US Army Corps
of Engineers

FINAL COMPLETION REPORT
FORMER BUILDING 710
EPD FACILITY NO. 9025029

at

HUNTER ARMY AIRFIELD
SAVANNAH, GEORGIA

under

Contract No. DACA21-93-D-0049
Delivery Order No. 11

June 1996

Submitted to:
U.S. ARMY CORPS OF ENGINEERS
SAVANNAH, GEORGIA

Presented by:
METCALF & EDDY, INC.
ATLANTA, GEORGIA

This investigation was conducted in accordance with the Statement of Work (SOW) prepared by the United States Army Corps of Engineers (USACE) for former Building 710 at Hunter Army Airfield, Savannah, Georgia. The investigation was conducted consistent with state and federal laws involving subsurface contaminant assessment. Field relatedportions of the investigation were supervised by Mr. David Humphris, P.G., Project Geologist, and overall project supervision was provided by Mr. David Wilderman, P.G., Project Manager. Contract management for this task order was provided by Mr. J. E. Bentkowski, P.G., Deputy Contract Manager. All information provided in this document is true and correct to the best knowledge of personnel involved in the project.

This document was reviewed and approved by:

David M. Wilderman, P.G.

Project Manager
Title

Date

HUNTER ARMY AIRFIELD
SAVANNAH, GEORGIA
CONTRACT NO. DACA21-93-D-0049
DELIVERY ORDER NO. 11

FINAL COMPLETION REPORT
BUILDING NO. 710
EPD FACILITY NO. 9025029

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LIST OF ACRONYMS

ACE	Anderson Columbia Environmental, Inc.
ARAR	Applicable or Relevant and Appropriate Requirements
ASTM	American Society of Testing and Materials
AT&E	Atlanta Testing & Engineering
bls	below land surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAP	Corrective Action Plan
CDAP	Chemical Data Acquisition Plan
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cm/s	centimeter per second
COE	Corps of Engineers
CR	Completion Report
CS	Confirmation Sampling
DIOF	Deionized organic-free
DNR	Department of Natural Resources
DO	Delivery Order
DOT	Department of Transportation
DQO	Data Quality Objectives
DRO	Diesel Range Organics
EB	Equipment Blank
EM	Engineer Manual
EPA	Environmental Protection Agency
EPD	Environmental Protection Division (State of Georgia, Department of Natural Resources)
ER	Equipment Rinsates
FID	Flame ionization detector
ft/day	feet per day
ft/ft	feet per feet
°F	degrees fahrenheit
GC	Gas chromatograph
GPR	Ground-Penetrating Radar
GRO	Gasoline Range Organics
GUST	Georgia Underground Storage Tank
HA	Hand Auger
HAAF	Hunter Army Airfield
HQ	Headquarters
HSA	Hollow Stem Auger
HSRA	Hazardous Site Response Act
ID	Inside diameter
IDW	Investigation-derived waste
IRP	Installation Restoration Program
MCL	Maximum Contaminant Level
M&E	Metcalf & Eddy, Inc.

ACRONYMS (Continued)

mg/kg	milligram per kilogram
mg/L	Milligrams per liter
mL	milli Liter
MOP	Monitoring Only Plan
msl	mean sea level
MS/MSD	Matrix spike/matrix spike duplicate
MW	Monitoring Well
NAVD	North American Vertical Data
NGVD	National Geodetic Vertical Datum
NIST	National Institute of Sciences and Technology
NSF	National Sanitation Foundation
OD	Outside diameter
OVA	Organic Vapor Analyzer
PAH	Polynuclear Aromatic Hydrocarbons
ppb	Parts per billion
ppm	Parts per million
PVC	Polyvinyl chloride
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QM	Quarterly monitoring
QMBN	Quartermaster Battalion
QPR	Quarterly Progress Report
RF	Response Factor
RPD	Relative Percent Difference
SADL	South Atlantic Division Laboratory
SAV	Savannah District
SB	Soil Boring
SDG	Sample Delivery Group
SDWA	Safe Drinking Water Act
SI	Site Investigation
SL	Savannah Laboratories
SOW	Scope of Work
SPH	Separate Phase Hydrocarbons
SSS	Split Spoon Sample
SPT	Standard Penetration Test
SVOC	Semivolatile organic compound
TB	Trip Blanks
TOC	Top of Casing
TRPH	Total Recoverable Petroleum Hydrocarbons
TVHC	Total Volatile Hydrocarbon Compounds
UST	Underground storage tank
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System

ACRONYMS (Continued)

USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOA	Volatile Organic Analysis
VOC	Volatile organic compound
WQS	Water Quality Standards

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1.0 INTRODUCTION

Metcalf & Eddy, Inc. (M&E) has been contracted by the United States Army Corps of Engineers (USACE), Savannah District (SAV), to perform an environmental assessment at Hunter Army Airfield (HAAF) in Savannah, Georgia. This assessment consists of confirmatory sampling (CS) at a former underground storage tank (UST) site (Building 710). The CS will be followed by a 1-year period of quarterly monitoring (QM). Several grades of motor fuel were stored and dispensed using the systems at this facility. A site location map is shown in **Figure 1.1.** The CS and QM efforts for former Building 710 were performed under the contract DACA21-93-D-0049, Delivery Order No. 11. The USACE SAV has been assigned responsibility for the environmental assessment under the Installation Restoration Program (IRP).

This investigation was conducted in accordance with federal, state, and local regulations and rules. Specifically, USTs are regulated by 40 Code of Federal Regulations (CFR), Parts 280 and 281. The State of Georgia Department of Natural Resources, Environmental Protection Division (EPD) Rules (Chapter 391-3-15) are also applicable. Specific guidelines for CS and QM were outlined in the Corrective Action Plan (CAP) submitted by Atlanta Testing & Engineering (AT&E, 1993) for Building 710.

The objectives for the investigation at former Building 710 were to: 1) determine the contaminant characteristics of soil and groundwater; 2) evaluate the effectiveness of recent interim remedial activities; 3) assess any remaining contamination in soil, surface water, and sediment; 4) assess groundwater contamination; and 5) characterize the geologic and hydrogeologic setting of the sites. The CS phase of the project will be followed by quarterly monitoring for a 1-year period to determine if any downgradient receptors may be impacted.

The project objectives for former Building 710 were achieved by collecting confirmatory soil, groundwater, and potable wellhead samples as outlined in the CAP. Quarterly monitoring began in mid-December, 1995.

METCALF & EDDY

SCALE 1:24000

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

AIRFIELD LOCATION MAP
BUILDING 710 AREA, HUNTER ARMY AIRFIELD

SOURCE: GARDEN CITY AND SAVANNAH, GA USGS QUADRANGLE MAPS, 1978

FIGURE 1.1

2.0 SUMMARY OF REMEDIAL ACTIVITIES

The former Building 710 area previously consisted of one building for operators, four USTs, and three pump islands. The USTs were approximately 45 years old and were constructed of steel. The two 10,000-gallon tanks, which were installed around 1940, held diesel and gasoline and were managed by the 260th Quartermaster Battalion (QMBN). The two 12,000-gallon tanks, which were installed around 1941, held gasoline and diesel and were managed by the Transportation Motor Pool. The two tanks operated by the QMBN were taken out of service in 1988 after the discovery of mud and water in the diesel tank. The remaining two tanks were in operation until 1990, when it was determined that the 12,000-gallon diesel tank was leaking.

Several investigations were conducted to determine if petroleum hydrocarbons had been lost to the subsurface at former Building 710. In March 1990, Tracer Research Corporation performed leak tests on two of the four underground storage tanks. The results of this investigation indicated that soils in the vicinity of the USTs had been impacted by petroleum products. The U.S. Army Corps of Engineers (USACE) conducted further evaluation of the vertical and horizontal extent of contamination near the USTs. Several soil borings and monitoring wells were installed to collect subsurface soil and groundwater samples. The results of samples collected and observations made indicated that approximately 700 cubic yards of soil had been contaminated. In addition, separate phase hydrocarbons were identified floating on the groundwater surface at monitoring well MW1 (located near H710-MW4). Soluble hydrocarbon compounds were also identified in groundwater wells.

The four tanks were removed in May 1994. Overexcavation and free product removal were also completed. During the removal, all monitoring wells were abandoned due to the excavation activities. The removal activities were conducted by Phoenix Construction Services, Inc. Soil contaminated with petroleum hydrocarbons and separate phase hydrocarbons (SPH) was removed from the tank excavation during this interim corrective action.

Remedial action completion reports are being prepared by Phoenix Construction Service, Inc. Additional information on the quantities of soil and SPH removed during remedial activities will be provided in the report. This information will also be summarized in the final version of this Completion Report.

3.0 SITE CONDITIONS

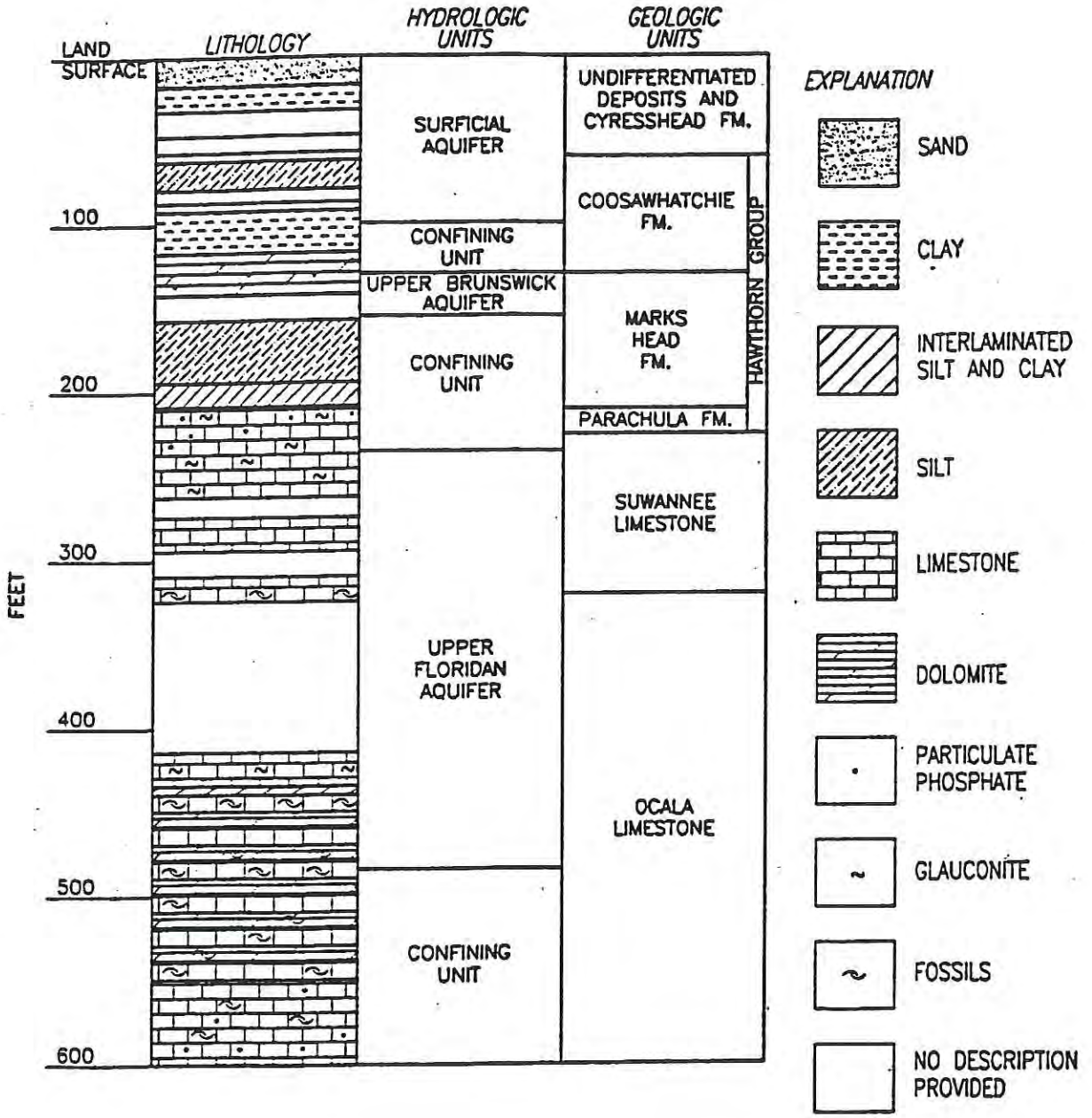
3.1 TOPOGRAPHY AND DRAINAGE

The site is relatively small and flat and topography varies little. Topographic relief ranges from approximately 18.1 to 20.3 feet above mean sea level (msl). Surface drainage is generally towards the northwest through drainage ditches and ultimately to Springfield Canal. Springfield Canal then flows southwest to Forest River.

3.2 GEOLOGY

3.2.1 Regional Geology

HAAF is located in the Coastal Plain physiographic province of Georgia and is approximately 20 miles west of the Atlantic Coast. The Coastal Plain geology is characterized by a wedge of sediments ranging in thickness from zero feet at the Fall Line (around Macon, Georgia) to about 5,000 feet along the Georgia-Florida border near Jacksonville, Florida (Arora, 1989). The Cretaceous to Quaternary age clastic and carbonate sediments of the wedge rest on a basement complex of Mesozoic and Paleozoic sedimentary, igneous, and metamorphic rocks. The total thickness of the wedge in the Savannah area is around 4,000 where its base is formed by Lower Mesozoic red beds intruded by diabase (Miller, 1990). The geologic formations that make up the Coastal Plain wedge consist of unconsolidated sand and clay, limestone, and dolomite. The Coastal Plain formations generally strike northeast-southwest and dip to the southeast. Specifically, the formations underlying the HAAF area to approximately 600 feet BLS consist of (shallow to deep) undifferentiated surficial sand, undifferentiated alluvial deposits, Cypresshead Formation, Hawthorn Group, and Suwanee and Ocala Limestone. A generalized stratigraphic column showing predominant Cenozoic lithologic units is provided in **Figure 3.1.**



METCALF & EDDY

GENERALIZED HYDROGEOLOGIC STRATIGRAPHIC COLUMN

HUNTER ARMY AIRFIELD SAVANNAH, GA

FROM AT & E, 1992

FIGURE 3.1

The undifferentiated surficial sand is late Pleistocene to Holocene in age and underlies the local soil profiles. These deposits consist of massive-bedded, structureless, well to moderately well-sorted, fine- to medium-grained, white to buff colored sand; ranging in thickness from 0 to 10 feet (Huddleston, 1988).

