

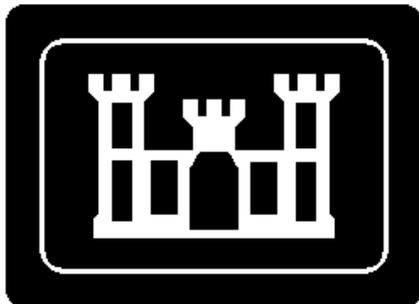
# RCRA FACILITY INVESTIGATION REPORT

*FOR*

**FH-020 (BATTERY ACID PIT)  
FORT HOOD, TEXAS**

*PREPARED FOR*

**U.S. ARMY CORPS OF ENGINEERS**



**FORT WORTH DISTRICT**

CONTRACT NO. DACA63-96-D-0021

**MAY 4, 1998**

**SAIC** Science Applications  
International Corporation  
An Employee-Owned Company

**RCRA Facility Investigation Report  
For  
Site FH-020 (Battery Acid Pit)**

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

**Under Contract Number  
DACA63-96-D-0021**

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Science Applications International Corp.  
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**May 4, 1998**

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## ACRONYMS

AA	Atomic absorption
ATV	all-terrain vehicle
BEGM	Bureau of Economic Geology
BG	background
BGS	below ground surface
CQAR	Chemical Quality Assessment 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 Resources Conservation Commission
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit

## **1.0 INTRODUCTION**

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

Fort Hood began operations in 1942. Robert Gray Air Field, originally operated by the Air Force as Robert Gray Air Force Base, was established in 1947 (U. S. Army 1996a). Fort Hood's mission is training, testing, and deployment of military personnel and equipment. The post is commanded by the III Corps Commander. Currently, the post supports two full armored divisions (the 1st Cavalry and 4th Infantry Divisions). Forty-three thousand military personnel are stationed there; and an additional 30,000 family members, civilians, volunteers, and private-sector employees also live or work at Fort Hood (U.S. Army 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, former and inactive underground storage tank locations, active wash rack/sewer systems, effluent ponds, and a sanitary sewer network. An installation map is shown in Figure 1.2.

This report describes the collection and analysis of soil data from SWMU FH-020, Battery Acid Pit, one of 35 SWMUs investigated during the RFI conducted November 1996 through March 1997. FH-020 is located south of Owl Creek Road in Training Area 65 at North Fort Hood.

### **1.1 BACKGROUND**

FH-020 is a site approximately 110 feet by 124 feet located within what is currently known as the impact area. It is believed that the site was used to dispose of battery acid sometime prior to 1979 (IIA 1982). The disposal area, approximately 11 feet wide by 24 feet long and 6 inches deep, is located within a larger fenced area. When the acid pit was in operation, there was a device installed at the edge of the pit to safely facilitate the tipping of the acid containers onto the pit floor at a distance. The acid container tipping device does not presently exist at the site, but was reportedly in the southeast corner of the pit. The floor of the pit was designed to slope away from the acid container tipping device and the edges of the pit were raised to a berm. It was believed that the underlying limestone strata neutralized the battery acid. Photographs of FH-020 were taken in April, 1997 and are provided in Figure 1.3. As can be seen from the photograph, the lower end of the pit floor contained standing water at this time and the area around the pit is heavily vegetated.

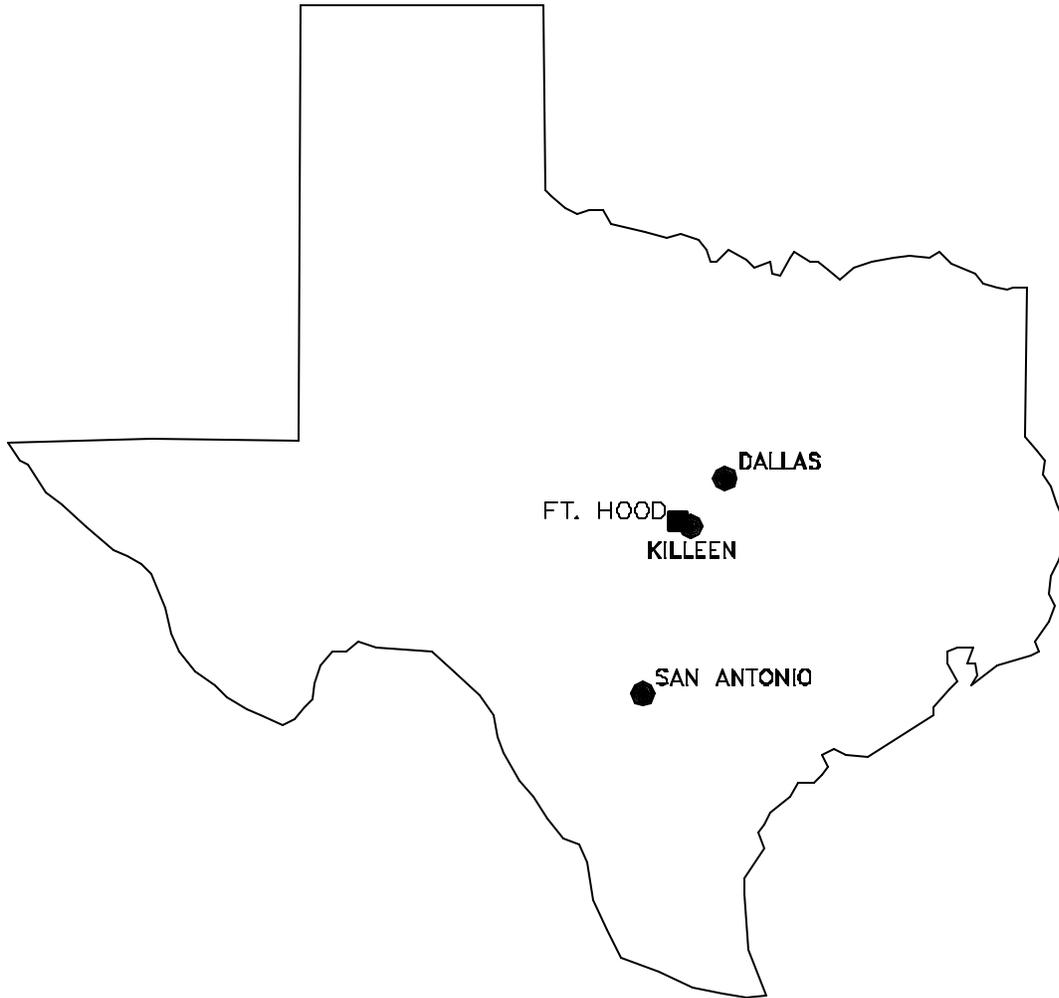
### **1.2 SCOPE AND OBJECTIVES**

The objective of the RFI at FH-020 was to determine if lead from the battery acid disposal activities is present at the site and, if identified, to characterize the potential source and extent of contamination. 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-020 are as follows:

- C determine/confirm the presence or absence of lead in the soils of the pit;

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U.S. ARMY  
FORT HOOD, TEXAS



