribution is not normal							

Shapiro Wilk for Cadmium

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	-3.912023005	15.303924	-0.235722334	3.676300672	0.3872	1.42346362
BKSB102	-3.912023005	15.303924	-0.798507696	3.113515309	0.2667	0.830374533
BKSB103	-3.912023005	15.303924	-1.049822124	2.862200881	0.2323	0.664889265
BKSB104	-3.912023005	15.303924	-1.237874356	2.674148649	0.2072	0.5540836
BKSB105	-3.912023005	15.303924	-1.30933332	2.602689685	0.1868	0.486182433
BKSB106	-3.688879454	13.6078316	-1.560647748	2.128231706	0.1695	0.360735274
BKSB107	-3.688879454	13.6078316	-1.609437912	2.079441542	0.1542	0.320649886
BKSB108	-3.688879454	13.6078316	-1.609437912	2.079441542	0.1405	0.292161537
BKSB109	-2.995732274	8.97441185	-1.609437912	1.386294361	0.1278	0.177168419
BKSB110	-2.995732274	8.97441185	-1.609437912	1.386294361	0.116	0.160810146
BKSB111	-2.813410717	7.91527986	-1.609437912	1.203972804	0.1049	0.126296747
BKSB112	-2.813410717	7.91527986	-1.660731207	1.15267951	0.0943	0.108697678
BKSB113	-2.813410717	7.91527986	-1.714798428	1.098612289	0.0842	0.092503155
BKSB114	-2.813410717	7.91527986	-1.714798428	1.098612289	0.0745	0.081846616
BKSB115	-2.813410717	7.91527986	-1.714798428	1.098612289	0.0651	0.07151966
BKSB116	-2.659260037	7.07166394	-1.771956842	0.887303195	0.056	0.049688979
BKSB117	-2.659260037	7.07166394	-1.832581464	0.826678573	0.0471	0.038936561
BKSB118	-2.659260037	7.07166394	-1.897119985	0.762140052	0.0383	0.029189964
BKSB119	-2.525728644	6.37930518	-1.897119985	0.628608659	0.0296	0.018606816
BKSB120	-2.525728644	6.37930518	-2.120263536	0.405465108	0.0211	0.008555314
BKSB121	-2.207274913	4.87206254	-2.207274913	0	0.0126	0
BKSB122	-2.207274913	4.87206254	-2.207274913	0	0.0042	0
BKSB123	-2.207274913	4.87206254	-2.207274913	0	0	0
BKSB124	-2.207274913	4.87206254	-2.207274913	0		0
BKSB125	-2.120263536	4.49551746	-2.525728644	-0.405465108		
BKSB126	-1.897119985	3.59906424	-2.525728644	-0.628608659	Sum of b=	5.896360202
BKSB127	-1.897119985	3.59906424	-2.659260037	-0.762140052		
BKSB128	-1.832581464	3.35835482	-2.659260037	-0.826678573	W=	0.941776836
BKSB129	-1.771956842	3.13983105	-2.659260037	-0.887303195	W(0.05,44)=	0.944
BKSB130	-1.714798428	2.94053365	-2.813410717	-1.098612289		
BKSB131	-1.714798428	2.94053365	-2.813410717	-1.098612289		
BKSB132	-1.714798428	2.94053365	-2.813410717	-1.098612289		
BKSB133	-1.660731207	2.75802814	-2.813410717	-1.15267951		
BKSB134	-1.609437912	2.59029039	-2.813410717	-1.203972804		
BKSB135	-1.609437912	2.59029039	-2.995732274	-1.386294361		
BKSB136	-1.609437912	2.59029039	-2.995732274	-1.386294361		
BKSB137	-1.609437912	2.59029039	-3.688879454	-2.079441542		
BKSB138	-1.609437912	2.59029039	-3.688879454	-2.079441542		
BKSB139	-1.560647748	2.43562139	-3.688879454	-2.128231706		
BKSB140	-1.30933332	1.71435374	-3.912023005	-2.602689685		
BKSB141	-1.237874356	1.53233292	-3.912023005	-2.674148649		