The undifferentiated alluvial deposits are Pleistocene in age and occur throughout the drainage systems of the Coastal Plain and consist of floodplain deposits and river terrace deposits. These deposits are predominantly sand with a little clay and range in thickness from 20 to 50 feet (Huddleston, 1988).

The undifferentiated surficial sands and alluvial deposits are underlain by the Cypresshead Formation. The Cypresshead Formation is early Pleistocene in age. The Cypresshead Formation generally consists of quartz sand with prominent clay beds in some down dip areas. Two lithofacies are dominant in this unit. The up dip facies generally consist of fine- to coarse-grained, well to poorly sorted sand with scattered gravel stringers. The down dip facies generally consist of fine-grained, well sorted sand with thin layers of clay. The Cypresshead Formation disconformably overlies the Coosawhatchie Formation of the Hawthorn Group (Huddleston, 1987).

The Hawthorn Group is of Miocene age and generally consists of a basal calcareous unit, a middle clastic unit, and an upper unit that is a mixture of clastic and carbonate rocks (Miller, 1986). The Hawthorn Group has been divided into three formations, Coosawhatchie Formation, Markshead Formation, and the Parachula Formation which are listed here from youngest to oldest (Huddleston, 1987).

The Coosawhatchie Formation is composed predominantly of clay, but also has sandy clay, argillaceous sand, and phosphorite units. This formation is approximately 170 feet thick in the Savannah area. This unit disconformably overlies the Markshead Formation and is distinguished from the underlying unit by dark phospathic clays or phosphorite in the lower part and fine-grained sand in the upper part (Huddleston, 1987).

The Markshead Formation is approximately 70 feet thick in the Savannah area and consists of light colored phosphatic, slightly dolomitic, argillaceous sand to fine-grained sandy clay with scattered beds of dolostone, limestone, and siliceous claystone. The Markshead Formation disconformably overlies the Parachula Formation and is distinguished from the underlying unit by being more phosphatic, siliceous, and dolomitic and less calcareous (Huddleston, 1987).

The Parachula Formation consists of sand, clay, limestone and dolomite, and is approximately 10 feet thick in the Savannah area. The Parachula Formation generally overlies the Suwanee Limestone in Georgia (Huddleston, 1987).

The Suwanee Limestone of Oligocene age consists of a cream to tan, crystalline, highly vuggy limestone and is approximately 100 feet thick in the Savannah area (Miller, 1986) and overlies the Ocala Limestone. The Ocala Limestone of late Eocene age is a gray to cream, dense, highly fossiliferous limestone (Furlow, 1969).

3.2.2 Local Geology

The local geology has been documented by the collection of soil samples at over 130 locations from nearby subsurface investigations at other sites. The maximum depth of drilling was generally 14 feet below land surface.

The lithology encountered was predominantly a dark gray to dark brown, very fine to medium sand, with variable silt and clay content. Moisture content averaged about 22.2 percent but ranged from 16 to 29 percent. Generally, the samples with higher silt and clay content were within a few feet of the surface. Less silt and clay content was noted with depth. Soil samples from 6 locations were analyzed for grain size distribution and the results are presented in **Table 3-1.**

TABLE 3-1 FORMER BUILDING 710 GRAIN SIZE ANALYSIS					
		Grain Size Distribution (%)			
Location	Depth (ft, bgs)	Gravel (0.19 to 2.9 inches)	Sand (0.003 to 0.19 inches)	Silt/Clay (<0.003 inches)	USCS
H710-SB1	5-7	0	58.6	41.4	SC
H710-SB2	3-5	0	89.1	10.9	SP-SM
H710-SB3	5-7	0	77.4	22.6	SM
H710-SB4	11-13	1.1	90.9	8.0	SP-SM
H710-SB5	9-11	0	97.2	2.8	SP
H710-SB6	1-3	0	87.7	12.3	SM

3.3 HYDROGEOLOGY

Groundwater at the site is under water table conditions and is encountered between 2.35 to 4.97 feet below land surface (bls), averaging 3.77. Groundwater flow is toward the northwest with a gradient of approximately 0.011 ft/ft.

Slug test results were previously reported for seven wells at the site (AT&E 1993). The average hydraulic conductivity (k) result was 9.7 x 10^{-4} cm/s (2.7 ft/day). Using the formula (Fetter, 1988):

$$v = \frac{ki}{n_e}$$

where:

v = seepage velocity

k = hydraulic conductivity

i = gradient

n_e = effective porosity (assumed .20, Heath, 1987)

the seepage velocity is calculated to be 5.0 x 10^{-5} cm/s (0.14 ft/day).

4.0 SITE INVESTIGATION METHODOLOGIES

4.1 FIELD EQUIPMENT CALIBRATION

This section outlines the procedures used to ensure the proper operation and accuracy of all field instrumentation used during this investigation. The organic vapor analyzer (OVA) was used to screen soil samples for volatile organic compounds (VOCs) and to screen breathing zones for health and safety purposes. The pH/conductivity meter was used to determine the temperature, pH and conductivity of the groundwater prior to sampling.

OVA Calibration

The Foxboro 128 (OVA) was calibrated on-site with a reference gas and zeroed with ambient air at the beginning and end of each work day the instrument was used. Field calibration sheets were completed each day the instrument was used and are provided in **Appendix A.**

pH and Conductivity Meter Calibration

The Hydac 910 conductivity and pH meter was calibrated before use in the field and at the end of each work day the instrument was used. A temperature adjustment knob was used to correct for temperature changes during the day. Field calibration sheets were completed each day of instrument use and are provided in **Appendix A.**

4.2 DRILLING

4.2.1 Hand Auger Soil Boring

The nine hand-augered soil borings at former Building 710 were drilled to determine the extent of soil contamination. The procedures used were as follows:

1. The physical characteristics of the surface soil such as grain size, color, texture, etc., were recorded in accordance with USACE EM 1110-1-4000.

2. A sketch of the sampling location was prepared or located on a base map.

3. A borehole was advanced at the test site in 1-foot increments using a decontaminated stainless steel hand auger to approximately 0.5 foot below the saturated zone. Decontamination consisted of alconox and water wash using a scrub brush followed by a potable water rinse, isopropanol rinse, and a deionized organic-free (DIOF) rinse. Each auger sample was screened with an OVA. The sample with the highest OVA reading from each location was collected, packed on ice and shipped to a laboratory for chemical analysis as specified in the CDAP. If auger refusal occurred before the desired total depth was reached, one offset location was attempted. The offset boring was within 3 feet of the original location. The boring location was abandoned if hand auger refusal was reached a second time.

4. Each sample was characterized in accordance with USACE EM 1110-1-4000. Geologic logs are presented in **Appendix B**. Soil sampling sheets are presented in **Appendix C**.

5. At completion of the hand auger drilling, the boring was backfilled with grout cement.

6. The hand auger soil borings were surveyed to determine their location and elevation.

4.2.2 Geoprobe Groundwater Sampling

Groundwater sampling probes consisted of 4-foot sections, 3/4-inch outside diameter (OD), of hardened drill steel attached to a Geoprobe screen point groundwater sampler. Groundwater samples were collected at depths of 10 feet bls.

The hollow probes with detachable drive points were advanced below the water table by hydraulically pushing and/or hammering the probes to the desired depths using a truck-mounted hydraulics rig. Depth to the water table was estimated using nearby hand-auger data. If required, an air compressor and rock drill were used to drill through any asphalt or concrete.

Once the sample was collected, the rods and screenpoint sampler were retrieved, disassembled, and decontaminated before use at another location.

4.2.3 Monitoring Well Installation

Borings for monitoring well installation were drilled using a Diedrich D-120 drill rig and hollow stem augers (HSA). A HSA column simultaneously rotates and axially advances using a mechanically or hydraulically powered drill rig. The hollow stem of the auger allows the use of various methods for continuous or intermittent soil sampling. Augers with an inside diameter (ID) of 6.25 inch were used to allow sufficient borehole annulus for well material placement. Casing and screens for monitoring wells were set through the augers when the desired depth had been reached. The gravel pack and grout was placed as the auger was gradually withdrawn from the hole.

All borings were started by post hole digging or hand-augering to 3 feet to clear any unknown underground utilities at each location. The holes were opened at least as wide as the outside diameter of the augers (or other downhole tools). Drilling began at 3 feet and continued with the addition of 5-foot auger sections. Split spoon samples were collected from 3 to 5 feet bls and continuously thereafter, to the bottom of the hole. Soil samples were taken through the HSA in advance of the auger bit. Generally, the borings were drilled to a depth of 13 to 14 feet so that 5 to 7 feet of water would collect in a well installed in the boring.

Split spoon sampling was conducted in accordance with ASTM D1586, "Method for Penetration Test, and Split Barrel Sampling of Soils." The sampler was a hollow steel barrel approximately 2 inches in diameter, 24 inches long, split lengthwise and threaded at the ends. The two pieces were held together at the bottom by the drive shoe which screws onto the threads, and at the top by screwing onto the sampling rods. The split spoon sampler was attached to the bottom of a rod and driven into the ground by a 140-pound hammer, free falling 30 inches. The number of hammer blows required to drive the sampler 24 inches in

6-inch increments (blow counts) was recorded along with the length of soil actually recovered.

The storage, packaging, and shipment procedures for samples suspected of being hazardous were in accordance with the site health and safety plan, and applicable DOT regulations for transporting hazardous materials.

The well riser pipe consisted of new 2-inch ID, flush-threaded schedule 40 PVC in conformance with National Sanitation Foundation (NSF)/ASTM F480 potable-water grade requirements. Riser lengths used were either 5 or 10 feet. Well screens were also made of the above material and factory slotted at 0.010 inch. Screen lengths were 10 feet long and the bottom sealed with a 2-inch threaded PVC plug.

Clean, inert, natural fine silica sand (20/30 grade) was used to construct a uniform and continuous filter pack extending from the well bottom to about 1 foot above the screen due to a shallow water table. The filter pack depth was checked with a weighted measuring tape during placement.

Generally, a 1-foot-thick bentonite seal was installed above the filter pack. A commercial-grade bentonite in 3/8-inch to 1/4-inch pellet form was used, and the depth was checked with a weighted measuring tape. The bentonite pellets were hydrated with 2 to 3 gallons of potable water and hydrating time was at least 1 hour before grouting. For very shallow water table wells, the thickness of bentonite seal may have been reduced to accommodate well completion.

A cement-bentonite grout was placed in the borehole annulus from the top of the bentonite seal to the ground surface. Cement grout consisted of a mixture of not more than 7 gallons of water and 3 pounds bentonite powder per 94-pound sack of Portland Type II cement. Due to the shallow well depths, grout was hand-mixed and poured in the borehole from the surface.

All wells were completed flush to the ground with a 6-inch diameter airport-grade manhole with a bolt-down cover to prevent tampering. A 4-inch thick, 2 to 3 foot square concrete pad, sloping away from the well, was constructed around the manhole. All wells were equipped with a water-tight, locking well cap and all locks are keyed alike.

A metal plate bearing the contractor's name and registration number, well completion date, well number, total depth, depth of screen section, and depth to water was affixed to the concrete well collar. Monitoring well schematics are presented in **Appendix D.**

4.2.4 Well Survey

Coordinates and elevations were established for each monitoring well and borehole by Hoffman and Co., a registered surveyor, licensed in the State of Georgia. The coordinates are to the closest 1.0 foot and referenced to the State Plane Coordinate System. A permanent survey mark (control point) is scribed on the top of each monitor well riser casing. Ground elevations to the closest 0.1 foot and an elevation on the top of the well riser casing to the closest 0.01 foot were determined for each well. Elevations are referenced to the NGVD of 1929. Survey data is presented in **Appendix E.**

4.2.5 Well Development

Well development began at least 48 hours after grouting. Development consisted of mechanical pumping with intermittent surging. The pump utilized was a 12V DC submersible Whale pump with 1/2-inch polyethylene tubing. Water levels, specific conductance, temperature, and pH were measured and recorded before, during, and after development. Development continued until the water was clear and relatively free from sediment. The groundwater at some locations still had color and some turbidity following complete development. However, no sediment was present in the sample jar after 15 to 30 minutes of settling time. At least five well volumes of water, including the saturated borehole volume (assuming 30 percent porosity), was removed during development. A clear glass jar filled with groundwater from the well was labeled and photographed with 35 mm

color print film to be part of the well log. All developed water was containerized in DOT-approved 55-gallon drums. Monitoring well development sheets are presented in **Appendix F.**

4.3 SAMPLING PROCEDURES

Methods and procedures used to collect the field samples during this investigation are presented below. A detailed discussion of sampling procedures was presented in the Chemical Data Acquisition Plan (CDAP), a subplan of the Final Work Plan. Specific procedures for bottling and packaging samples for chemical analysis followed the Corps of Engineers EM 1110-1-263 (dated October 1, 1990) guidelines. A chronology of sample collection activities is provided in this section.