**RCRA FACILITY INVESTIGATION**

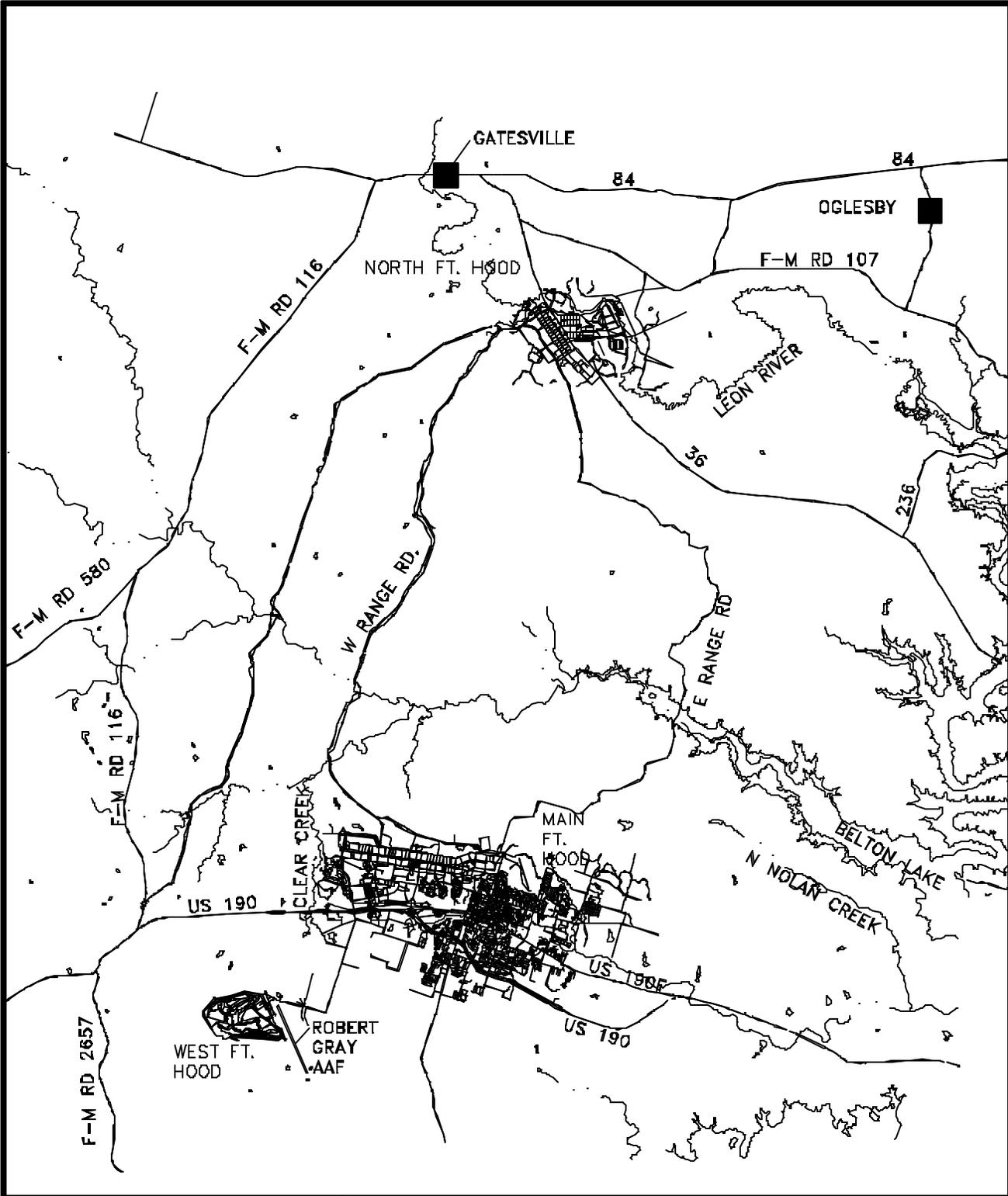
**FORT HOOD  
VICINITY MAP**



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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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**Figure 1.3. Photographs of FH-020**

- C determine the vertical and lateral extent of soil contamination at the pit, where practicable;
- C characterize the migration potential of any lead identified in the soils beneath the pit; and
- C determine what, if any, corrective measures are needed to address contamination associated with SWMU FH-020.

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-020 (USACE 1995).

## **2.0 ENVIRONMENTAL SETTING**

The material presented in this section describes the physical characteristics of FH-020 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 Fort Hood in the area of FH-020 is provided in Figure 2.1.

Local relief on the north cantonment is generally less than 100 ft, with flat to gently rolling topography. Elevations on the north cantonment extend from 955 ft above mean sea level (msl) along the west boundary to approximately 700 ft msl at the eastern boundary. The general slope of the ground surface is to the east towards the Leon River. SWMU FH-020's elevation is approximately 955 to 950 ft above msl.

The rivers, streams, and creeks that constitute the main surface water pathways at Fort Hood are shown on Figure 1.2. Surface drainage from the north cantonment is primarily along Turnover Creek, which drains to the Leon River. Turnover Creek lies at the north end of the north cantonment, and the Leon River lies along the northern and eastern portion of the cantonment. Other unnamed tributaries of the Leon River drain the central and southern portion of the north cantonment. The Leon River originates west of Fort Hood and continues to flow east where it drains into a northern branch of Belton Lake.

### **2.2 GEOLOGIC CONDITIONS**

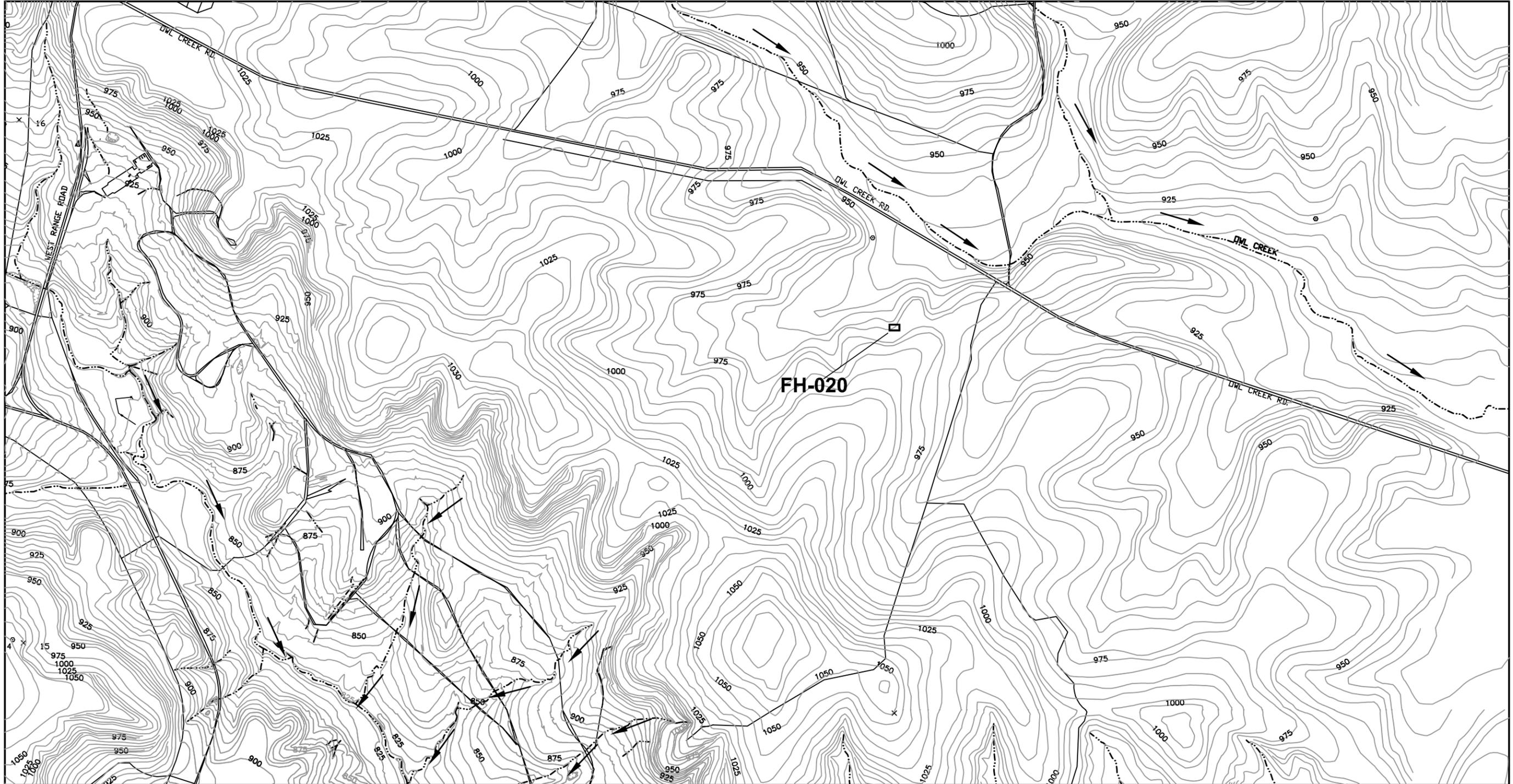
A summary of the geology of the Fort Hood area relevant to this RFI is adapted from the Final RCRA Facility Investigation Work Plan, 35 Solid Waste Management Units, Fort Hood, Texas (USACE 1995). Relevant information on the occurrences of soils and bedrock has been incorporated to further characterize the geology of FH-020 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. The SWMUs at North Fort Hood are underlain by the Walnut Formation.

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.

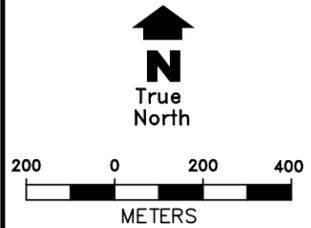
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FH-020



FH-020  
NORTH FT.  
HOOD  
LOCATION  
MAP



LEGEND

-  TOPOGRAPHIC CONTOUR (FT.)
-  DRAINAGE
-  FH-020
-  SURFACE DRAINAGE FLOW

U.S. ARMY  
FORT HOOD, TEXAS

RCRA FACILITY INVESTIGATION

TOPOGRAPHY SURROUNDING FH-020

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### **2.2.2 Unconsolidated Materials**

Alluvial deposits of Quaternary age are present along stream valleys on the main cantonment, specifically along South Nolan Creek on the southern edge of the cantonment (USACE 1995). It is suspected that much alluvium and other natural surface deposits have been reworked throughout the active life of Fort Hood during construction projects. At North Fort Hood, unconsolidated clay soils overlie the Walnut Formation, and Quaternary alluvial terraces are present on the eastern edge of North Fort Hood along the Leon River.

### **2.3 CHARACTERIZATION OF SOILS**

In many areas of Fort Hood, 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 nearly zero to as much as 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 installation.

### **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**

Soil samples were collected at site FH-020 in August, 1989 to determine soil pH and lead toxicity (ADSS 1989). Sampling results indicated that soil pH was similar to background for the area. Lead toxicity results indicated no detection in every sample. However, there was a question as to whether or not the exact location of the pit was determined in the 1989 study and further sampling was warranted.