BKSB142	-1.049822124	1.10212649	-3.912023005	-2.862200881		
BKSB143	-0.798507696	0.63761454	-3.912023005	-3.113515309		
BKSB144	-0.235722334	0.05556502	-3.912023005	-3.676300672		
Sum of xi	-103.106874					
Mean	-2.343338046					
n=	44					
sum of xi^2	278.5307172					
1/n=	0.022727273					
xi=(sum xi)^2	10631.02747					
d=	36.91645655					
W=	0.941776836					
W(0.05,44)=	0.944					
W<W(0.5,44), the 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	7.318863636					
n=	44					
sum of x_i^2	3340.1149					
1/n=	0.022727273					
x_i=(sum xi)^2	103703.3209					
d=	983.2212432					
W=	0.87100033					
W(0.05,44)=	0.944					
W<W(0.5,45), the distribution is not normal						

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	-0.072570693	0.005266505	3.161246712	3.233817405	0.3872	1.252134099
BKSB102	0.182321557	0.03324115	3.010620886	2.828299329	0.2667	0.754307431
BKSB103	0.587786665	0.345493163	2.809402695	2.22161603	0.2323	0.516081404
BKSB104	0.741937345	0.550471024	2.778819272	2.036881927	0.2072	0.422041935
BKSB105	0.78845736	0.621665009	2.557227311	1.768769951	0.1868	0.330406227
BKSB106	0.993251773	0.986549085	2.501435952	1.508184179	0.1695	0.255637218
BKSB107	1.131402111	1.280070738	2.406945108	1.275542997	0.1542	0.19668873
BKSB108	1.30833282	1.711734767	2.332143895	1.023811076	0.1405	0.143845456
BKSB109	1.386294361	1.921812056	2.312535424	0.926241063	0.1278	0.118373608
BKSB110	1.386294361	1.921812056	2.186051277	0.799756916	0.116	0.092771802
BKSB111	1.458615023	2.127557784	2.140066163	0.681451141	0.1049	0.071484225
BKSB112	1.526056303	2.328847841	2.128231706	0.602175402	0.0943	0.05678514
BKSB113	1.589235205	2.525668537	2.128231706	0.538996501	0.0842	0.045383505
BKSB114	1.589235205	2.525668537	2.116255515	0.52702031	0.0745	0.039263013
BKSB115	1.62924054	2.654424736	2.091864062	0.462623522	0.0651	0.030116791
BKSB116	1.62924054	2.654424736	2.041220329	0.411979789	0.056	0.023070868
BKSB117	1.62924054	2.654424736	2.028148247	0.398907708	0.0471	0.018788553
BKSB118	1.704748092	2.906166058	1.987874348	0.283126256	0.0383	0.010843736
BKSB119	1.740466175	3.029222506	1.974081026	0.233614851	0.0296	0.006915
BKSB120	1.774952351	3.150455848	1.871802177	0.096849826	0.0211	0.002043531
BKSB121	1.808288771	3.26990828	1.871802177	0.063513406	0.0126	0.000800269
BKSB122	1.824549292	3.328980119	1.840549633	0.016000341	0.0042	6.72014E-05
BKSB123	1.840549633	3.387622953	1.824549292	-0.016000341	0	0
BKSB124	1.871802177	3.503643389	1.808288771	-0.063513406		0
BKSB125	1.871802177	3.503643389	1.774952351	-0.096849826	Sum of b=	4.387849744
BKSB126	1.974081026	3.896995897	1.740466175	-0.233614851		
BKSB127	1.987874348	3.951644424	1.704748092	-0.283126256	W=	0.96653268
BKSB128	2.028148247	4.113385313	1.62924054	-0.398907708	W(0.05,45)=	0.945
BKSB129	2.041220329	4.166580431	1.62924054	-0.411979789		
BKSB130	2.091864062	4.375895253	1.62924054	-0.462623522		