4.3.1 Sample Designation

A sample naming system used in the field investigation was applied to all environmental samples collected during the fieldwork at HAAF. Each sample was numbered consecutively as they were collected and indicate the site location, site identifier (building number), sample collection technique/matrix, and sample number. The naming system also provided a discrete sample number for each duplicate sample collected, and each was recorded in the field logbook. The quality control samples (equipment rinsates and trip blanks) have numeric designations following the letters ER for equipment rinsates and TB for trip blanks.

An example of the format used is depicted below:

FIELD SAMPLE DESIGNATION

H ***710*** ***HA*** ***12***

IDENTIFICATION KEY

H = Site Location, Hunter Army Airfield
710 = Site Identifier, Building #710
HA = Sample Collection Technique/Matrix, Hand Auger or:
- MW = Monitoring Well
- SB = Soil Boring
- EB = Equipment Blank
- TB = Trip Blank

12 = Sample Number 12

4.3.2 Chronology of Samples Collected

All environmental samples were collected at Hunter Army Airfield in a logical sequence as determined by the initial sampling schedule. This logic is based on sampling method, expected level of contamination, well installation, and weather conditions. Soil from monitoring well borings were collected during well installation. **Table 4-1** lists the environmental field samples, associated quality control samples collected during the field investigation, and the analyses required for each sample.

4.3.3 Quality Assurance/Quality Control Samples

Quality assurance (QA) and quality control (QC) samples were collected and analyzed to ensure that the proper procedures were followed during sample collection, equipment decontamination, shipping and laboratory analysis. Field QA/QC samples consisted of duplicates, splits, equipment rinsate blanks, trip blanks and temperature blanks. The field QC samples were analyzed as discrete samples by the subcontractor, Savannah Laboratories (SL), located in Savannah, Georgia. The field QA split samples were analyzed by the USACE, South Atlantic Division Laboratory (SADL), located in Marietta, Georgia.

TABLE 4-1
SAMPLING SCHEDULE
HUNTER ARMY AIRFIELD
SAVANNAH, GEORGIA

SAMPLE LOCATION	SAMPLE IDENTIFICATION	QA/QC		SAMPLE DEPTH (FT)	SDG #	SAMPLE DATE	LAB RC'D DATE	REPORT RC'D DATE	PARAMETERS					COMMENTS
		SAMPLE	MATRIX						BTEX 8020	TPH (1) 8015M/8100M	TRPH 418.1M	PAH (2) 8100/8310	METALS 6000/7000	
BUILDING 710 MOGAS DIESEL TANKS														
Hand Auger	H710-HA1		SOIL	4	HAA03	6-17-95	6-17-95	7-17-95	X	X		X		
	H710-HA2		SOIL	4	HAA03	6-17-95	6-17-95	7-17-95	X	X		X		
	H710-HA3	QC/DUP	SOIL	4	HAA03	6-17-95	6-17-95	7-17-95	X	X		X		H710-HA9
	H710-HA9	DUPLICATE	SOIL	4	HAA03/08	6-17-95	6-17-95	7-17-95	X	X		X		H710-HA3
	H710-HA4	QA/SPLIT	SOIL	2	HAA03	6-17-95	6-19-95	7-17-95	X	X		X		H728-TB3/SADL
	H710-HA5		SOIL	1	HAA03	6-17-95	6-17-95	7-17-95	X	X		X		
	H710-HA6		SOIL	4	HAA03	6-17-95	6-17-95	7-17-95	X	X		X		
	H710-HA7		SOIL	4	HAA03	6-17-95	6-17-95	7-17-95	X	X		X		*-TPH analysis for purg.
	H710-HA8		SOIL	4	HAA03	6-17-95	6-17-95	7-17-95	X	X		X		
	H710-TB32	SAV.LAB	WATER		HAA03	6-17-95	6-17-95	7-17-95	X	X*				
	H710-HA10		SOIL	2	HAA08	6-28-95	6-28-95	7-28-95	X	X		X		
Monitoring Well Soil	H710-SB1		SOIL	5	HAA11	8-05-95	8-08-95	9-08-95	X	X		X		
	H710-SB2		SOIL	5	HAA11	8-05-95	8-08-95	9-08-95	X	X		X		H710-SB7
	H710-SB3		SOIL	5	HAA11	8-05-95	8-08-95	9-08-95	X	X		X		
	H710-SB4		SOIL	7	HAA11	8-05-95	8-08-95	9-08-95	X	X		X		
	H710-SB5	SPLIT	SOIL	5	HAA11	8-05-95	8-08-95	9-08-95	X	X		X		
	H710-SB6		SOIL	5	HAA11	8-06-95	8-08-95	9-08-95	X	X		X		
	H710-SB7	DUPLICATE	SOIL	5	HAA11	8-05-95	8-08-95	9-08-95	X	X		X		H710-SB2
	H710-TB34	SAV. LAB	WATER		HAA11	8-05-95	8-08-95	9-08-95	X	X*				*-TPH analysis for purg.
	H710-TB35	SADL	WATER			8-05-95			X	X*				*-TPH analysis for purg.
Monitoring Well Groundwater	H710-MW1		WATER		HAA15/16	9-07-95	9-07-95	9-29-95	X			X		
	H710-MW2		WATER		HAA15	9-07-95	9-07-95	9-29-95	X			X		
	H710-MW3		WATER		HAA16	9-08-95	9-08-95	9-29-95	X			X		
	H710-MW4		WATER		HAA16	9-08-95	9-08-95	9-29-95	X			X		H710-MW7
	H710-MW5	SPLIT	WATER		HAA16	9-08-95	9-08-95	9-29-95	X			X		
	H710-MW6		WATER		HAA16	9-08-95	9-08-95	9-29-95	X			X		
	H710-MW7	DUPLICATE	WATER		HAA16	9-08-95	9-08-95	9-29-95	X			X		H710-MW4
	H710-ER3	EQ. RINS.	WATER		HAA15/16	9-07-95	9-07-95	9-29-95	X			X		

Duplicate Samples

One groundwater, and two soil samples were collected as duplicate samples and submitted to Savannah Laboratories for analysis. The field duplicates, collected at the same location, are composed of the same material as the original samples. **Table 4-1** identifies the original and corresponding duplicate samples collected during this field investigation.

QA Split Samples

One groundwater, and two soil samples were collected as split samples and submitted to the USACE SADL for analysis. The field QA splits were collected from the same material as the original samples, and were not field duplicate samples. **Table 4-1** lists the original samples and the corresponding splits.

Equipment Blanks

Equipment blanks were included to determine the effectiveness of decontamination procedures. An equipment blank was collected by rinsing the decontaminated field equipment (stainless steel split spoon) with DIOF water supplied by the laboratory. The resultant rinse water was collected in appropriate sample containers and analyzed for the same parameters as the corresponding sample. One equipment blank was collected during this investigation.

Trip Blanks

Trip blanks were included in each shipment that contained groundwater or surface water samples for volatile organics analysis. The trip blanks were prepared in the laboratory and accompanied the sample containers to the site. The blanks were handled with the field samples and were packed and shipped in coolers back to the laboratory. The trip blanks were used to determine if samples were contaminated during storage and shipment.

Temperature Blanks

Temperature blanks were included in each sampler cooler containing environmental samples shipped to the laboratory. Upon receipt to the laboratory, the sample custodian measures the temperature to ensure the proper temperature of 4°C was maintained during shipment.

4.3.4 Soil Sampling

After driving the split spoon sampler 24 inches, it was removed from the borehole, opened, and screened for volatile organics using the OVA. Samples were scraped on the sides and ends (peeled) to expose a fresh soil surface prior to vapor screening. The volatile sample was collected from the portion of the spoon having the highest OVA reading and placed in a laboratory-approved container as soon as possible. Each volatile sample was refrigerated while the boring was advanced to the desired depth. The remaining soil was placed into an aluminum pie plate and covered with aluminum foil. A portion of soil (approximately 2 ounces) taken from the same area of the spoon as the volatile sample was placed into a foil topped glass jar for headspace screening.

OVA headspace readings from each soil sample were reviewed upon boring completion. Additional laboratory glassware was filled with soil from the sampling horizon which had the most elevated OVA reading. If no readings were detected, the sample from the soil/water table interface was selected for chemical analysis.

Soil in each split spoon was examined and described by the geologist. Descriptions included comments on grain size percentages, color, plasticity, consistency, density, moisture content, texture structure, and angularity, etc., as described in USACE EM 1110-1-4000. This information was logged on USACE Engineering Form 1836. A detailed discussion of subsurface soil characteristics is provided in Section 3.0 of this report.

Samples for the physical analysis of grain size, Atterburg limits, and moisture content (ASTM C117 and 136, ASTM D4318, and ASTM D2216, respectively), were retained from

six monitoring well borings. The selected samples covered the range of lithologies encountered during drilling. Grain size distributions are summarized in **Table 3-1** and geotechnical laboratory analyses are discussed in Section 3.2.2 of this report. Geotechnical data is presented in **Appendix G.**

4.3.5 Geoprobe Groundwater Sampling

Groundwater samples were collected using geoprobe sampling rods as part of the initial site characterization. The purpose of this sampling effort was to determine monitoring well placement based on groundwater screening results. Groundwater samples were collected and screened for BTEX and total volatile hydrocarbons.

Sampling Procedures

The geoprobe sampling rods were driven below the water table as described in Section 4.2.2. Once the desired depth was reached, the rods were pulled back about 6 inches to expose the screen, and water was allowed to collect in the probe. Water samples were collected using a stainless steel check valve attached to 1/4-inch ID polytubing that was inserted into the sample probe. The water was retrieved by raising and lowering the check valve apparatus into the groundwater table, which forced a column of water into the tubing. Groundwater samples were collected in 40 mL VOA vials that were filled to exclude air and capped with Teflon-lined septa caps.

Analysis

In the analytical van, approximately half of the liquid in the bottle was decanted. The vials were then vigorously shaken, and a headspace sample was injected into the gas chromatograph (GC) in volumes of 1 to 1,000 mL depending on the VOC concentrations in the sample.

Indirect (headspace) analysis was used because of the large number of water and/or soil samples analyzed daily. The method is more time efficient for VOC measurement than direct injection of the water or soil sample into the GC due to a lower probability for semi-volatile and non-volatile contamination of the instrument. Depending upon the partitioning coefficient of a given compound, the indirect analysis method may be more sensitive than the direct injection method. The precision and accuracy of both methods are similar.

Analytical instruments were calibrated daily using fresh working standards made from National Institute of Sciences and Technology (NIST) traceable standards and reagent blank solvents.

The GC was calibrated for indirect analysis by decanting 20 milliliters (mL) of the known standard, and leaving approximately the same amount of headspace as in the groundwater samples. The standard bottle was resealed and shaken vigorously for 30 seconds. An analysis of the headspace in the bottle determined the Response Factor (RF) which was then used to calculate the sample concentrations.

A Hewlett Packard 5890 II GC, equipped with a flame ionization detector (FID) and one computing integrator, was used for the groundwater analyses. The compounds were separated in the GC on a 4-foot by 1/8-inch OD packed analytical column in a temperature controlled oven. Nitrogen was used as the carrier gas.

The instrument calibrations were checked periodically throughout the day to monitor the response factors and retention times. The following paragraphs explain the GC and FID processes.

GC Process

A headspace sample was injected into the GC where it was swept through the analytical column by the carrier gas. The detector senses the presence of a component different from the carrier gas and converts that information to an electrical signal. The components of the

sample pass through the column at different rates, according to their individual properties, and are detected by the detector. Compounds are identified by the time it takes them to pass through the column (retention time).

FID Process

The FID utilizes a flame produced by the combustion of hydrogen and air. When a component, which has been separated on the GC analytical column, is introduced into the flame, a large increase in ions occurs. A polarizing voltage is applied to an ion collector near the flame. The ions are attracted to the collector, producing a current which is proportional to the amount of sample analyte in the flame. The electrical current causes the computing integrator to record a peak on the chromatogram. By measuring the area of the peak and comparing that area to the integrator response of a known standard, the concentration of the analyte in the sample is determined.

4.3.6 Monitoring Well Sampling

Each well was allowed to chemically equilibrate for at least 14 days after development before sampling. Well sampling began with the well located in the area suspected of least contamination. Protective gloves were worn during sampling and changed between samples. The following procedures were used:

1. The weather conditions and other on-site data were recorded.
2. The protective casing on the well was unlocked. Plastic sheeting was placed around the well to provide protection from contamination for any field sampling equipment used in this procedure.
3. The air in the well head was sampled for organic vapors using a photoionization detector or organic vapor analyzer and the measurements were recorded.
4. Using a decontaminated water level indicator, the static groundwater level and depth to the bottom of the well were measured and recorded. The water level indicator was decontaminated after use.

5. The volume of standing water in the well was calculated from the well diameter and the measured depth of the standing water. This volume was recorded.

6. Using a disposable teflon bailer, at least three well casing volumes of water were removed prior to sampling. The volumes purged were measured by discharging all the purge water into a precalibrated container. During purging, the temperature, conductivity, and pH of each volume of water was measured and recorded as it was removed. Purge water was drummed with the development water from the same well. Purging was discontinued after at least three volumes had been removed provided the pH and conductivity readings had stabilized to within 10 percent from the previous reading. If the readings had not stabilized, another well volume was purged. Groundwater sampling sheets are presented in **Appendix C.**

7. Using a disposable teflon bailer and connecting cord, groundwater samples were collected from the well. The time at the beginning and end of bailing was recorded. (During sample collection and purging, the downhole equipment was not allowed to touch the ground or any objects except the well casing.)