## 4.0 CHARACTERIZATION OF UNIT CONTAMINATION

The RFI field program was designed to do the following at SWMU FH-020:

- C determine/confirm the presence or absence of lead in the soils in the pit;
- C determine the vertical and lateral extent of soil contamination at the pit, where practicable;
- C characterize the migration potential of any lead identified in the soils beneath the pit; and
- C determine what, if any, corrective measures are needed to address contamination associated with the site.

### 4.1 TECHNICAL APPROACH

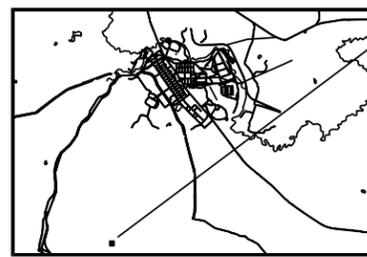
Both surface (0 - 2ft BGS) and subsurface soils (> 2ft. BGS) were sampled at FH-020. The different soil depths were sampled in order to provide data necessary to evaluate the potential human health risks associated with contaminants at the site and to better characterize the potential contamination present 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. At FH-020, direct contact with surface soils is more likely than contact with deeper soils.

Six shallow subsurface soil borings were installed using a hand auger and sampled in April 1997 at locations specified in the Final RCRA Facility Investigation Work Plan for 35 SWMUs (USACE 1995). A site map and sampling locations are shown in Figure 4.1. Conditions during sampling were dry; however, standing water was present in the vicinity of the six sampling locations. Two sample locations were in a dry area of the pit and four locations had approximately 6 to 12 inches of standing water at the surface. Two samples were collected from each of the six soil boring locations. Sampling locations were selected to surround the interior of the battery acid pit, a small depression with standing water in it. The sampling plan for FH-020 called for sampling at the ground surface (0 - 1 ft BGS) and at 5 ft BGS. However, sampling at depths greater than 3 ft were difficult due to the presence of coarse gravel and, in some cases, limestone fragments. Therefore, in addition to surface soil samples, samples were taken at maximum depths of 2.5 ft at SB105, 3.5 ft to 4.5 ft at SB101 and SB102, 2.5 ft to 3 ft in SB103 and SB106 and 3 to 3.5 ft in SB104. All samples were analyzed for lead using the procedures specified in the Final RCRA Facility Investigation Work Plan for 35 SWMUs (USACE 1995). No groundwater was encountered at the unit. Descriptions of the hand augered soil samples for FH-020 are presented in Appendix A. There was no visible contamination of the soil at the surface or the soil collected for samples.

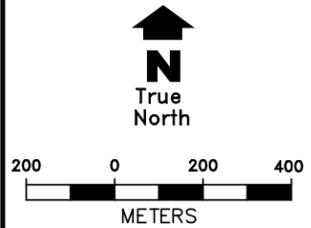
### 4.2 UNIT INVESTIGATION AND ANALYTICAL RESULTS

Analytical results for soils at SWMU FH-020 are provided in their entirety in Appendix B. Table 4.1 summarizes those constituents detected above practical quantitation limits (PQLs). Lead was detected at each sampling location in surface (0-2 ft) soils and all sampling locations except SB104 in subsurface soils (>2 ft). Concentrations of lead in surface soils ranged from 3.2 ppm (SB102) to 40 ppm (SB105). Concentrations of lead in subsurface soils ranged from 1.9 ppm (SB101) to 10.1 ppm (SB106). Samples which contained lead above practical quantitation limits (PQLs) were screened against background criteria as described in Section 4.3.

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FH-020  
NORTH FT. HOOD LOCATION MAP



LEGEND

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

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FORT HOOD, TEXAS



RCRA FACILITY INVESTIGATION

SAMPLING LOCATIONS  
FH-020



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**Table 4.1 FH-020 Analytes Detected Above Practical Quantitation Limits (PQLs)**

<b>Location</b>	<b>Sample ID</b>	<b>Depth (Ft)</b>	<b>Analysis Type</b>	<b>Parameter</b>	<b>Result</b>	<b>PQL</b>	<b>Units</b>
SB101	20SB101	0.0-1.0	Metals	Lead	7.1	0.22	mg/kg
SB101	20SB102	4.0-4.5	Metals	Lead	1.9	0.2	mg/kg
SB102	20SB103	0.0-1.0	Metals	Lead	3.2	0.21	mg/kg
SB102	20SB104	4.0-4.5	Metals	Lead	3.4	0.21	mg/kg
SB103	20SB110	0.0-1.0	Metals	Lead	4.3	0.22	mg/kg
SB103	20SB111	2.5-3.5	Metals	Lead	2.7	0.21	mg/kg
SB104	20SB105	0.0-1.0	Metals	Lead	7.2	0.22	mg/kg
SB104	20SB106	3.0-3.5	Metals	Lead	4.7	0.2	mg/kg
SB105	20SB112	0.0-1.0	Metals	Lead	21.2	0.3	mg/kg
SB105	20SB113	2.0-2.5	Metals	Lead	40	0.26	mg/kg
SB106	20SB107	0.0-1.0	Metals	Lead	32.4	0.23	mg/kg
SB106	20SB109	2.5-3.5	Metals	Lead	10.1	0.21	mg/kg

#### **4.2.1 Disposition of Investigation Derived Waste (IDW)**

No solid IDW was generated during sampling at FH-020. Excess soil generated during sampling was replaced in the hand-augered boreholes following sample collection. Liquid IDW was limited to a small quantity of non-hazardous decontamination fluids from the cleaning of sampling equipment. The liquid IDW was disposed of at the First Calvary Tank Wash Facility, since the concentration of lead present in surface and subsurface soils at site FH-020 are consistent with naturally occurring background values. This wash water at the First Calvary Tank Wash Facility is treated before release into the environment.

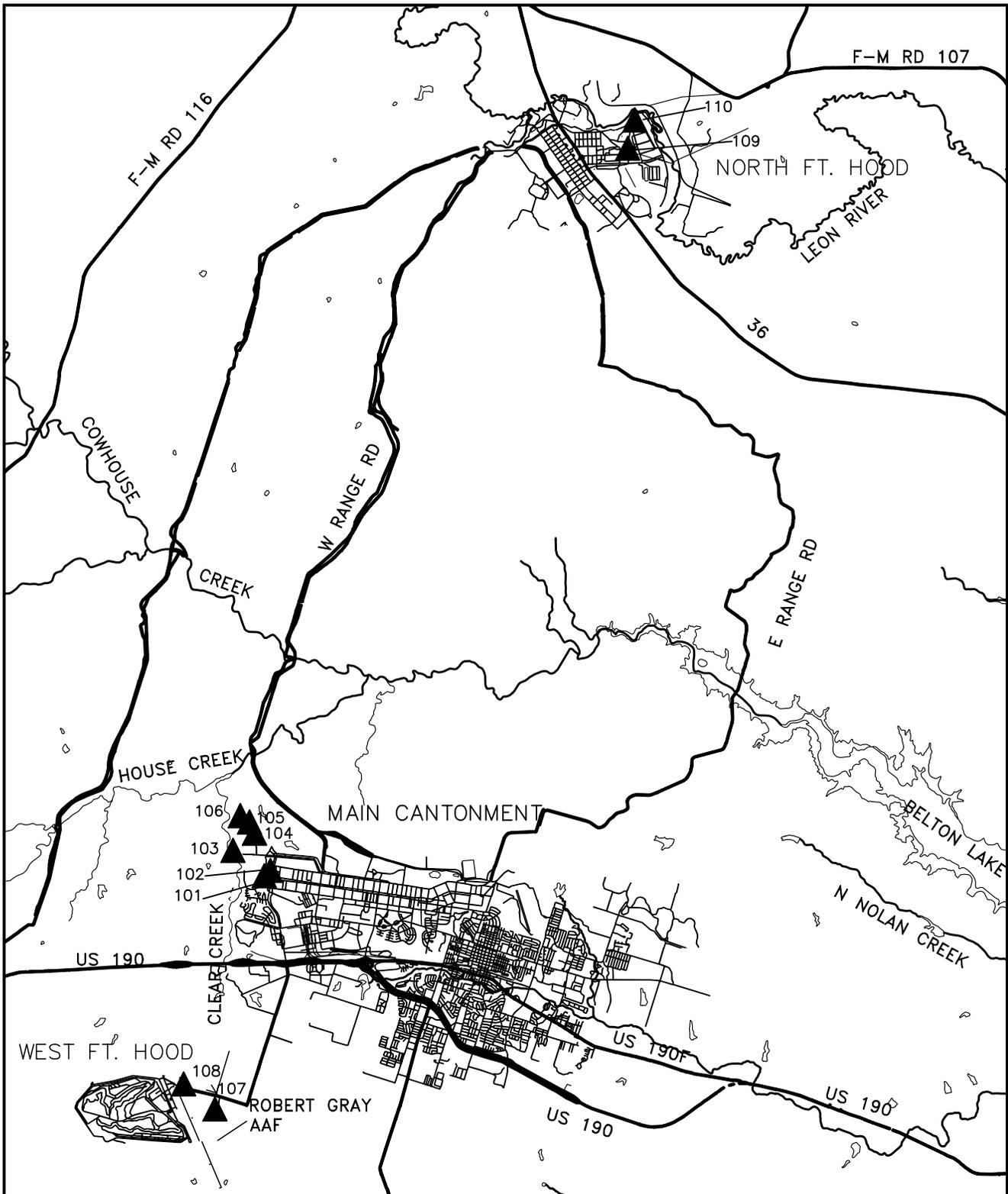
#### **4.3 BACKGROUND CHARACTERIZATION AND COMPARISONS WITH WASTE UNIT SAMPLING RESULTS**