BKSB131	2.116255515	4.478537404	1.589235205	-0.52702031		
BKSB132	2.128231706	4.529370194	1.589235205	-0.538996501		
BKSB133	2.128231706	4.529370194	1.526056303	-0.602175402		
BKSB134	2.140066163	4.579883184	1.458615023	-0.681451141		
BKSB135	2.186051277	4.778820185	1.386294361	-0.799756916		
BKSB136	2.312535424	5.347820087	1.386294361	-0.926241063		
BKSB137	2.332143895	5.793384754	1.30833282	-1.023811076		
BKSB138	2.406945108	6.257181821	1.131402111	-1.275542997		
BKSB139	2.501435952	6.539411522	0.993251773	-1.508184179		
BKSB140	2.557227311	7.721836546	0.78845736	-1.768769951		
BKSB141	2.778819272	7.892743505	0.741937345	-2.036881927		
BKSB142	2.809402695	9.06383812	0.587786665	-2.22161603		
BKSB143	3.010620886	9.993480774	0.182321557	-2.828299329		
BKSB144	3.161246712	#REF!	-0.072570693	-3.233817405		
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)^2	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	12.576256
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=	26.379216
BKSB127	3.8	5.3	4.1	-1.2		
BKSB128	7.5	5.6	4	-1.6	W=	0.64773337
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	5.7731818					
n=	44					
sum of xi^2	2540.8084					
1/n=	0.0227273					
xi=(sum xi)^2	64526.16					
d=	1074.3048					
W=	0.6477334					
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	3.831053943	0.3872	1.483384087
BKSB102	0.262364264	0.068835007	2.493205453	2.230841188	0.2667	0.594965345
BKSB103	0.405465108	0.164401954	2.32238772	1.916922612	0.2323	0.445301123
BKSB104	0.405465108	0.164401954	2.312535424	1.907070316	0.2072	0.395144969
BKSB105	0.530628251	0.281566341	2.282382386	1.751754135	0.1868	0.327227672
BKSB106	0.832909123	0.693737607	2.251291799	1.418382676	0.1695	0.240415864
BKSB107	0.832909123	0.693737607	2.116255515	1.283346392	0.1542	0.197892014
BKSB108	0.916290732	0.839588705	2.054123734	1.137833002	0.1405	0.159865537
BKSB109	1.098612289	1.206948961	2.054123734	0.955511445	0.1278	0.122114363
BKSB110	1.131402111	1.280070738	2.041220329	0.909818217	0.116	0.105538913
BKSB111	1.16315081	1.352919806	2.014903021	0.851752211	0.1049	0.089348807
BKSB112	1.280933845	1.640791516	1.887069649	0.606135804	0.0943	0.057158606
BKSB113	1.30833282	1.711734767	1.840549633	0.532216814	0.0842	0.044812656
BKSB114	1.335001067	1.782227848	1.808288771	0.473287704	0.0745	0.035259934
BKSB115	1.335001067	1.782227848	1.791759469	0.456758402	0.0651	0.029734972
BKSB116	1.360976553	1.852257178	1.791759469	0.430782916	0.056	0.024123843
BKSB117	1.386294361	1.921812056	1.722766598	0.336472237	0.0471	0.015847842
BKSB118	1.410986974	1.99088424	1.667706821	0.256719847	0.0383	0.00983237
BKSB119	1.410986974	1.99088424	1.667706821	0.256719847	0.0296	0.007598907
BKSB120	1.410986974	1.99088424	1.62924054	0.218253566	0.0211	0.00460515
BKSB121	1.504077397	2.262248815	1.609437912	0.105360516	0.0126	0.001327542
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	-0.105360516		0