8. Each groundwater sample was transferred directly from the bailer to the appropriate sample containers. Samples collected for volatile organic analysis were collected first. Samples collected for volatile organic analysis contained no air bubbles in the VOA vial after it had been capped. All other sample containers were filled to the shoulder.

9. Each sample was immediately labeled; preserved if necessary, refrigerated on ice, logged into the sample field log book, and chain-of-custody forms were completed.

10 The standing water level in the well was remeasured and recorded after the sampling.

11. The protective cap on the well was replaced and locked.

4.4 Equipment Decontamination

All drilling and sampling equipment was decontaminated prior to arrival on site, before the start of each hole, and before leaving the site. Decontamination of the drill rig, tools, and downhole equipment consisted of steam cleaning. Decontamination of split spoons and geoprobe tools consisted of an alconox wash, a potable water rinse, a pesticide-grade isopropanol rinse, and DIOF water rinse.

All water used for decontamination and well construction was from a potable source (Water Point) located at the end of Westly Street. The bulk of decontamination operations took place on a plastic lined "decon pad" located near the fenced area at Building 728 located approximately 200 feet to the northeast. The decon pad was equipped with a sump area to collect decon fluids, which were pumped into drums pending analysis. The area adjacent to the decon pad served as a storage area for well construction materials, water trucks, etc. and was protected from over-spray and splash from decon activities. The only decontamination not conducted at the decon pad was decontamination of sampling tools during active sampling. Split spoons were decontaminated between each sample in clean 5-gallon buckets at the drilling location. All decontamination fluids were stored in the locked, fenced area of Building 728 until proper disposal was arranged.

4.5 Investigation-Derived Wastes (IDW)

All drill cuttings, well water, and decontamination water was collected in drums. Plastic sheeting was also collected and removed from each site as IDW. The drums were labeled as to their contents, source, generation date, and point of contact. The drums were moved to a central fenced location near Building 728 after the drilling, development, and sampling activities. The drummed water was disposed of at the HAAF Water Treatment Facility. Drummed soil whose analyses showed no contamination was spread on the ground within the fenced area at Building 728. All remaining drummed soil will be incinerated pending funding from the USACE.

Expendable supplies, gloves, tyvek, etc., were collected in plastic garbage bags and screened with the OVA prior to placing in the trash.

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5.0 FIELD INVESTIGATION SUMMARY

5.1 BACKGROUND SAMPLING LOCATION RATIONALE

Background samples generally characterize natural soil and groundwater conditions. Background locations are intended to be beyond plume boundaries and hydraulically upgradient of known contamination. However, upgradient monitoring well locations 710-MW5 and 710-MW6 contained trace amounts of hydrocarbons in soil and water, respectively. Thus, 710-MW1 is designated as the background location, even though it is downgradient, since no hydrocarbons were detected.

5.2 SAMPLING LOCATIONS AND FIELD OBSERVATIONS

5.2.1 Soil Sampling and Lithology

Soil samples from 9 hand-auger borings were collected on June 17 and 28, 1995. Sample locations were generally placed around the former UST locations and across Moore Road to the south to determine the effectiveness of soil excavation performed during UST removal. Hand auger depths were generally 4 feet (first wet sample) but ranged from 1.0 (auger refusal) to 4 feet. Soil samples were analyzed for BTEX, GRO, DRO, and PAHs. Analytical results of soil samples are discussed in Section 6.3.

The near-surface lithology determined from the hand-auger borings is a fine- to medium-grained sand with variable clay and silt. The clay and silt content generally decreases with depth.

5.2.2 Geoprobe Groundwater

Groundwater samples from ten geoprobe locations were collected with direct-push technology at Building 710 on July 12, 1995. Locations were placed around the excavation perimeter to better define the extent of contamination. All sample depths were 10 feet below ground surface. Since the geoprobe investigation was used as a screening tool for groundwater monitoring well placement, the results are discussed below.

The results of the geoprobe sampling are presented in **Table 5-1**. The majority of the analyses indicate the absence of BTEX contamination. Other hydrocarbons were detected during the field screening exercise. The highest screening results were detected in the total volatile hydrocarbon compound (TVHC) range of C1-C9. The "C" range refers to the

TABLE 5-1
BUILDING 710 GEOPROBE RESULTS

Groundwater Sample	Benzene	Toluene	E-Benzene	Xylene	TVHC (C1-C9)	TVHC (C10-CX)
710-HP-01-10'	<3	<4	<5	<11	1000	<9
710-HP-02-10'	<2	<3	<4	9	5400	<7
710-HP-03-10'	<5	<7	<9	<20	4000	<17
710-HP-04-10'	<5	<7	<9	<20	3300	<17
710-HP-05-10'	<5	<7	<2	<5	1100	<4
710-HP-06-10'	<1	<2	<2	<5	4900	<4
710-HP-07-10'	<2	<4	<4	<10	3900	<8
710-HP-08-10'	<2	<4	<4	<10	970	<8
710-HP-09-10'	<2	<4	<4	80	11000	17
710-HP-10-10'	23	<4	<4	<10	1400	<8

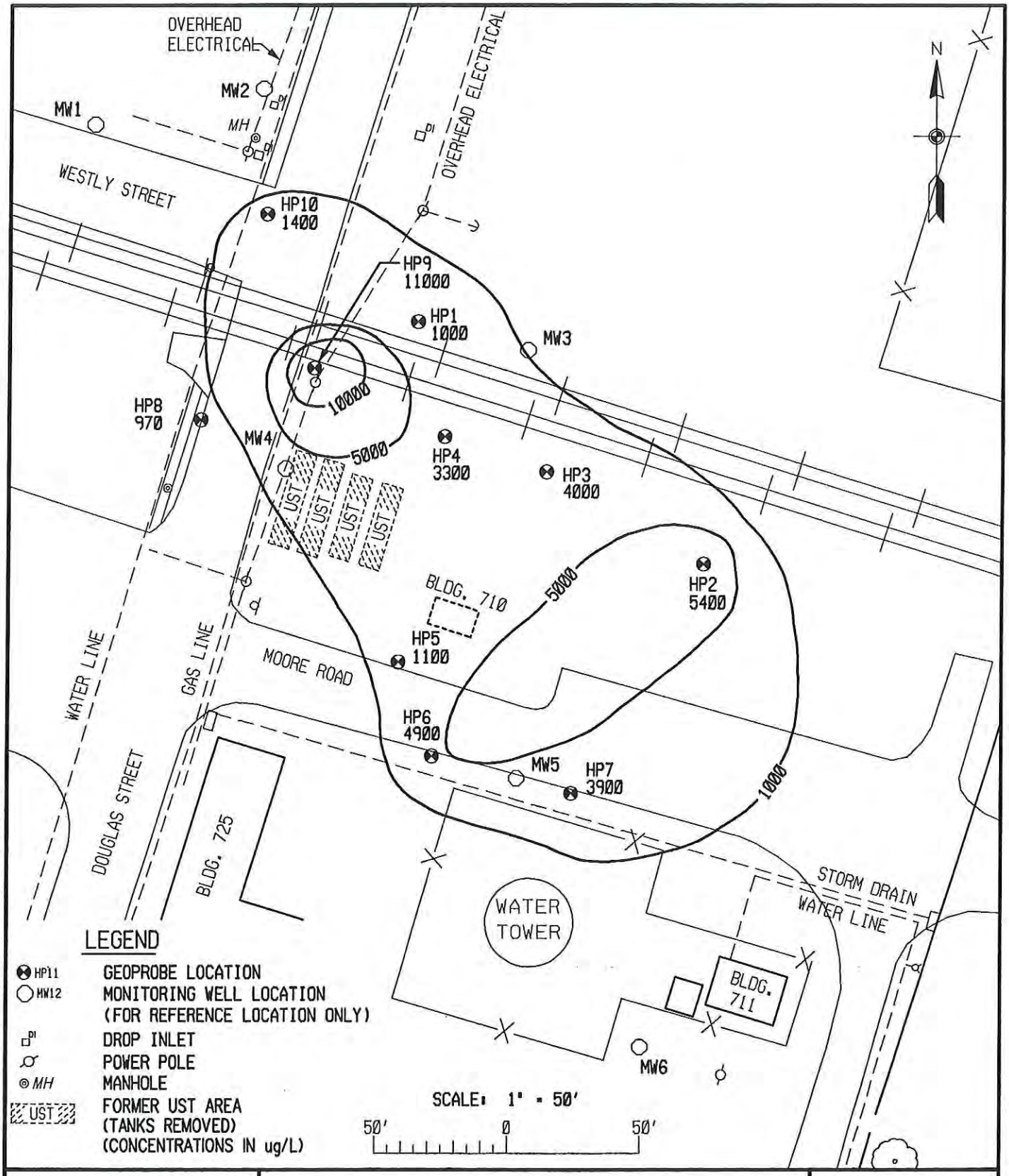
All concentrations are in micrograms per liter (μg/L)

carbon atoms in a particular hydrocarbon (i.e., C-1 = methane, C-5 = pentane, etc.) identified by the field GC. The C10-CX range includes all hydrocarbons having greater than 10 carbon atoms that were identified during the field activities. The light fraction of TVHC (C1-C9) probably contains some methane, but relative concentrations may indicate potential contamination. Three locations indicated some hydrocarbon impact: 710-HP2 contained 9 μg/L xylene, 710-HP10 had a benzene concentration of 23 μg/L; and 710-HP9 contained 80 and 17 μg/L of xylene and heavy TVHC (C10-CX), respectively. **Figure 5.1** shows the distribution of TVHC (C1-C9), with the highest concentration centered at HP-9.

5.2.3 Monitoring Well Installation

Six monitoring wells (H710-MW1 to 6) were installed at the site from August 5 to 6, 1995. The locations were based upon the geoprobe results. The wells were placed in downgradient locations, an area of previously known separate phase hydrocarbons (former UST area) and at upgradient locations to evaluate the extent of soluble hydrocarbon contamination in groundwater.

Monitoring well depths range from 12.9 to 13.7 feet bls and are constructed with a 10-foot screen. The screen interval was placed, where possible, to bracket the water table and allow for seasonal fluctuations. Water level measurements at the time of sampling indicated that the water table interface exists above the screened portion of monitoring wells H710-MW5 and H710-MW6. This was due to abnormal (17") rainfall and well construction. The well construction utilized lesser amounts of sand above screen, bentonite, and grout than specified in the EM1110-1-4000 in order to set the screen above the water table while maintaining an adequate seal and grout collar. Subsequent measurements indicate water levels within the screen zone. However, both of these wells are located hydraulically upgradient of the former hydrocarbon source areas. These wells should provide accurate chemical data for assessment of shallow groundwater quality.



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FORMER BUILDING 710
GEOPROBE – TOTAL
VOLATILE HYDROCARBONS (C1-C9)

HUNTER army AIRFIELD SAVANNAH, GEORGIA

FIGURE 5.1

METCALF & EDDY

LOC: p:\proj\16602HAF\C\AREA710\CHHAF001.DGN DATED: 05-24-96 BY: M.A. FRANK

5.2.4 Topographic Survey

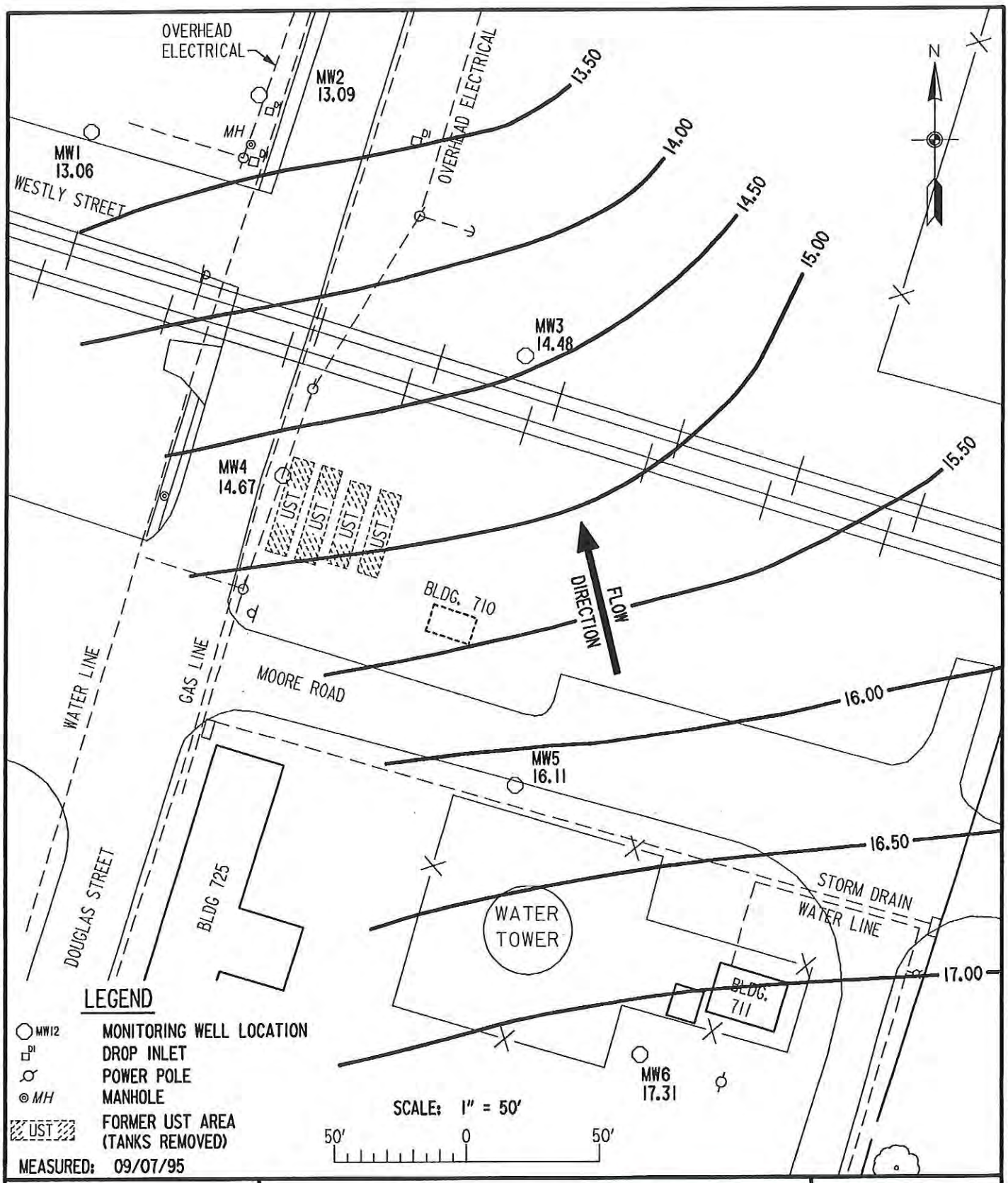
Coordinates and elevations were established for each monitoring well and borehole by Hoffman and Co., a registered surveyor, licensed in the State of Georgia. The coordinates are to the closest 1.0 foot and referenced to the State Plane Coordinate System. A permanent survey mark (control point) is scribed on the top of each monitor well riser casing. Ground elevations to the closest 0.1 foot and an elevation on the top of the well riser casing to the closest 0.01 foot were determined for each well. Elevations are referenced to the NGVD of 1929.