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 samples were analyzed for the following metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Mercury, selenium, and silver were not detected in any of the background surface soil samples. Mercury was detected in only 1 of 36 subsurface soil samples and selenium in 2 of 28 background subsurface samples. Silver was not detected in any background subsurface soil samples. Two statistical methods were used to determine if there is a statistically significant difference between background lead concentrations and the concentration of lead detected in FH-020 samples. Background statistical calculations were determined based on lead results from surface soils (0 - 2 ft) and subsurface soils (> 2 ft) in order to be consistent with soil depths sampled in the characterization of SWMU soils. Surface soils are evaluated separately from deeper soils in order to evaluate potential human health risks and to better characterize contaminants present in the different soil strata as discussed in Section 4.1. 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. Results of the 95% UTL calculation for background soils are presented in Table 4.2. The 95% UTL background value for surface and subsurface soils was used as the background screening values.

The second statistical method determined the mean concentration for lead detected in background concentrations and compared it against the mean concentration for lead determined for FH-020. Results of the mean background calculations are presented in Table 4.3. The table summarizes the frequency of detection for background (BG), the results of the Shapiro-Wilk tests for normality (distribution), the mean concentrations, and the results of the T-tests and the nonparametric Wilcoxon tests for comparisons of the means. The frequency of detection column shows the number of samples above the PQL per the total number of samples (for background and waste unit). T-tests were evaluated for those cases in which either the results or the logarithms of the results were normally distributed for both background and waste unit samples. Results of the T-Test and/or Wilcoxon tests are considered statistically significant from background if the results are less than 0.05. Surface and subsurface mean lead concentrations for FH-020 were not statistically significant from background mean lead levels.

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**LEGEND**

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

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**RCRA FACILITY INVESTIGATION**

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LOCATIONS OF  
BACKGROUND SOIL SAMPLES



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**Table 4.2 Statistical Analysis of 95% UTL Concentrations  
Background Soils**

Analyte (units)	Mean	95% UTL	Maximum Detect	Results> PQL	Distribution
Surface Soils:					
Lead (mg/kg)	8.01	49.60	33.20	12/12	L
Subsurface Soils:					
Lead (mg/kg)	5.06	10.56	12.10	36/36	N

Results less than the detection limit were set to **2** the reported detection limit.

L-distribution most similar to lognormal.

N-distribution most similar to normal.

**Table 4.3 Statistical Analysis of Mean Concentration**

Contaminant	Frequency of Detection		Distribution		Mean		T-Test Probability	Wilcoxon Test Probability
	BG	FH-020	BG	FH-020	BG	FH-020		
Surface Soils:								
Lead (mg/kg)	12/12	6/6	L	L	8.01	12.57	0.1766	0.7826
Subsurface Soils:								
Lead (mg/kg)	36/36	6/6	N	L	5.06	10.47	NT	0.0975

Distribution Codes:     L-distribution most similar to lognormal,  
                               N-distribution most similar to normal,  
                               X - distribution significantly different from normal and lognormal,  
                               D-distribution not determined - fewer than five detects or less than 50% detects.

NT -    T-test not calculated; neither the results nor the logarithms of results were normally distributed for both the background and the waste unit.

BG -    Background.

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 with statistical calculations are provided in Appendix E and the results are summarized in Table 4.2 and Table 4.3.

## 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, whichever are greater. The TNRCC RRSs Number 1 are used to determine if there has been a release of hazardous constituents from a site. The background concentration for lead is considered as the TNRCC RRS Number 1 at Fort Hood because it is greater than the PQL. 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 FH-020, soil sample results for lead were compared to the 95% UTL background lead concentration levels for surface and subsurface soils. The characteristics of surface and subsurface soils may vary from location to location; however, in order to perform the data comparison, sample results needed to be separated into specific depth intervals. One sample, SB105, was collected at a depth of 2 -2.5 ft. Due to the depth interval, the sample was included as a subsurface sample in the statistical evaluation. However, for screening purposes, SB105 was evaluated as a surface sample because it was collected near the surface and was more characteristic of surface soils than background. Based on both the statistical evaluation of mean concentrations and evaluation of the 95% UTL background concentration, lead was not present in any surface or subsurface soil sample at FH-020 at a concentration that exceeded background criteria. Complete results of the background soil screening analysis are provided in their entirety in Appendix F. Organic constituents were not analyzed at FH-020.

## **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-020 samples. Field QC samples included trip blanks, rinse 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 issue a Chemical Quality Assurance Report (CQAR).

According to the CQAR, no split quality assurance samples or field duplicate samples were provided to Southwestern Division Laboratory for this SWMU. However, field duplicate and QA split samples were collected at a 10% frequency for the entire Fort Hood RFI investigations. The required number of QA samples (both split and field duplicates) were collected based on the total number of samples collected for the Fort Hood SWMU investigations. The CQAR report states that, upon review of the internal QC data that was generated for this site, there were no weaknesses in the data.

It should be noted that replication of a concentration of a constituent in soil samples is difficult due to the heterogeneity of soils. Analyses are considered good and reproducible for soil samples if the highest concentration reported in a set of samples for a single field sample is less than five times the lowest concentration reported in the same set of samples. This holds true as long as all other quality control measures and data quality objectives (e.g. holding times, surrogate recoveries, internal standards, etc.) are met. All quality control measures and data quality objectives were met for the replicate soil sample results; therefore, these results are good and reproducible for the site.

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-020 data that were reviewed as a function of the data validation task met project data quality objectives, and are usable 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-020 results. No other problems with the data were encountered. A copy of the laboratory results and the associated quality control samples are included in Appendix B.

### **6.2 INVESTIGATION RESULTS**

The data set for surface and subsurface soils at FH-020 and the quality of the data are adequate to meet the objectives of the RFI as described in Section 4.0 of this report. A total of twelve soil samples were collected from six soil boring locations 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/absence of lead contamination, the characterization of the vertical and lateral extent of potential contamination and the boundaries of the suspected disposal area. Based on the results of the soil analysis it is believed that a release of lead contamination has not occurred. Due to the topography of the site and the characteristics of the pit floor and its bermed edges, it is not likely that surface water runoff during rainfall events has transported contaminants from the acid pit to areas downstream. Results of soil analysis indicate that concentrations of lead present in surface and subsurface soils are consistent with naturally occurring background values.

## **7.0 CONCLUSIONS AND RECOMMENDATIONS**

Analytical results for surface and subsurface soils at FH-020 indicate that lead is not present at concentrations above naturally occurring background values. Based on the results of the RFI investigation, the site should be considered closed under TNRCC RRSs Number 1 and no further action is recommended.

## 8.0 REFERENCES

- ADSS. 1989. Acid Disposal Site Study, Training Area 65, December 26, 1989.
- BEGM 1979. Geologic Atlas of Texas, Waco Sheet (map). University of Texas at Austin/Bureau of Economic Geology.
- 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.
- 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.
- IIA. 1982. Installation Assessment of Fort Hood, Texas, Report Number DRXTH-ES-IA-81188. June, 1982.

**APPENDIX A**

**FH-020 Sample Location Descriptions**

<b>SAMPLE LOCATION SKETCH</b>		HOLE NUMBER SB-1Ø1
PROJECT FORT HOOD RFI		ELEVATION TOP OF HOLE NA
LOCATION/STATION FH-Ø20 NORTH FORT HOOD		DATUM FOR ELEVATION SHOWN
LOCATION SKETCH		SCALE:
<u>DESCRIPTION</u>		
	0-1 ft : 7.5 VR 5/4 BROWN SILTY SAND, V. FINE, saturated	
	1-3.5 ft : same as above, sample collected	(FHØ20 - SB1Ø1 0957)
	3.5-4.5 ft 5Y 7/2 coarse gravel, well rounded in clay-sand matrix, saturated.	
	sample collected @ 1Ø20 (SB FHØ20 - SB1Ø2)	
COMMENTS		
SIGNATURE OF INSPECTOR/DATE LL [Signature] 4-16-97		
PROJECT FORT HOOD RFI		HOLE NO. FH Ø20-SB1Ø1