BKSB125	1.62924054	2.654424736	1.410986974	-0.218253566		
BKSB126	1.667706821	2.781246039	1.410986974	-0.256719847	Sum of b=	4.391500517
BKSB127	1.667706821	2.781246039	1.410986974	-0.256719847		
BKSB128	1.722766598	2.96792475	1.386294361	-0.336472237	W(ln)=	0.975368151
BKSB129	1.791759469	3.210401996	1.360976553	-0.430782916		
BKSB130	1.791759469	3.210401996	1.335001067	-0.456758402	W(0.05,44)=	0.944
BKSB131	1.808288771	3.26990828	1.335001067	-0.473287704		
BKSB132	1.840549633	3.387622953	1.30833282	-0.532216814		
BKSB133	1.887069649	3.56103186	1.280933845	-0.606135804		
BKSB134	2.014903021	4.059834182	1.16315081	-0.851752211		
BKSB135	2.041220329	4.166580431	1.131402111	-0.909818217		
BKSB136	2.054123734	4.219424313	1.098612289	-0.955511445		
BKSB137	2.054123734	4.219424313	0.916290732	-1.137833002		
BKSB138	2.116255515	4.478537404	0.832909123	-1.283346392		
BKSB139	2.251291799	5.068314762	0.832909123	-1.418382676		
BKSB140	2.282382386	5.209269354	0.530628251	-1.751754135		
BKSB141	2.312535424	5.347820087	0.405465108	-1.907070316		
BKSB142	2.32238772	5.393484723	0.405465108	-1.916922612		
BKSB143	2.493205453	6.216073429	0.262364264	-2.230841188		
BKSB144	3.502549876	12.26785563	-0.328504067	-3.831053943		
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						

APPENDIX F

FH-038C Screening Results

Summary of Detected Analytical Results, Detection Limits, and Screening Criteria for FH-038C Samples									
Location	**Sample ID**	**Depth**	**Parameter**	**Results**	**Detection Limit**	**Units**	**Screening Criteria**	**Screening Value**	**Units**
SB108	38SB116	0.0-1.0	Lead	2.3	0.21	mg/kg	Soil Background	19	mg/kg
SB108	38SB117	4.0-5.0	Lead	1.5	0.20	mg/kg	Soil Background	19	mg/kg
SB108	38SB118	11.0-12.0	Lead	3.2	0.21	mg/kg	Soil Background	19	mg/kg
SB108	38SB119	16.0-17.0	Lead	4.2	0.21	mg/kg	Soil Background	19	mg/kg
SB108	38SB120	17.0-18.0	Lead	4	0.20	mg/kg	Soil Background	19	mg/kg
SB109	38SB112	0.0-1.0	Lead	4.5	0.21	mg/kg	Soil Background	19	mg/kg
SB109	38SB113	4.0-5.0	Lead	4.5	0.20	mg/kg	Soil Background	19	mg/kg
SB109	38SB114	14.0-15.0	Lead	3.1	0.20	mg/kg	Soil Background	19	mg/kg
SB109	38SB115	17.5-18.5	Lead	2.9	0.20	mg/kg	Soil Background	19	mg/kg
SB110	38SB143	0.0-1.0	Lead	2.1 J	0.21	mg/kg	Soil Background	19	mg/kg
SB110	38SB144	5.0-6.0	Lead	12.6 J	0.21	mg/kg	Soil Background	19	mg/kg
SB111	38SB101	0.0-1.0	Lead	23.6	0.17	mg/kg	Soil Background	19	mg/kg
SB111	38SB102	4.0-5.0	Lead	2.1	0.16	mg/kg	Soil Background	19	mg/kg
SB111	38SB103	9.0-10.0	Lead	1.8	0.15	mg/kg	Soil Background	19	mg/kg
SB111	38SB104	11.0-12.0	Lead	2.2	0.15	mg/kg	Soil Background	19	mg/kg
UST	38SB163	2.0-2.5	Lead	21.3 J	0.16	mg/kg	Soil Background	19	mg/kg
UST	38SB164	2.0-2.5	Lead	6.6 J	0.17	mg/kg	Soil Background	19	mg/kg
UST	38SB165	8.0-10.0	Lead	14.4 J	0.17	mg/kg	Soil Background	19	mg/kg
UST	38SB166	8.0-10.0	Lead	17 J	0.18	mg/kg	Soil Background	19	mg/kg