5.2.5 Potentiometric Surface

All monitoring wells were gauged on September 5, 1995. **Table 5-2** lists the water level, elevations at top of casing (TOC) and the ground surface for all wells at Building 710. **Figure 5.2** shows the potentiometric surface over the site. Groundwater flow is north-northwest with a gradient of 0.011 ft/ft.

TABLE 5-2
BUILDING 710 AREA WELL SUMMARY

Location	Screen Interval, ft	Water Depth, TOC	TOC Elevation, msl	Water Level Elevation, msl	Surface Elevation, msl
H710-MW1	3.3-13.3	4.97	18.03	13.06	18.4
H710-MW2	3.6-13.6	4.97	18.06	13.09	18.4
H710-MW3	3.0-13.0	3.96	18.44	14.48	18.7
H710-MW4	2.9-12.9	3.69	18.36	14.67	18.7
H710-MW5	3.7-13.7	2.35	18.46	16.11	18.9
H710-MW6	3.1-13.1	2.68	19.99	17.31	20.3



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FORMER BUILDING 710 POTENTIOMETRIC SURFACE MAP

HUNTER army AIRFIELD SAVANNAH, GEORGIA

FIGURE 5.2

METCALF & EDDY

LOC. p:\proj\16602HAF\C\AREA710\CHHAF002.DGN DATED: 11-14-95 BY: ROS

5.2.6 Groundwater Sampling

Groundwater sampling of the six monitoring wells occurred September 7-8, 1995. Sampling procedures followed those described in Section 4.5. The monitoring wells were sampled and analyzed for BTEX, GRO, DRO, and polynuclear aromatic hydrocarbons (PAHs). The analytical results are presented in Section 6.3.

6.0 NATURE AND EXTENT OF CONTAMINATION

6.1 DATA EVALUATION

Analytical data for the Building 710 investigation were evaluated based on a comparison of compounds detected to various regulatory criteria. Applicable or relevant and appropriate requirements (ARARs) were developed in response to contaminants identified in previous investigations as well as compounds identified during this investigation.

Regulatory levels to assess contamination and/or establish action levels are outlined to evaluate the potential need for remediation. ARARs are outlined in the following sections by media type for contaminants in soil and groundwater.

6.1.1 Soil Evaluation Criteria

The State of Georgia DNR EPD has promulgated Soil Threshold Levels under the Underground Storage Tank (UST) Management program, Chapter 391-3-15. These threshold levels are based on groundwater pollution susceptibility, the distance to drinking water sources, and the distances between the contaminated media and surface water bodies. As mentioned, the site is within a higher groundwater pollution susceptibility area (as defined by the EPD 1992 Geologic Survey Map). Although public water supply wells were identified within 2 miles of the study area, these wells are not believed to be hydraulically connected to the shallow aquifer due to the large vertical separation and presence of confining units. The intake zones of the two wells lie 259 and 260 feet below land surface. Therefore, Table B Soil Threshold Levels (391-3-15-.09) which are based on distance to surface water are used. Springfield Canal is located within 500 feet of the petroleum contaminated soil identified at the Building 710 area.

The Georgia Hazardous Site Response Act (HSRA), Rule 391-3-19 became effective in March 1995. HSRA identifies target soil concentrations for both residential and non-

residential sites. The values included in **Table 6-1** are based on an industrial site (non-residential Type 3). HSRA Type 3 standards consider carcinogenic and non-carcinogenic criteria and use standardized risk assumptions for ingestion and inhalation.

Site-specific soil results were compared to the Soil Threshold Levels for the volatile and semi-volatile organic compounds (BTEX and PAH) listed by EPD UST program. Concentrations of other analytes in soil were compared to HSRA Type 3 target soil concentrations. The constituents identified in soil samples and the available associated screening criteria are listed in Table 6-1.

6.1.2 Groundwater Evaluation Criteria

Federal and state water quality standards were used to evaluate groundwater data. Maximum contaminant levels (MCLs), listed in **Table 6-2**, were federally promulgated in the Safe Drinking Water Act (SDWA). MCLs are enforceable standards established for drinking water purposes, and they are often applied to contaminants in the groundwater as well as surface water. MCLs are established for the protection of human health and represent the maximum permissible level of a contaminant in water which is delivered to any user of a public water system. The MCLs are current standards from the Office of Water, U.S.EPA Drinking Water Regulations and Health Advisories, June 1995, and 40 CFR Part 141.

Secondary drinking water criteria are also included in **Table 6-2.** In general, these are non-enforceable standards based on aesthetic criteria (taste and odor) rather than protection of public health. Secondary criteria are included for reference, where MCLs have not been established, since MCLs have precedence.

The State of Georgia EPD has promulgated Instream Water Quality Standards (WQS) under Chapter 391-3-6. These standards may be more stringent than the federal MCLs, as is the case for some metals and one PAH. The State Instream WQS are used to determine if contamination exists in the fresh waters of the State and may be applied as clean-up goals. These standards will be used to evaluate the data collected on both surface water and

TABLE 6-1

SCREENING CRITERIA USED FOR EVALUATION OF SOILS

BUILDING 710

Hunter Army Air Field

SOIL CONTAMINANT	HSRA Type 3 (1) (mg/kg)	< 500' TH LEVEL (2) (mg/kg)	> 500' TH LEVEL (3) (mg/kg)
INORGANICS			
ARSENIC	613	-	-
BARIUM	44,000 (a)	-	-
CADMIUM	1000	-	-
CHROMIUM	10,000	-	-
LEAD	300 (b)	-	-
MERCURY	0.5 (c)	-	-
SELENIUM	10,000	-	-
SILVER	10,000	-	-
VOLATILE ORGANICS			
BENZENE	NL	0.017	0.12
ETHYLBENZENE	NL	18	140
TOLUENE	NL	115	500
TOTAL XYLENES	NL	700	700
SEMIVOLATILE ORGANICS			
ACENAPHTHENE	38,000 (b)	NA	NA
ANTHRACENE	NL	NA	NA
BENZO(a)ANTHRACENE	NL	0.66 (d)	NA
BENZO(a)PYRENE	NL	0.66 (d)	NA
BENZO(b)FLUORANTHENE	NL	0.66 (d)	NA
BENZO(k)FLUORANTHENE	NL	0.66 (d)	NA
CHRYSENE	NL	0.66 (d)	NA
DIBENZ(a,h)ANTHRACENE	NL	0.66 (d)	NA
FLUORANTHENE	NL	NA	NA
FLUORENE	NL	NA	NA
INDENO(1,2,3-c,d)PYRENE	NL	0.66 (d)	NA
NAPHTHALENE	82,000	NA	NA
PHENANTHRENE	NL	NA	NA
PYRENE	NL	NA	NA

1 - HSRA Type 3 Soil criteria for non-residential sites based upon standardized risk assumptions for inhalation and ingestion.
2 - Soil Threshold Levels < 500 feet to surface water body - GA DNR, EPD Chapter 391-3-15-.09, UST Management, Table B
3 - Soil Threshold Levels > 500 feet to surface water body - GA DNR, EPD Chapter 391-3-15-.09, UST Management, Table B
(a) The calculated concentration for the industrial scenario is in excess of 10% of the soil's dry weight, at which concentration soil would be waste-like. The concentration listed for a residential scenario.
(b) Trigger or notification concentration under HSRA. A risk-based concentration cannot be calculated in the absence of toxicity data.
(c) - The HSRA trigger/notification concentration is 17 mg/kg.
(d) - Estimated detection limit (since the calculated Health-Based Threshold is less than the laboratory detection limit).
NA - Not Applicable. EPD bases cleanup on Corrective Action Plan, Part B.
NL- Not Listed. HSRA Type 3 target soil concentrations are not listed where EPA has published concentrations for UST sites.

TABLE 6-2

FEDERAL MAXIMUM CONTAMINANTLEVELS AND STATE IN-STREAM STANDARDS FOR GROUNDWATER
BUILDING 710
Hunter Army Air Field

CONTAMINANT	WATER MCL (ug/L) 1	SECONDARY DWS (ug/L) 2	GADNR - WQ STDS (ug/L) 3
INORGANICS			
ARSENIC	50	-	50
BARIUM	2000	-	-
CADMIUM	5	-	36
CHROMIUM (Total)	100	-	120*
LEAD	15	-	1.3*
MERCURY	2	-	0
SELENIUM	50	-	5
SILVER	-	100	-
VOLATILE ORGANICS			
BENZENE	5	-	71.28
ETHYLBENZENE	700	-	28,718
TOLUENE	1000	-	200,000
TOTAL XYLENES	10,000	-	-
SEMIVOLATILE ORGANICS			
ANTHRACENE	-	-	110,000
BENZO(a)ANTHRACENE	-	-	0.0311
BENZO(b)FLUORANTHENE	-	-	0.0311
BENZO(k)FLUORANTHENE	-	-	0.0311
BENZO(a)PYRENE	0.2	-	0.0311
CHRYSENE	-	-	0.0311
DIBENZ(a,h)ANTHRACENE	-	-	0.0311
FLUORANTHENE	-	-	370
FLUORENE	-	-	14,000
INDENO(1,2,3-c,d)PYRENE	-	-	0.0311
PYRENE	-	-	11,000

1 - MCL - MAXIMUM CONTAMINANT LEVEL, maximum permissible level of a contaminant in water which is delivered to any user of a public water system; primary drinking water standards, enforceable.
Office of Water, USEPA Drinking Water Regulations and Health Advisiories, May 1995 and 40 CFR PART 141.
2 - Secondary DWS - Secondary Drinking Water Standard; non-enforceable standard based on aesthetics.
3 - Georgia DNR, EPD, Chapter 391-3-6.03, Water Quality Control, Instream Water Quality Standards, Section 5(d)(ii)&(iii) 5/29/94.
(-) No criteria exists.
(*) - For hardness levels less than 100 mg/L. (Acceptable concentrations increase with increasing hardness).

groundwater samples at Building 710. The State UST program recommends these WQS be used to evaluate groundwater data where no potable water supply sources are at risk of impact.

6.1.3 Data Validation Criteria

The criteria used to validate the analytical data and determine useability of the results involves review of the prescribed holding times, determination of blank contamination, and calculation of surrogate compound recoveries for each method performed. Data qualifiers were applied to the results upon completion of the validation process. The data qualifiers that were used are "J" for estimated or " R" for rejected. Estimated (J) results were used in the evaluation process; however, definitive decisions will not be based on an estimated result. Results that have been rejected (R) are considered unacceptable and unusable.

For organic data, specifically BTEX and TPH, the positive and undetected (U) results were qualified as estimated (J/UJ) if one surrogate compound was detected outside acceptable recovery limits and/or the recovery was greater than 10 percent. If the recoveries of one surrogate compound were less than 10 percent, then the positive results were qualified as estimated (J) and the undetected results were rejected (R). Results of PAHs are validated in the same manner as the BTEX results.

Results for individual metals were qualified if percent recoveries for matrix spike/matrix spike duplicate (MS/MSD) samples are low or outside acceptable recovery limits. If MS/MSD recoveries were greater than 125 percent, the nondetect results (U) are acceptable (no qualifiers are applied); however, the detected results were qualified as estimated (J). If percent recoveries of MS/MSD samples were between 30-74 percent, both the positive and undetected results were qualified as estimated (J/UJ). If recoveries were less than 30 percent, positive results were qualified as estimated (J) and undetected results are rejected (R).

6.2 EVALUATION OF BACKGROUND DATA

The background location, 710-MW1, contained no petroleum hydrocarbons (BTEX or PAHs) in groundwater or soil (BTEX, GRO, DRO, or PAHs) and is considered to represent background conditions.

6.3 NATURE AND EXTENT OF CONTAMINATION

6.3.1 Soil

Fifteen soil samples (nine from hand augers, six from monitoring well locations) were analyzed for BTEX, purgeable TPH (GRO), extractable TPH (DRO), and PAHs. The analytical results are presented in **Table 6-3**. The sampling locations and analytical results are posted on **Figure 6.1**. The majority of the soil samples (11 of 15) reported results of non-detect for all the above parameters. Locations HA4, HA1, MW3, and MW5 contained minimal concentrations of petroleum hydrocarbons, well below the EPD levels.