<b>SAMPLE LOCATION SKETCH</b>		HOLE NUMBER SB1Ø2
PROJECT FORT HOOD RFI		ELEVATION TOP OF HOLE NA
LOCATION/STATION FH-Ø2Ø NORTH FORT HOOD		DATUM FOR ELEVATION SHOWN NA
<p>LOCATION SKETCH</p> <p>SCALE: DESCRIPTION:</p> <p><u>0-1 ft</u>: 7.5 YR 5/6 STRONG BROWN SANDY SILT, V. FINE SAND, MOIST. SAMPLE COLLECTED @ 1031 (FHØ2Ø - SB1Ø3)</p> <p><u>1-3 ft</u> same lithology. Moist.</p> <p>SB1Ø1 3-3.5 coarse gravel in sand 10YR 5/4 yellowish brown. standing water in hole.</p> <p>SB1Ø2 <u>3.5-4 ft</u> grayish wet 5Y 7/2 gravel in clay sand matrix. Refusal.</p> <p>FHØ2Ø - SB1Ø4 collected 1050</p>		
COMMENTS		
SIGNATURE OF INSPECTOR/DATE ILL Dominik 4.16.97	PROJECT FORT HOOD RFI	HOLE NO. FH-Ø2Ø-SB1Ø2

<b>SAMPLE LOCATION SKETCH</b>		HOLE NUMBER SB105
PROJECT FH RFI		ELEVATION TOP OF HOLE NA
LOCATION/STATION FH020 N. FT. HOOD		DATUM FOR ELEVATION SHOWN NA
LOCATION SKETCH		SCALE:
<p><u>DESCRIPTION</u></p> <p>0-1 ft - Dk. brown silty clay (FSYR 4/3) w/ limestone fragments - sand to coarse gravel size. WET. F1020-SB112 collected 1228</p> <p>1-2 ft - Limestone fragments + rounded gravel in silty sand, color</p> <p>2-2.5 ft Rock fragments + rounded gravel (as above) Refusal. FH020-SB113 collected 1229.</p>		
COMMENTS Sample collected in 7 ft. of standing water.		
SIGNATURE OF INSPECTOR/DATE K. Dominick 4.16.97	PROJECT FORT HOOD RFI	HOLE NO. FH020-SB105

SAIC 1996 after ENG FORM 5056-R

<b>SAMPLE LOCATION SKETCH</b>		HOLE NUMBER <b>SB103</b>
PROJECT <b>FH RFI</b>	ELEVATION TOP OF HOLE	
LOCATION/STATION <b>FH-020</b>	DATUM FOR ELEVATION SHOWN	
LOCATION SKETCH		SCALE:
<u>DESCRIPTION</u>		
<p><u>0-1 ft</u> 7.5 YR 5/6 silty sand, wet, reddish brown to brown w/ minor rock fragments. FH020-SB110 collected 1155.</p> <p><u>1-2.5 ft</u> same lithology + color, w/ black organic matter streaks. Becoming gravelly (rounded, coarse).</p> <p><u>2.5-3 ft</u> same lithology. Gravel preventing recovery below 3'. Wet. Sample FH020-SB111 collected 1202. Refusal @ 3ft.</p>		
COMMENTS		
sample collected in 8" of standing water.		
SIGNATURE OF INSPECTOR/DATE <b>ILL [Signature] 4.16.97</b>	PROJECT <b>FORT HOOD RFI</b>	HOLE NO. <b>FH-020-SB103</b>

**SAMPLE LOCATION SKETCH** HOLE NUMBER SB 104 4

PROJECT FORT HOOD RFI.

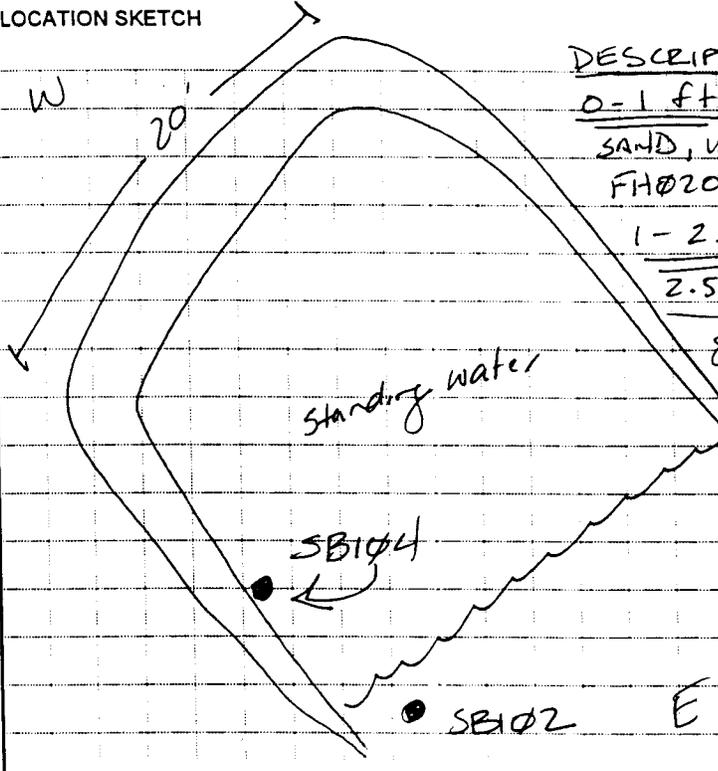
ELEVATION TOP OF HOLE NA

LOCATION STATION FH020 NORTH FORT HOOD

DATUM FOR ELEVATION SHOWN NA

LOCATION SKETCH

SCALE:



DESCRIPTION:

0-1 ft: 7.5 YR 4/3 BROWN SILTY SAND, WET (v. fine sand) sample FH020-SB105 collected 1109.

1-2.5 ft same lithology.

2.5-3.0 ft coarse, well-rounded gravel, water saturated.

3.0-3.5 ft ~~1040-54~~

57 7/2 gravel in silty clay sand matrix. Wet. Refusal.

Sample FH020-SB106 collected 1120.

COMMENTS

sample collected in ~12" of standing water.

SIGNATURE OF INSPECTOR/DATE KL [Signature] 4.16.97

PROJECT FORT HOOD RFI

HOLE NO. FH-020-SB 104



<b>SAMPLE LOCATION SKETCH</b>		HOLE NUMBER SB106
PROJECT FH RFI	ELEVATION TOP OF HOLE	
LOCATION/STATION FH-020	DATUM FOR ELEVATION SHOWN N/A	
LOCATION SKETCH		SCALE:
<p>DESCRIPTION:</p> <p><u>0-1 ft</u> reddish brown to strong brown F.S.R 5/6 silty sand w/ rock fragments, then gray-brown rounded gravel FH020-SB107 collected @ 1130. <u>WET</u></p> <p><u>1-2.5ft</u> v. coarse rounded gravel w/ minor sand, <u>WET</u>. Becoming 5/4 7/2 gray.</p> <p><u>2.5-3.0</u> gravel mixed w/ limestone rock fragments, <u>wet</u>. Refusal. FH020-SB109 collect 1139.</p>		
COMMENTS		
sample collected in standing water		
SIGNATURE OF INSPECTOR/DATE KLD/min 4.16.97	PROJECT FORT HOOD RFI	HOLE NO. FH 020-SB106

**APPENDIX B**

**FH-020 Analytical Data**

### FH-020 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
SB101	20SB101	FH020-SB101/04-16-97/	04/16/1997	0.0-1.0	7439-92-1	Lead	7.1	0.22	mg/kg			SW846 6010
SB101	20SB102	FH020-SB102/04-16-97/	04/16/1997	4.0-4.5	7439-92-1	Lead	1.9	0.20	mg/kg			SW846 6010
SB102	20SB103	FH020-SB103/04-16-97/	04/16/1997	0.0-1.0	7439-92-1	Lead	3.2	0.21	mg/kg			SW846 6010
SB102	20SB104	FH020-SB104/04-16-97/	04/16/1997	4.0-4.5	7439-92-1	Lead	3.4	0.21	mg/kg			SW846 6010
SB103	20SB110	FH020-SB110/04-16-97/	04/16/1997	0.0-1.0	7439-92-1	Lead	4.3	0.22	mg/kg			SW846 6010
SB103	20SB111	FH020-SB111/04-16-97/	04/16/1997	2.5-3.5	7439-92-1	Lead	2.7	0.21	mg/kg			SW846 6010
SB104	20SB105	FH020-SB105/04-16-97/	04/16/1997	0.0-1.0	7439-92-1	Lead	7.2	0.22	mg/kg			SW846 6010
SB104	20SB106	FH020-SB106/04-16-97/	04/16/1997	3.0-3.5	7439-92-1	Lead	4.7	0.20	mg/kg			SW846 6010
SB105	20SB112	FH020-SB112/04-16-97/	04/16/1997	0.0-1.0	7439-92-1	Lead	21.2	0.30	mg/kg			SW846 6010
SB105	20SB113	FH020-SB113/04-16-97/	04/16/1997	2.0-2.5	7439-92-1	Lead	40	0.26	mg/kg			SW846 6010
SB106	20SB107	FH020-SB107/04-16-97/	04/16/1997	0.0-1.0	7439-92-1	Lead	32.4	0.23	mg/kg			SW846 6010
SB106	20SB109	FH020-SB109/04-16-97/	04/16/1997	2.5-3.5	7439-92-1	Lead	10.1	0.21	mg/kg			SW846 6010
SB106	20SW001	FH020-SW001/04-16-97	04/16/1997		7439-92-1	Lead	0.9	0.90	ug/l	U		SW846 6010
	ER075	FH020-ER075/04-05-97	04/05/1997		7439-92-1	Lead	0.9	0.90	ug/l	U	U	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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)  
 Matrix: Soil