6.3.2 Groundwater

Six monitoring wells were installed and sampled for BTEX and PAHs. In addition, the potable supply water well (No. 285) located about 150 feet south of the site was also sampled for BTEX and PAHs. The analytical results are presented in **Table 6-4**. **Figure 6.2** shows the sampling locations and analytical results. Monitoring wells MW3 and MW4 contained benzene concentrations above both the MCL (5 μg/L) and Georgia Instream WQS (71.28 μg/L) at concentrations of 350 and 1600 μg/L, respectively. MW4 also exceeded the MCL for both ethylbenzene and toluene. MW4 was placed near former well MW1 (since destroyed) which had 0.61 foot of separate phase hydrocarbons (SPH) before soil excavation activities. SPH have not been detected in any well since the soil was excavated.

TABLE 6-3
Building 710
Hunter Army Airfield
SUMMARY OF CONSTITUENTS DETECTED IN SOIL

SAMPLE ID	SOIL	GA SOIL	H710-HA1	H710-HA2	H710-HA3*	H710-HA4	H710-HA5
SAMPLE DATE	SCREENING	THRESHOLD	06/17/95	06/17/95	06/17/95	06/17/95	06/17/95
SAMPLE DEPTH	LEVEL (1)	LEVEL (2)	4.0'	4.0'	4.0'	2.0'	1.0'
MATRIX	RANGE	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BTEX (8020)			U	U	U		U
Ethylbenzene	NL	18				0.15	
Xylenes	NL	700				0.32	
PURGEABLE TPH (8015M)	NL	-	U	U	U	20	U
EXTRACTABLE TPH (8100M)	NL	-	0.55	U	U	110	U
PAH (8100)				U	U		U
Acenaphthene	38,000	-	1.1				
1-Methylnaphthalene	NL	-	0.65			0.55	
2-Methylnaphthalene	NL	-	3.0			1.5	
Naphthalene	82,000	-	2.3			1.4	
Phenanthrene & Anthracene(3)	NL / NL	-	0.46				

SAMPLE ID	SOIL	GA SOIL	H710-HA6	H710-HA7	H710-HA8	H710-HA9*	H710-HA10
SAMPLE DATE	SCREENING	THRESHOLD	06/17/95	06/17/95	06/17/95	06/17/95	
SAMPLE DEPTH	LEVEL (1)	LEVEL (2)	4.0'	4.0'	4.0'	4.0'	
MATRIX	RANGE	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BTEX (8020)			U	U	U	U	NA
PURGEABLE TPH (8015M)	NL	-	U	U	U	U	NA
EXTRACTABLE TPH (8100M)	NL	-	U	U	U	U	NA
PAH (8100M)			U	U	U	U	NA

NOTE: SOIL BORINGS CORRESPOND TO MONITORING WELL LOCATIONS
(1) - SCREENING LEVEL RANGE FOR SOILS
(2) - STATE UST CRITERIA FOR SOILS
(3) - THESE CONSTITUENTS CANNOT BE INDIVIDUALLY CONFIRMED BECAUSE THEY COELUTE IN METHOD 8100
(-) - NO CRITERIA EXISTS

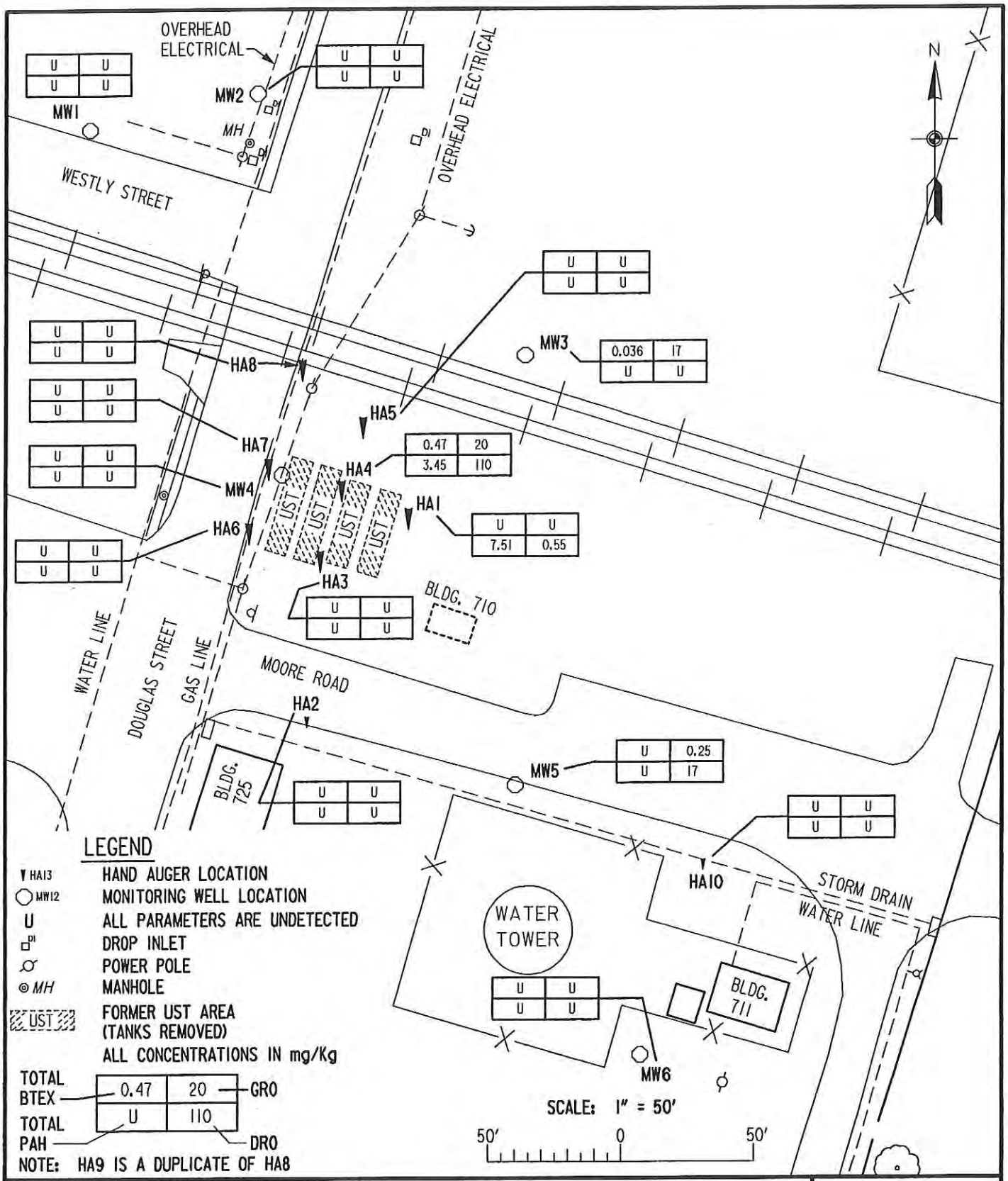
NL - NOT LISTED
* - DENOTES SAMPLE/DUPLICATE PAIRS
J - RESULT ESTIMATED
U - ALL PARAMETERS ARE UNDETECTED
NA - PARAMETER NOT ANALYZED

TABLE 6-3
Building 710 (Cont.)
Hunter Army Airfield
SUMMARY OF CONSTITUENTS DETECTED IN SOIL

SAMPLE ID	SOIL	GA SOIL	H710-SB1	H710-SB2	H710-SB3	H710-SB4	H710-SB5	H710-SB6	H710-SB7*
SAMPLE DATE	SCREENING	THRESHOLD	08/05/95	08/05/95	08/05/95	08/05/95	08/05/95	08/06/95	08/05/95
SAMPLE DEPTH	LEVEL (1)	LEVEL (2)	5.0'	5.0'	5.0'	7.0'	5.0'	5.0'	5.0'
MATRIX	RANGE	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BTEX (8020)			U	U		U	U	U	U
Xylenes	NL	700			0.036				
PURGEABLE TPH (8015M)	NL	-	U	U	17	U	0.25	U	U
EXTRACTABLE TPH (8100M)	NL	-	U	U	U	U	17	U	U
PAH (8100)			U	U	U	U	U	U	U

NOTE: SOIL BORINGS CORRESPOND TO MONITORING WELL LOCATIONS
(1) - SCREENING LEVEL RANGE FOR SOILS
(2) - STATE UST CRITERIA FOR SOILS
(3) - THESE CONSTITUENTS CANNOT BE INDIVIDUALLY CONFIRMED BECAUSE THEY COELUTE IN METHOD 8100
(-) - NO CRITERIA EXISTS

NL - NOT LISTED
* - DENOTES SAMPLE/DUPLICATE PAIRS
J - RESULT ESTIMATED
U - ALL PARAMETERS ARE UNDETECTED
NA - PARAMETER NOT ANALYZED



LOC. p:\proj\16602HAF\C\AREA710\CHHAF003.DGN DATED: 11-14-95 BY: RDS

U.S. ARMY
ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

FORMER BUILDING 710 CONCENTRATION OF PETROLEUM HYDROCARBONS IN SOIL SAMPLES

HUNTER army AIRFIELD SAVANNAH, GEORGIA

FIGURE 6.1

METCALF & EDDY

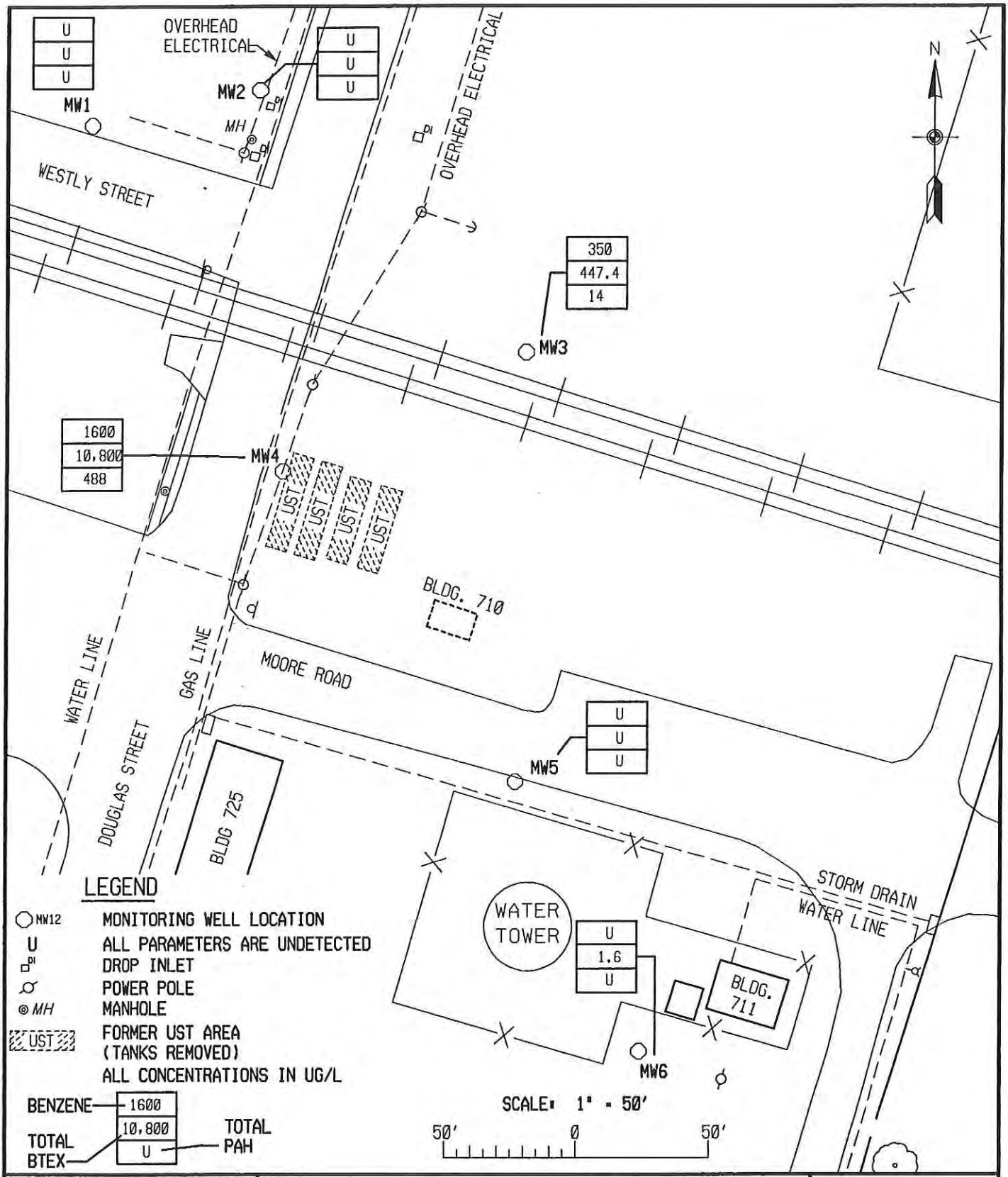
TABLE 6–4
Building 710
Hunter Army Airfield
SUMMARY OF CONSTITUENTS DETECTED IN GROUNDWATER