Sample Depth: 0.0-1.0 FT  
 Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers	
				Lab	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)  
 Matrix: Soil

Sample Depth: 9.0-9.5 FT  
 Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers	
				Lab	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)  
 Matrix: Soil

Sample Depth: 14.0-14.5 FT  
 Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers	
				Lab	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)  
 Matrix: Soil

Sample Depth: 19.0-20.0 FT  
 Field Sample Type: Grab Collected: 12/12/96

Metals	Result	Detection Limit	Units	Qualifiers	
				Lab	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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**

<b>HTRW DRILLING LOG</b>		DIVISION FORT WORTH DIST.	INSTALLATION FORT HOOD	SHEET 1	SHEETS OF 2
1. PROJECT FORT HOOD RFI		10. SIZE AND TYPE OF BIT 4 1/4" HSA			
2. LOCATION/STATION FHBKG		11. DATUM FOR ELEVATION SHOWN NA			
3. DRILLING AGENCY TERRA MAR		12. MANUFACTURER'S DESIGNATION OF DRILL MOBILE B-50			
4. HOLE NUMBER FHBKG-SB102		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 <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEGREES FROM VERTICAL		15. GROUNDWATER ELEVATION NA			
7. THICKNESS OF OVERBURDEN NA		16. DATE HOLE		STARTED 12-12-96	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE NA			
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR HOLE _____ PERCENT NA			

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	1.5		(Upper 0.4 topsoil) Silty clay, mottled 10YR 5/3 brown and 10YR 8/2 v. pale brown, not plastic, firm, dry, weathered limestone fragments			BKS B121
	2.0		same, dry			cuttings
	3.5					
	4.0		tan, weathered limestone and silty clay interbeds, dry			cuttings
	6.0					
	8.0		Zones of limestone and highly indurated silty clay (weathered limestone!) very hard, shell fragments, roots, 2.5Y 8/2 pale yellow, dry			
	9.0		same, dry			cuttings
			same, dry			

SIGNATURE OF INSPECTOR/DATE <i>[Signature]</i> 12-17-96	PROJECT FHBKG-SB102	HOLE NO. FHBKG-SB102
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# HTRW DRILLING LOG (continued)

HOLE NUMBER

FHBKG-SB102

PROJECT

INSPECTOR

J. DeVaughn SAIC

SHEET

SHEETS

2 OF 2

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

SIGNATURE OF INSPECTOR DATE

J. DeVaughn 12-12-96

PROJECT

HOLE NO.

FHBKG-SB102

<b>HTRW DRILLING LOG</b>		DIVISION Ft. Worth Dist.	INSTALLATION Fort Hood	SHEET 1	SHEETS OF 2
1. PROJECT Fort Hood RFI		10. SIZE AND TYPE OF BIT 4 1/4" HSA			
2. LOCATION/STATION FHBKG		11. DATUM FOR ELEVATION SHOWN NA			
3. DRILLING AGENCY TERRA MAR		12. MANUFACTURER'S DESIGNATION OF DRILL MOBILE B-50			
4. HOLE NUMBER FHBKG-SB103		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 <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEGREES FROM VERTICAL		15. GROUNDWATER ELEVATION NA			
7. THICKNESS OF OVERBURDEN NA		16. DATE -HOLE	STARTED 12-10-96	COMPLETED 12-10-96	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE NA			
9. TOTAL DEPTH OF HOLE		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 1/4" R 1/4" v. pale brown and 1/4" R 3/2" v. dk. grayish brown, 40% coarse sand to pebble sized angular to subrounded rock fragments, dry, mod. plastic			
	2.5		same, dry, no pebbles			cuttings
	4.0		same, weathered tan limestone fragments, dry			BKSB105
	4.5		same, dry, interbeds of limestone			
	6.0		same, dry			
	8.0					
	9.0		same, dry			BKSB106
	9.5		same, dry			

SIGNATURE OF INSPECTOR/DATE <i>J. C. [Signature]</i> 12-10-96	PROJECT FHBKG-SB103	HOLE NO. FHBKG-SB103
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# HTRW DRILLING LOG (continued)

HOLE NUMBER  
FH3KG-SB103  
SHEET SHEETS  
2 OF 2

PROJECT

INSPECTOR

J. DeVaughn SAIC

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, soft, not plastic, dry			
	14.0		same, dry			cuttings
	15.0		Silty clay, mottled 1/4 R @ 2 in. pale brown and 1/4 R 6/4 ft. yellowish brown, weathered limestone fragments, mod. plastic, damp, firm			BKS3107
	16.0		Blue-gray weathered limestone fragments			cuttings
	17.0		TD			
	18.0					
	20.0					

SIGNATURE OF INSPECTOR/DATE

J. DeVaughn 12-10-96

PROJECT

HOLE NO.

FH3KG-SB103

<b>HTRW DRILLING LOG</b>		DIVISION Fort Worth Dist.	INSTALLATION Fort Hood	SHEET 1	SHEETS OF 3
1. PROJECT Fort Hood RFI		10. SIZE AND TYPE OF BIT 4 1/4" HSA			
2. LOCATION/STATION FH3KG		11. DATUM FOR ELEVATION SHOWN NA			
3. DRILLING AGENCY TERRA MAR		12. MANUFACTURER'S DESIGNATION OF DRILL MOBILE B-50			
4. HOLE NUMBER FH3KG-SR104		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 <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEGREES FROM VERTICAL		15. GROUNDWATER ELEVATION NA			
7. THICKNESS OF OVERBURDEN NA		18. DATE HOLE	STARTED 12-11-96	COMPLETED 12-11-96	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE NA			
9. 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, 2.547/6 yellow, damp, low plasticity, trace organics, soft, weathered limestone fragments			cuttings
	4.0'		same			
	5.0'		same with 104R7/8 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 J. [Signature] 12-11-96	PROJECT	HOLE NO. FH3KG-SR104
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# HTRW DRILLING LOG (continued)

HTRW DRILLING LOG (continued)					HOLE NUMBER FH3K6-SB104	
PROJECT			INSPECTOR J. DeVaughn SAIC		SHEET 2	SHEETS 3
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		silty clay as above, dry			BKSB110
	11.5		same, dry			cuttings
	12.0		same, dry			Geotechnical Sample
	13.0		silty clay and weathered limestone interbeds			cuttings
	14.0		silty clay and weathered limestone interbeds			cuttings
	16.0		silty clay and weathered limestone interbeds			cuttings
	18.0		silty clay as above, dry			BKSB111
	18.5		silty clay and weathered limestone interbeds			cuttings
	20.0		silty clay and weathered limestone interbeds			cuttings

SIGNATURE OF INSPECTOR/DATE  
*J. DeVaughn* 12-11-96

PROJECT

HOLE NO.  
FH3K6-SB104

# HTRW DRILLING LOG (continued)

HOLE NUMBER  
**FHBKG-SB104**  
 SHEET **3** OF **3** SHEETS

PROJECT

INSPECTOR

*E. DeVaughn, SAIC*

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
			<p><i>same, dry</i></p> <hr style="border: 1px solid black;"/> <p>TD  <i>Blue-gray weathered limestone fragments, dry</i></p>			

SIGNATURE OF INSPECTOR/DATE

*E. DeVaughn* 12-11-96

PROJECT

HOLE NO.

**FHBKG-SB104**

<b>HTRW DRILLING LOG</b>		DIVISION Fort Worth Dist.	INSTALLATION Fort Hood	SHEET 1	SHEETS OF 3
1. PROJECT Fort Hood RFI		10. SIZE AND TYPE OF BIT 4 1/4" HSA			
2. LOCATION/STATION FHBKG		11. DATUM FOR ELEVATION SHOWN NA			
3. DRILLING AGENCY TERRA MAR		12. MANUFACTURER'S DESIGNATION OF DRILL MOBILE B-50			
4. HOLE NUMBER FHBKG-SB105		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 <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEGREES FROM VERTICAL		15. GROUNDWATER ELEVATION NA			
7. THICKNESS OF OVERBURDEN NA		18. DATE HOLE		STARTED 12-11-96	COMPLETED 12-11-96
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE NA			
9. TOTAL DEPTH OF HOLE 24.6'		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		Gravel (graded area)			cuttings
	1.5		Silty clay, 2.5Y6/4 H. yellowish brown, firm, not plastic, dry, weathered limestone fragments			BKSB112
	2.0		same, dry			cuttings
	4.0					
	5.0		Fat mottled clay, 2.5Y6/4 H. yellowish brown and 10YR6/6 brownish yellow, highly plastic, dry, firm			BKSB113
	6.0					
	8.0		same as above except now silty clay, limestone interbeds, dry			cuttings

SIGNATURE OF INSPECTOR/DATE A. Ryan 12-11-96	PROJECT	HOLE NO. FHBKG-SB105
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# HTRW DRILLING LOG (continued)

HOLE NUMBER

FHBKG-SB105

PROJECT

INSPECTOR

J. 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					
	15.5		same with more silt, brittle, dry, hard, not plastic			BKSB115
	16.0					
			same with weathered limestone interbeds			
	18.0					cuttings
	20.0					

SIGNATURE OF INSPECTOR/DATE

J. DeVaughn 12-11-96

PROJECT

HOLE NO.