SAMPLE ID	MCL (1)	GADNR (2)	H710–MW1	H710–MW2	H710–MW3	H710–MW4*	H710–MW5	H710–MW6	H710–MW7*
SAMPLE DATE			09/07/95	09/07/95	09/08/95	09/08/95	09/08/95	09/08/95	09/08/95
SAMPLE DEPTH			3.3 – 13.3'	3.6 – 13.6'	3.0 – 13.0'	2.9 – 12.9'	3.7 – 13.7'	3.1 – 13.1'	2.9 – 12.9'
MATRIX	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
UNITS	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
BTEX (8020)			U	U			U		
Benzene	5	71.28			350	1600			1400
Ethylbenzene	700	28,718			9.4	1700			1300
Toluene	1000	200,000				1700		1.6	1300
Xylenes	10,000	–			88	5800			4500
PAH (8100)			U	U			U	U	
Acenaphthene	–	–							
1–Methylnaphthalene	–	–				50			58
2–Methylnaphthalene	–	–				88			120
Naphthalene	–	–				350			430
Phenanthrene & Anthracene(3)	–	– / 110,000			14				

SAMPLE ID	MCL (1)	GADNR (2)	H710–SMW1
SAMPLE DATE			09/07/95
SAMPLE DEPTH			
MATRIX	WATER	WATER	WATER
UNITS	ug/L	ug/L	ug/L
BTEX (8020)			U
PAH (8100)			U

(1) – MAXIMUM CONTAMINANT LEVEL
(2) – GEORGIA IN–STREAM WATER QUALITY STANDARDS
(3) – COMPOUNDS ARE COELUTING, LEVELS ARE CORRESPONDING AS PRESENTED
(–) – NO REGULATORY OR ACTION LEVEL LISTED

* – DENOTES SAMPLE/DUPLICATE PAIRS
J – RESULT ESTIMATED
U – ALL PARAMETERS ARE UNDETECTED
NS – PARAMETER NOT SAMPLED



LOC. p:\proj\16602HAF\C\AREA710\CHHAF004.DGN DATED: 05-24-96 BY: M.A. FRANK

U.S. ARMY
ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

FORMER BUILDING 710 CONCENTRATION OF HYDROCARBONS IN GROUNDWATER SAMPLES

HUNTER ARMY AIRFIELD SAVANNAH, GEORGIA

FIGURE 6.2

METCALF & EDDY

Monitoring wells MW1 and MW2 are located hydraulically downgradient and both wells indicate no hydrocarbon impact. Monitoring well MW4 is located directly adjacent to the former UST tank area. Elevated concentrations of both soluble BTEX and PAH compounds were identified in the groundwater sample from MW4. MW3, located across the railroad tracks from the Building 710 area, also contained soluble BTEX and PAH compounds. Groundwater contamination identified in MW3 is likely related to past fuel spills at Building 710. Monitoring wells MW5 and MW6 are located upgradient of the former UST area and contain no contaminant above Federal MCLs. Similarly, the potable water supply well analyses showed non-detect for BTEX and PAHs.

6.3.3 Fate and Transport

Elevated contaminant concentrations were detected in groundwater at Building 710. The contaminated area is primarily undeveloped with the exception of railroad tracks to the north and Douglas Street to the west. Groundwater occurs at fairly shallow depths, and the aquifer is composed primarily of silt and sand. Under these conditions most rainwater that falls on the Building 710 area will percolate downward and reach the groundwater table. Contamination may migrate in the aquifer through advection and dispersion under both natural and artificially influenced groundwater flow.

Although percolation and subsequent hydrocarbon mobilization in groundwater is possible, the extent of the groundwater plume has apparently not migrated a great distance from the known source areas (near MW4). The absence of any BTEX or PAH compounds in the two downgradient wells (MW1 and MW2) located approximately 150 feet north of MW4 support this conclusion. Some migration has apparently taken place in a northeast direction if the hydrocarbons identified at MW3 represent a contiguous plume.

The distribution of soluble hydrocarbons in groundwater appears to be limited based on groundwater data obtained from the geoprobe and monitor wells. This may be a result of several factors the most likely of which is groundwater flow and velocity. Biometabolism of

hydrocarbon compounds by naturally occurring microorganisms may also be limiting the spread of hydrocarbon in groundwater.

Water levels obtained from the Building 710 area on 9/5/95 suggest that groundwater flows towards the northwest with an average gradient of approximately 0.011 ft/ft. The groundwater velocity was calculated in Section 3.3 as approximately 5.0×10^{-5} cm/s (or 0.14 ft/day). The shallow hydraulic gradient and low groundwater velocity result in a relatively slow rate of plume advancement through groundwater advection. The interaction of petroleum hydrocarbons with organic matter and microorganisms common in the subsurface may also retard the spread of hydrocarbon contaminants in groundwater.

7.0 SUMMARY AND CONCLUSIONS

A total of 9 hand auger borings, 10 geoprobe groundwater sampling points, and 6 groundwater monitoring wells were installed during the investigation of Building 710. A survey of potential receptors was conducted which identified potable wells and surface water bodies in proximity to the investigation area. A review of potable well records indicated the potable wells were screened at a significant distance below ground surface and are separated from the shallow aquifer by a confining unit. The potable wells (one is located about 150 feet south of the site) are therefore not considered potential receptors of shallow aquifer contamination. A surface water body was located within 500 feet to the northwest of the site and is most likely hydraulically connected to the shallow aquifer. No other potential receptors were identified during the investigation.

The GUST Rule, 391-3-15-.09, provides soil threshold levels for a number of petroleum compounds depending on groundwater susceptibility and location to potential receptors. The more stringent soil threshold levels listed in Table B of the GUST Rule were used to evaluate soil contamination at Building 710. No petroleum constituents were identified in any hand auger or soil boring sample that exceeded the State Soil Threshold Limits.

The Georgia In-Stream WQS for benzene was exceeded at locations MW3 and MW4. All other constituents detected did not exceed their respective WQS standard. Thus, extent of contamination has been defined based on downgradient and upgradient wells.

A fuel storage and dispensing system was in place at this facility for approximately 45 years. The fuel losses which are responsible for hydrocarbons that have been identified in both soil and groundwater at former Building 710 took place over a period of years. Recent overexcavation activities appear to have removed a significant portion of petroleum-contaminated soils near the suspected source area. Components of fuels, including benzene, remain in groundwater at concentrations above Georgia Water Quality Standards. Several groundwater monitoring wells are located hydraulically downgradient of MW4 and contain

no detectable concentrations of petroleum hydrocarbons. The downgradient wells are located between the source (MW4) and the most probable receptor; Springfield Canal, located approximately 300 feet north of MW4. Metcalf & Eddy recommends that a monitoring program be initiated which would include groundwater sampling on a quarterly basis from upgradient and downgradient wells with respect to MW4. Quarterly groundwater monitoring for both BTEX and PAH constituents would be adequate to assure the potential receptor is not adversely impacted by mobile hydrocarbons in groundwater.

A monitoring only plan (MOP) will be prepared and submitted to the Georgia EPD for review and approval. The MOP will identify the objectives of the monitoring plan, monitoring wells selected for groundwater sampling, and the sampling schedule. Quarterly progress reports will be prepared and submitted to the EPD which will provide groundwater flow and contaminant concentration information. The appropriate maps and plans will be included in the quarterly progress reports. A summary of the MOP will be provided in the final Quarterly Report along with conclusions and further recommendations for: no further action required, continued monitoring, or implementation of additional corrective action(s).

APPENDIX A

FIELD EQUIPMENT CALIBRATION SHEETS

INSTRUMENT CALIBRATION

DATE. 6-13-95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	A41828				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)					
CONCENTRATION	95.5 ppm CH_4				
READING/ADJUSTMENT	91 ppm				
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	-				
READING/ADJUSTMENT	0				
BATTERY CHECK:	✓				
TIME CALIBRATED:	0750				
CALIBRATED BY:	GR				
CALIBRATION CHECK:					
TIME:	1830				
BY:	GR				
STATUS:	89 ppm				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 6-14-95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	941828				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)					
CONCENTRATION	95.5 ppm CH_4				
READING/ADJUSTMENT	97 ppm				
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	✓				
READING/ADJUSTMENT	0				
BATTERY CHECK:	✓				
TIME CALIBRATED:	0720				
CALIBRATED BY:	GR				
CALIBRATION CHECK:					
TIME:	1830				
BY:	GR				
STATUS:	95 ppm				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 6/15/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	A 41858				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)					
CONCENTRATION	95.5 ppm methane				
READING/ADJUSTMENT	95 ppm				
ZERO GAS:	NA				
MANUFACTURER					
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT	0				
BATTERY CHECK:	✓				
TIME CALIBRATED:	0738				
CALIBRATED BY:	DLH				
CALIBRATION CHECK:					
TIME:	1800				
BY:	GL				
STATUS:	94 ppm				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 6/16/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	A 41828				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)					
CONCENTRATION	95.5 ppm CH_4				
READING/ADJUSTMENT	95 ppm				
ZERO GAS:					
MANUFACTURER					
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT					
BATTERY CHECK:	✓				
TIME CALIBRATED:	0730				
CALIBRATED BY:	GR				
CALIBRATION CHECK:					
TIME:	1830				
BY:	DLH				
STATUS:	98				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

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INSTRUMENT CALIBRATION

DATE: 6/16/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	A41828				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)					
CONCENTRATION	95.5 ppm CH_4				
READING/ADJUSTMENT	96 ppm				
ZERO GAS:					
MANUFACTURER					
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT					
BATTERY CHECK:	✓				
TIME CALIBRATED:	0755				
CALIBRATED BY:	DLH				
CALIBRATION CHECK:					
TIME:	1830				
BY:	DLH				
STATUS:	98 ppm				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 6/18/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	A41828				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)					
CONCENTRATION	95.5 ppm CH_4				
READING/ADJUSTMENT	96ppm				
ZERO GAS:					
MANUFACTURER					
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT					
BATTERY CHECK:	✓				
TIME CALIBRATED:	0740				
CALIBRATED BY:	KS				
CALIBRATION CHECK:					
TIME:	1800				
BY:	DLH				
STATUS:	95ppm				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 6/19/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	A 41828				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)					
CONCENTRATION	95.5 ppm CH_4				
READING/ADJUSTMENT	95 ppm				
ZERO GAS:					
MANUFACTURER					
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT					
BATTERY CHECK:	✓				
TIME CALIBRATED:	0750				
CALIBRATED BY:	DLH				
CALIBRATION CHECK:					
TIME:	1800				
BY:	DLH				
STATUS:	93				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 6/20/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	A 41858				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)					
CONCENTRATION	95.5 ppm CH_4				
READING/ADJUSTMENT	94 ppm				
ZERO GAS:					
MANUFACTURER	/				
IDENTIFICATION (LOT #)	/				
READING/ADJUSTMENT	/				
BATTERY CHECK:	✓				
TIME CALIBRATED:	0750				
CALIBRATED BY:	DLH				
CALIBRATION CHECK:					
TIME:	1920				
BY:	DLH				
STATUS:	94 ppm				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 6/21/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	A41858				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)	—				
CONCENTRATION	95.5 ppm CH_4				
READING/ADJUSTMENT	95 ppm				
ZERO GAS:					
MANUFACTURER	/				
IDENTIFICATION (LOT #)	/				
READING/ADJUSTMENT	/				
BATTERY CHECK:	✓				
TIME CALIBRATED:	0750				
CALIBRATED BY:	DLH				
CALIBRATION CHECK:					
TIME:	1930				
BY:	DLH				
STATUS:	94 ppm				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 6/27 GL/26/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	A41858				
CALIBRATION STANDARD					
MANUFACTURER	EAGLE				
IDENTIFICATION (LOT #)					
CONCENTRATION	95.5 PPM CH_4				
READING/ADJUSTMENT	93				
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	/				
READING/ADJUSTMENT	0				
BATTERY CHECK:	✓				
TIME CALIBRATED:	0815				
CALIBRATED BY:	KS				
CALIBRATION CHECK:					
TIME:	1900				
BY:	GL				
STATUS:	96 ppm				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 6-28-95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	A41858				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)					
CONCENTRATION	95.5 ppm CH_4				
READING/ADJUSTMENT					
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	/				
READING/ADJUSTMENT	0				
BATTERY CHECK:	✓				
TIME CALIBRATED:	0805				
CALIBRATED BY:	GL				
CALIBRATION CHECK:					
TIME:	1800				
BY:	GL				
STATUS:	94 ppm				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 7/10/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER HACH	2399				
CALIBRATION STANDARD					
MANUFACTURER	EAGLE				
IDENTIFICATION (LOT #)	029194				
CONCENTRATION	95.5				
READING/ADJUSTMENT	84				
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	-				
READING/ADJUSTMENT	0				
BATTERY CHECK:	OK				
TIME CALIBRATED:	0715				
CALIBRATED BY:	DH				
CALIBRATION CHECK:					
TIME:	1650				
BY:	DH				
STATUS:	86				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 7/11/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	H+20 2391				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)	029194				
CONCENTRATION	95.5				
READING/ADJUSTMENT	94				
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	–				
READING/ADJUSTMENT	0				
BATTERY CHECK:	OK				
TIME CALIBRATED:	0705				
CALIBRATED BY:	DH				
CALIBRATION CHECK:					
TIME:	1530				
BY:	DH				
STATUS:	86				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE 7/12/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	HA20 2399				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)	029194				
CONCENTRATION	95.5				
READING/ADJUSTMENT	100				
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	—				
READING/ADJUSTMENT	0				
BATTERY CHECK:	OK				
TIME CALIBRATED:	0655				
CALIBRATED BY:	DH				
CALIBRATION CHECK:					
TIME:	1710				
BY:	DH				
STATUS:	95				
TIME:					
BY:					
STATUS:					