FHBKG-SB105

# HTRW DRILLING LOG (continued)

HOLE NUMBER

FHBK6-SE105

PROJECT

INSPECTOR

*J. DeLoughlin, SAIC*

SHEET

SHEETS

3 OF 3

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
	24.0		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

*J. DeLoughlin* 12-11-96

PROJECT

HOLE NO.

FHBK6-SE105

<b>HTRW DRILLING LOG</b>		DIVISION Fort Worth Dist.	INSTALLATION Fort Hood	SHEET 1	SHEETS OF 3
1. PROJECT Fort Hood RFI		10. SIZE AND TYPE OF BIT 4 1/4" HSA			
2. LOCATION/STATION FH BKG		11. DATUM FOR ELEVATION SHOWN NA			
3. DRILLING AGENCY TERRA MAR		12. MANUFACTURER'S DESIGNATION OF DRILL MOBILE B-50			
4. HOLE NUMBER FH BKG-SB106		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 <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEGREES FROM VERTICAL		15. GROUNDWATER ELEVATION NA			
7. THICKNESS OF OVERBURDEN NA		16. DATE HOLE		STARTED COMPLETED	
8. DEPTH DRILLED INTO ROCK		12-12-96		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 10YR 6/6 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		Silty fine sand, 2.5Y8/4 pale yellow, dry, carbonate (HCl fizzes), not plastic			BKSB118
	9.5		same, dry			

SIGNATURE OF INSPECTOR/DATE J. D. Wayburn 12-12-96	PROJECT Fort Worth Dist.	HOLE NO. FH BKG-SB106
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# HTRW DRILLING LOG (continued)

HOLE NUMBER

FHBKG-SB1006

PROJECT

INSPECTOR

J. DeVaughn SAIC

SHEET

SHEETS

2 OF 3

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		same except color change to 10YR 8/2 v. pale brown			cuttings
	14.0		same as above fine sand except no silt			BKSB119
	14.5					
	16.0		same, dry			cuttings
	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

J. DeVaughn 12-12-96

PROJECT

HOLE NO.

FHBKG-SB1006

# HTRW DRILLING LOG (continued)

HOLE NUMBER  
FH BKG-SB106

PROJECT

INSPECTOR

J. DeLaugh, SAIC

SHEET SHEETS  
3 OF 3

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

SIGNATURE OF INSPECTOR/DATE

J. DeLaugh 12-12-96

PROJECT

HOLE NO.

FH BKG-SB106

<b>HTRW DRILLING LOG</b>		DIVISION Fort Worth Dist.	INSTALLATION Fort Hood	SHEET 1	SHEETS 1
1. PROJECT Fort Hood T2F1		10. SIZE AND TYPE OF BIT 4 1/4" HSA			
2. LOCATION/STATION FH BKG		11. DATUM FOR ELEVATION SHOWN NA			
3. DRILLING AGENCY TERZA MAR		12. MANUFACTURER'S DESIGNATION OF DRILL MOBILE B-50			
4. HOLE NUMBER FH BKG-SB107		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 <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEGREES FROM VERTICAL		15. GROUNDWATER ELEVATION NA			
7. THICKNESS OF OVERBURDEN NA		16. DATE HOLE		STARTED 12-12-96	COMPLETED 12-12-96
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE NA			
9. TOTAL DEPTH OF HOLE 6.0'		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		Silty clay, mottled 10YR 6/8 brownish yellow and 10YR 6/2 lt. brownish gray, hard, not plastic, dry, weathered limestone fragments			BKSB124
	1.7		same			
	2.0		Blue-gray weathered limestone, 2.5 Y 6/1 gray, fossiliferous			cuttings
	4.0					
	4.5		same			BKSB125
	5.5		same			cuttings
	6.0		same			BKSB126
	8.0		TD			

SIGNATURE OF INSPECTOR/DATE J. W. [Signature] 12-12-96	PROJECT Fort Worth Dist.	HOLE NO. FH BKG-SB107
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# HTRW DRILLING LOG

LOCATION: **Fort Worth Dist. Fort Hood**

SHEET **1** OF **2**

1. PROJECT: **Ft. Hood RFI**

2. LOCATION: **FHBKG**

3. DRILLING AGENCY: **TERDA MAR**

4. HOLE NUMBER: **FHBKG-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: \_\_\_\_\_

9. TOTAL DEPTH OF HOLE: **17.0'**

10. SIZE AND TYPE OF BIT: **4 1/4" HSA**

11. DATUM FOR ELEVATION SHOWN: **NA**

12. MANUFACTURE'S IDENTIFICATION OF DRILL: **MOBILE B-50**

13. TOTAL NUMBER OF OVERBURDEN SAMPLES TAKEN: **NA**

14. TOTAL NUMBER OF CORE BOXES: **NA**

15. GROUNDWATER ELEVATION: **NA**

16. DATE HOLE STARTED: **1-14-97** COMPLETED: **1-14-97**

17. ELEVATION FOR DEPTH 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		(Upper 0.4 topsoil) Silty clay 19YR6/8 brownish yellow, weathered limestone fragments, firm, not plastic, dry			BKSB135
	2.0		same, dry			
	3.0		same, dry			cuttings
	4.0		same, dry			
	5.0		same, mottled with 2.5Y7/3 pale yellow, dry			BKSB136
	6.0		same, dry			
	7.0		same, dry			cuttings
	8.0		same, dry			
	9.0		same, dry			BKSB137
	9.5		same, dry			
	10.0		same, dry			cuttings

SIGNATURE OF INSPECTOR/DATE: **J. Williams 1-14-97**

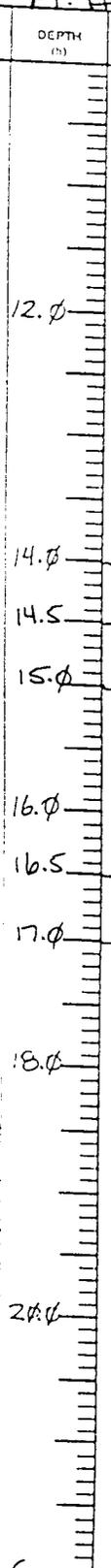
PROJECT: **Ft. Hood RFI**

DATE: **1-14-97**

SAIC: **FHBKG-SB108**

SAIC 1003 after ENG FORM 1836

# HTRW DRILLING LOG (continued)

PROJECT				INSPECTOR		HOLE NUMBER	
Ft. Hood RFI				J. Saughn SAIC		FH3KG-S3108	
ELEVATION		DEPTH (2)	LEGEND (2)	CLASSIFICATION OF MATERIALS (1)	% CORE RECOVERY (3)	BOX OR SAMPLE NO. (4)	REMARKS (5)
				same, dry			cuttings
		12.0					
		14.0		same, less silty, dry			
		14.5					BKSB138
		15.0		same, dry			
		16.0		Blue-gray weathered limestone			
		16.5					
		17.0		same, dry			
		17.5		TD			BKSB139
		18.0					
		20.0					

SIGNATURE OF INSPECTOR/DATE	PROJECT	HOLE NO.
J. Saughn 1-14-97	Ft. Hood RFI	FH3KG-S3108

HTERW DRILLING LOG		DIVISION Fort Worth Dist	INSTALLATION Fort Hood	SHEET 1	SHEETS OF 3
1. PROJECT Ft. Hood RFI		10. SIZE AND TYPE OF BIT 4 1/4" HSA			
2. LOCATION OF STATION FHBKG		11. DATUM FOR ELEVATION SHOWN NA			
3. DRILLING AGENCY TERDA MAR		12. MANUFACTURE OR DESIGNATION OF DRILL MOBILE B-50			
4. HOLE NUMBER FHBKG-SB109		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 <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEGREES FROM VERTICAL		15. GROUNDWATER ELEVATION NA			
7. THICKNESS OF OVERBURDEN NA		16. DATE HOLE		STARTED 1-15-97	COMPLETED 1-15-97
8. DEPTH OF LEEED INTO ROCK		17. ELEVATION TOP OF HOLE NA			
9. TOTAL DEPTH OF HOLE 24.0'		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)
	1.0		Silty clay 5YR 2.5/1 black, highly plastic, damp, trace roots, trace angular to subrounded rock fragments < 1 cm			BKSB140
	2.0		same, damp			
	3.0		same, damp			cuttings
	4.0		same, damp			
	5.0		same, damp			BKSB141
	6.0		same, damp			
	8.0		Silty clay 7.5YR 6/4 lt. brown, not plastic, dry, trace weathered limestone fragments, stiff, some fine sand from 8'-9' bgs.			
	9.0		same, dry			BKSB142
	10.0					

SIGNATURE OF INSPECTOR/DATE J. W. Wayman 1-15-97	PROJECT Ft. Hood RFI	TABLE NO. FHBKG-SB109
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# HTRW DRILLING LOG (continued)

PROJECT

*Ft. Hood RFI*

INSPECTOR

*J. DeVaughn SAIC*

HOLE NUMBER

*FH3KG-SB109*

SHEET

SHEETS

*2 OF 3*

ELEVATION

DEPTH

LEGEND

CLASSIFICATION OF MATERIALS

CORE RECOVERY

BOX OR SAMPLE NO

REMARKS



*same except rock fragments (mostly weathered limestone) up to 2% total matrix*

*same, dry*

*cuttings*

*SD 1-15-97*

*same, dry, with limestone frags up to 4%, also 1% fine sand*

*BKSB143*

*same, dry*

*same, dry*

*BKSB144*

*same, dry*

*cuttings*

SIGNATURE OF INSPECTOR/DATE

*J. DeVaughn 1-15-97*

PROJECT

*Ft. Hood RFI*

HOLE NO.

*FH3KG-SB109*

# HTRW DRILLING LOG (continued)

HOLE NUMBER  
**FHCKG-53109**  
 SHEET SHEETS  
**3 OF 3**

PROJECT  
**Ft. Hood RFI**

INSPECTOR  
**J. DeVaughn SAIC**

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		Silty fine to med. sand, massive 7.5YR7/8 reddish yellow and 7.5YR7/1 lt. gray, mod. plastic, moist, soft			
	26.0		TD Angular gravel, saturated			water in hole, attempted sample, no recovery (in gravel at 24' bgs)
	28.0					
	30.0					
	32.0					

SIGNATURE OF INSPECTOR/DATE  
**J. DeVaughn 1-15-97**

PROJECT  
**Ft. Hood RFI**

HOLE NO.  
**FHCKG-53109**

<b>HTRW DRILLING LOG</b>		DIVISION Fort Worth Dist.	INSTALLATION Fort Hood	SHEET 1	SHEETS OF 4
1. PROJECT FORT HOOD RFI		10. SIZE AND TYPE OF BIT 4 1/4" HSA			
2. LOCATION/STATION FHBKG		11. DATUM FOR ELEVATION SHOWN NA			
3. DRILLING AGENCY TERRA MAR		12. MANUFACTURER'S DESIGNATION OF DRILL MOBILE B-50			
4. HOLE NUMBER FHBKG-SB110		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 <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEGREES FROM VERTICAL		15. GROUNDWATER ELEVATION NA			
7. THICKNESS OF OVERBURDEN NA		18. DATE HOLE		STARTED COMPLETED	
8. DEPTH DRILLED INTO ROCK		12-13-96		12-13-96	
9. 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, 7.5 YR 5/6 strong brown, fine to medium with some silt, soft, damp, not plastic			BKSB127
	2.0		same, damp to moist			
	3.0		Clayey sand, 2.5 YR 4/6 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 A. [Signature] 12-13-96	PROJECT	HOLE NO. FHBKG-SB110
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# HTRW DRILLING LOG (continued)

HOLE NUMBER  
**FHBKG-SB110**  
 SHEET SHEETS  
**2 OF 4**

PROJECT

INSPECTOR  
**J. DeVaughn, SAIC**

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					
	20.0		Silty clay, trace sand, 7.5% 6/6 reddish yellow, hard, dry, trace tan weathered limestone fragments < 1 cm			
			same, dry			BKSB131
	21.0		same, dry			

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

PROJECT

HOLE NO.  
**FHBKG-SB110**

# HTRW DRILLING LOG (continued)

HOLE NUMBER  
**FHBKG-SB110**

SHEET SHEETS  
**3 OF 4**

PROJECT

INSPECTOR  
**J. DeVaughn SAIC**

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)
	24.0		same, dry			
	25.0		same, dry			BKSB132
	26.0		same, dry			
	28.0					
	29.0		same with more silt, moist, softer			
	30.0		same except very silty, soft, damp			BKSB133
	31.0					
	32.0		same, damp			
	33.0		silty fine sand, trace gravel and coarse sand at bottom, saturated, not plastic, 7.5YR6/6 reddish yellow			

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

PROJECT

HOLE NO.  
**FHBKG-SB110**

# HTRW DRILLING LOG (continued)

HTRW DRILLING LOG (continued)						HOLE NUMBER	
PROJECT				INSPECTOR		SHEET SHEETS	
				J. DeVaughn SAIC		4 OF 4	
ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (g)	
	39.0		Coarse sand / poorly sorted gravel, angular to round, saturated, 1.5' water in hole.  TD			BKSB134	
	34.5						

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

PROJECT

HOLE NO.

FHBKG-SB110

## **APPENDIX E**

### **Statistical Calculations**

Fort Hood Background 95 % Upper Tolerance Limits (UTLs)

Subsurface Soil							
smp_id	Lead						
	Result (x)	Qual					
BKSB101	6	J					
BKSB102	5	J					
BKSB103	9.5	J					
BKSB105	3.9	J					
BKSB106	5	J					
BKSB107	6.1	J					
BKSB109	3.2	J					
BKSB110	7.8	J					
BKSB111	5.3	J					
BKSB113	6	J					
BKSB114	7.7	J					
BKSB115	5.1	J					
BKSB116	5.6	J					
BKSB118	3.7	J					
BKSB119	1.3	J					
BKSB120	0.72	J					
BKSB122	4.1	J					
BKSB123	3.8	J					
BKSB125	1.7	J					
BKSB126	1.5	J					
BKSB128	7.5	J					
BKSB129	4.1	J					
BKSB130	3.1	J					
BKSB131	10.1	J					
BKSB132	7.8	J					
BKSB133	6.3	J					
BKSB134	2.3	J					
BKSB136	3	J					
BKSB137	2.3	J					
BKSB138	4.1	J					
BKSB139	3.6	J					
BKSB141	12.1	J					
BKSB142	5	J					

Fort Hood Background 95 % Upper Tolerance Limits (UTLs)

BKSB143	6.6	J					
BKSB144	4	J					
BKSB204	7.10	J					
%nondetects=		0					
Distribution	N						
Mean	5.056111						
std dev	2.554632						
n	36						
K	2.167						
UTL	<b>10.592</b>						
UTL=exp(mean + K(std dev))							
<b>bold= 95% UTL for background</b>							

Fort Hood Background 95 % Upper Tolerance Limits (UTLs)

<b>SURFACE SOILS</b>			
smp_id	<b>Lead</b>		
	Result (x)	Qual	
BKSB104	5.3	J	1.66771
BKSB108	9.8	J	2.28238
BKSB112	1.5	J	0.40547
BKSB117	8.3	J	2.11626
BKSB121	10.2	J	2.32239
BKSB124	4.5	J	1.50408
BKSB127	3.8	J	1.335
BKSB135	2.5	J	0.91629
BKSB140	33.2	J	3.50255
BKSB201	5.9	J	1.77495
BKSB202	4.5	J	1.50408
BKSB203	6.6	J	1.88707
%nondetects=		0%	
Distribution		L	
Mean	8.008333		1.76818
std dev	8.374795		0.77664
n	12		12
K			2.736
UTL			3.89307
			<b>49.0614</b>
N - Normal distribution			
L - Lognormal distribution			
X - distributions different from normal and lognormal			
D-Distribution not determined because < 50% detects UTL= maximum detected value			
UTL=mean+K(std deviation)			
U= not detected in sample			
J=inorganic detected but is an estimated quantity			
R=data is rejected			

**APPENDIX F**

**FH-020 Screening Results**

Summary of Detected Analytical Results, Detection Limits, and Screening Criteria for FH-020 Samples								
Location	Sample ID	Depth	Parameter	Results	Detection Limit	Screening Value	Units	Screening Value
SB101	20SB101	0.0-1.0	Lead	7.1	0.22	49.6	mg/kg	Surface Soil Background
SB101	20SB102	4.0-4.5	Lead	1.9	0.20	10.56	mg/kg	Subsurface Soil Background
SB102	20SB103	0.0-1.0	Lead	3.2	0.21	49.6	mg/kg	Surface Soil Background
SB102	20SB104	4.0-4.5	Lead	3.4	0.21	10.56	mg/kg	Subsurface Soil Background
SB103	20SB106	3.0-3.5	Lead	4.7	0.20	10.56	mg/kg	Subsurface Soil Background
SB103	20SB110	0.0-1.0	Lead	4.3	0.22	49.6	mg/kg	Surface Soil Background
SB103	20SB111	2.5-3.5	Lead	2.7	0.21	10.56	mg/kg	Subsurface Soil Background
SB104	20SB105	0.0-1.0	Lead	7.2	0.22	49.6	mg/kg	Surface Soil Background
SB105	20SB112	0.0-1.0	Lead	21.2	0.30	49.6	mg/kg	Surface Soil Background
SB105	20SB113	2.0-2.5	Lead	40	0.26	49.6	mg/kg	Surface Soil Background
SB106	20SB107	0.0-1.0	Lead	32.4	0.23	49.6	mg/kg	Surface Soil Background
SB106	20SB109	2.5-3.5	Lead	10.1	0.21	10.56	mg/kg	Subsurface Soil Background

J - estimated value