1 OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

pH PEN: Electronic pH tester manufactured by Fisher Brand

COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 7/13/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	HALCO 2391				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)	029194				
CONCENTRATION	95.5				
READING/ADJUSTMENT	92				
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	—				
READING/ADJUSTMENT	0				
BATTERY CHECK:	OK				
TIME CALIBRATED:	0650				
CALIBRATED BY:	DH				
CALIBRATION CHECK:					
TIME:	1800				
BY:	DH				
STATUS:	90				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE. 7/14/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	Hazco 2397				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)	029194				
CONCENTRATION	95.5				
READING/ADJUSTMENT	98				
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	-				
READING/ADJUSTMENT	0				
BATTERY CHECK:	OK				
TIME CALIBRATED:	0650				
CALIBRATED BY:	DH				
CALIBRATION CHECK:					
TIME:	1400				
BY:	DH				
STATUS:					
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 7/13/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	Hazlo 2399				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)	029194				
CONCENTRATION	95.5				
READING/ADJUSTMENT	~~100~~ DH 94				
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	—				
READING/ADJUSTMENT	0				
BATTERY CHECK:	OK				
TIME CALIBRATED:	0650				
CALIBRATED BY:	DH				
CALIBRATION CHECK:					
TIME:	1210				
BY:	DH				
STATUS:	98				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 7/31/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN (HYDAC 910)	CGI	HNu-PID
MODEL NUMBER	128		910		
SERIAL / ID NUMBER	AA1858		HAZCO 5127		
CALIBRATION STANDARD					
MANUFACTURER	Canaan ~~Eagle~~	Fisher	Fisher		
IDENTIFICATION (LOT #)	NA	-	1268		
CONCENTRATION	98.7	7.0 / 10.0	996		
READING/ADJUSTMENT	86	7.0 / 10.0	996		
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	-				
READING/ADJUSTMENT	0				
BATTERY CHECK:	OK				
TIME CALIBRATED:	1255	1415	1415		
CALIBRATED BY:	RAL	DH	DH		
CALIBRATION CHECK:					
TIME:	1715	1715	1716		
BY:	DH	DH	DH		
STATUS:	90	6.90 / 9.65	875		
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 1 Aug 95

INSTRUMENT (1)	OVA-FID	OVA-FID II pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128	128			
SERIAL / ID NUMBER	A42171	A41858			
CALIBRATION STANDARD					
MANUFACTURER	RAL ~~Foxboro~~ Canaan	Canaan			
IDENTIFICATION (LOT #)	88-14736	88-14736			
CONCENTRATION	98.7	98.7			
READING/ADJUSTMENT	84	86			
ZERO GAS:					
MANUFACTURER	ambient	ambient			
IDENTIFICATION (LOT #)	X	X			
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	ok	ok			
TIME CALIBRATED:	0710	0715			
CALIBRATED BY:	RAL	RAL			
CALIBRATION CHECK:					
TIME:	1620	1700 ~~15~~ RAL			
BY:	DH	RAL			
STATUS:	94	80			
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8/2/95

INSTRUMENT (1)	OVA-FID	OVA 2 ~~pH PEN~~	COND PEN	CGI	HNu-PID
MODEL NUMBER	128	128			
SERIAL / ID NUMBER	AA2171	AA1858			
CALIBRATION STANDARD					
MANUFACTURER	Canaan				
IDENTIFICATION (LOT #)	88-10736				
CONCENTRATION	98.7	98.7			
READING/ADJUSTMENT	90	94			
ZERO GAS:					
MANUFACTURER	Instant	—			
IDENTIFICATION (LOT #)	—	—			
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	OK	OK			
TIME CALIBRATED:	0705	0715			
CALIBRATED BY:	DH	KS			
CALIBRATION CHECK:					
TIME:	1530	1530			
BY:	KS	KS			
STATUS:	98	92			
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8/3/95

INSTRUMENT (1)	OVA-FID	~~pH PEN~~ OVA #2	COND PEN	CGI	HNu-PID
MODEL NUMBER		128			
SERIAL / ID NUMBER	AA2171	AA2858			
CALIBRATION STANDARD					
MANUFACTURER		Canada			
IDENTIFICATION (LOT #)		88-14736			
CONCENTRATION	98.7	98.7			
READING/ADJUSTMENT	90	96.0			
ZERO GAS:					
MANUFACTURER		Ambient			
IDENTIFICATION (LOT #)	—	—			
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	OK	OK			
TIME CALIBRATED:	0645	0745			
CALIBRATED BY:	DH	KS			
CALIBRATION CHECK:					
TIME:	1518	1615			
BY:	DH	MAL			
STATUS:	99	98			
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8/4/95

INSTRUMENT (1)	OVA-FID	~~pH PEN~~ OVA 2	COND PEN	CGI	HNu-PID
MODEL NUMBER	-128-				
SERIAL / ID NUMBER	A42171	AA2858			
CALIBRATION STANDARD					
MANUFACTURER	Canaan				
IDENTIFICATION (LOT #)	88-14736				
CONCENTRATION	-98.7-				
READING/ADJUSTMENT	100	94			
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	OK	OK			
TIME CALIBRATED:	0650	0730			
CALIBRATED BY:	DH	KS			
CALIBRATION CHECK:					
TIME:	1616	1416			
BY:	DH	KS			
STATUS:	98	94			
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8/5/95

INSTRUMENT (1)	OVA-FID	~~pH PEN~~ OVA 2	COND PEN	CGI	HNu-PID
MODEL NUMBER	- 128 -				
SERIAL / ID NUMBER	A4 2171	A4 2858			
CALIBRATION STANDARD					
MANUFACTURER	Canam				
IDENTIFICATION (LOT #)	88 - 14736				
CONCENTRATION	98.7				
READING/ADJUSTMENT	94	94			
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	—				
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	OK	OK			
TIME CALIBRATED:	0655	0710			
CALIBRATED BY:	DH	PLAC			
CALIBRATION CHECK:					
TIME:	1550	1530			
BY:	DH	KS			
STATUS:	100	94			
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   .HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8/6/95

INSTRUMENT (1)	OVA-FID	OVA #2 ~~pH PEN~~	COND PEN	CGI	HNu-PID
MODEL NUMBER	- 128 -				
SERIAL / ID NUMBER	AA2171	AA2858			
CALIBRATION STANDARD					
MANUFACTURER	Canaan				
IDENTIFICATION (LOT #)	88-14736				
CONCENTRATION	- 98.7 -				
READING/ADJUSTMENT	97	98			
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	-	-			
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	OK	OK			
TIME CALIBRATED:	0700	0715			
CALIBRATED BY:	DH	KS			
CALIBRATION CHECK:					
TIME:	1615	1625			
BY:	KS	KS			
STATUS:	94	93			
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8/7/95

INSTRUMENT (1)	OVA-FID	OVA 2 ~~pH PEN~~	COND PEN	CGI	HNu-PID
MODEL NUMBER	— 128 —				
SERIAL / ID NUMBER	AA2171	AA2858			
CALIBRATION STANDARD					
MANUFACTURER	Canaan				
IDENTIFICATION (LOT #)	88 - 14736				
CONCENTRATION	— 98.7 —				
READING/ADJUSTMENT	90	100			
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	—				
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	OK	OK			
TIME CALIBRATED:	0655	0715			
CALIBRATED BY:	DH	RAL			
CALIBRATION CHECK:					
TIME:	1607	1640			
BY:	DH	RAL			
STATUS:	98	95			
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8/8/95

INSTRUMENT (1)	OVA-FID	OVA #2 pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	- 128 -				
SERIAL / ID NUMBER	AA2171	AA28858			
CALIBRATION STANDARD					
MANUFACTURER	Canaan				
IDENTIFICATION (LOT #)	88-14 736				
CONCENTRATION	- 98.7 -				
READING/ADJUSTMENT	100	100			
ZERO GAS:					
MANUFACTURER	Ambient	Ambient			
IDENTIFICATION (LOT #)	/	/			
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	ok	ok			
TIME CALIBRATED:	0710	0710			
CALIBRATED BY:	RAL	RAL			
CALIBRATION CHECK:					
TIME:	1450	1700			
BY:	DH	KS			
STATUS:	100	92			
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8/9/95

INSTRUMENT (1)	OVA-FID	OVA 2 pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	-128-				
SERIAL / ID NUMBER	AA2171	A42858			
CALIBRATION STANDARD					
MANUFACTURER	Canaan				
IDENTIFICATION (LOT #)	88-14736				
CONCENTRATION	-98.7-				
READING/ADJUSTMENT	100	92			
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	—				
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	OK	OK			
TIME CALIBRATED:	0630	0710			
CALIBRATED BY:	DH	KS			
CALIBRATION CHECK:					
TIME:	1000	1004			
BY:	DH	DH			
STATUS:	98	94			
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8-15-95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	A42171				
CALIBRATION STANDARD					
MANUFACTURER	CANAAN				
IDENTIFICATION (LOT #)	88-14736				
CONCENTRATION	98.7 PPM CH4				
READING/ADJUSTMENT	84				
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT	0				
BATTERY CHECK:	OK				
TIME CALIBRATED:	0710				
CALIBRATED BY:	GL				
CALIBRATION CHECK:					
TIME:	1510				
BY:	DH				
STATUS:	89 ppm				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8/16/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN (HYDAC)	CGI	HNu-PID
MODEL NUMBER	128	HACH 2511	910 HACH 5127		
SERIAL / ID NUMBER	AA2171 / AA28858				
CALIBRATION STANDARD					
MANUFACTURER	Canaan	HACH			
IDENTIFICATION (LOT #)	88-14736	—	—		
CONCENTRATION	98.7	7.0/10.0	7.0/10.0 996		
READING/ADJUSTMENT	99 / 97	7.0/10.0	7.0/10.0 996		
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	—				
READING/ADJUSTMENT	0				
BATTERY CHECK:	OK	OK	OK		
TIME CALIBRATED:	0705	0715	0715		
CALIBRATED BY:	DH / GR	DH	DH		
CALIBRATION CHECK:					
TIME:	1556 | 1557	1606			
BY:	DH | DH	DH	D		
STATUS:	92 | 88	7.05/10.01 950 cond.			
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8-17-95

INSTRUMENT (1)	OVA-FID	~~pH PEN~~ OVA	~~COND PEN~~ Hydac	CGI	HNu-PID
MODEL NUMBER	128	128	910		
SERIAL / ID NUMBER	A42171	A42858			
CALIBRATION STANDARD					
MANUFACTURER	CANADA	CANADA	HACH		
IDENTIFICATION (LOT #)	88-14736	88-14736	-		
CONCENTRATION	98.7 ppm	98.7 ppm	7.0/10.0/556		
READING/ADJUSTMENT	96	98	7.0/10.0/556		
ZERO GAS:					
MANUFACTURER	Ambient	Ambient			
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	OK	OK	OK		
TIME CALIBRATED:	0719	0719	0719		
CALIBRATED BY:	GL	GL	GL		
CALIBRATION CHECK:					
TIME:	1520	1520	1730		
BY:	DH	DH	DH		
STATUS:	94	92	6.97/9.86/972		
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8/18/95

INSTRUMENT (1)	OVA-FID	~~pH PEN~~ OVA	~~COND PEN~~ Hydac	~~CGI~~ Hydac	HNu-PID
MODEL NUMBER	128	128	910	910	
SERIAL / ID NUMBER	A42171	A42858	2511	2619	
CALIBRATION STANDARD					
MANUFACTURER	CALIBAN	CALIBAN	HACH	HACH	
IDENTIFICATION (LOT #)	88-1476	88-1476			
CONCENTRATION	98.7 ppm CH_4	98.7 ppm CH_4	7/10/996	7/10/996	
READING/ADJUSTMENT	97	94	7.4/10.0/996	7.0/10.0/996	
ZERO GAS:					
MANUFACTURER	Ambient	Ambient			
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	OK	OK	OK	OK	
TIME CALIBRATED:	0710	0710	0715	0715	
CALIBRATED BY:	GL	GL	GL	GL	
CALIBRATION CHECK:					
TIME:	1231	1232	1243	1243	
BY:	DH	DH	DH	DH	
STATUS:	86	89	6.96/9.93/998	7.01/10.0/999	
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE 8-19-85

INSTRUMENT (1)	OVA-FID	OVA ~~pH PEN~~	Hydac ~~COND PEN~~	Hydac ~~CGI~~	HNu-PID
MODEL NUMBER	128	128	910	910	
SERIAL / ID NUMBER	A42171	A42858	2511	2619	
CALIBRATION STANDARD					
MANUFACTURER	Canadian	Canadian	Hach	Hach	
IDENTIFICATION (LOT #)	88-14736	88-14736			
CONCENTRATION	98.7 ppm CH_4	98.7 ppm CH_4	7/10/996	7/10/996	
READING/ADJUSTMENT	98 ppm	97 ppm	7/10/996	7/10/896	
ZERO GAS:					
MANUFACTURER	Ambient	Ambient			
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	OK	Ok	Ok	Ok	
TIME CALIBRATED:	0720	0720	0715	0715	
CALIBRATED BY:	GR	GR	GR	GR	
CALIBRATION CHECK:					
TIME:	1535	1535	1531	1531	
BY:	DH	DH	DH	DH	
STATUS:	97	95	7.39/10.16/933	7.26/10.73/963	
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8/20/95

INSTRUMENT (1)	OVA-FID	~~pH PEN~~ OVA	Hydac COND PEN	~~CGI~~ Hydac	HNu-PID
MODEL NUMBER	128	128	910	910	
SERIAL / ID NUMBER	A42171	A42858	2511	2619	
CALIBRATION STANDARD					
MANUFACTURER	Calgaz	Calgaz	Hach	Hach	
IDENTIFICATION (LOT #)	88-14736	88-14736			
CONCENTRATION	98.5 ppm CH_4	98.5 ppm CH_4	7/10/996	7/10/996	
READING/ADJUSTMENT	100 ppm	100 ppm	7/10/996	7/10/996	
ZERO GAS:					
MANUFACTURER	Ambient	Ambient			
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT	Ø	Ø			
BATTERY CHECK:	OK	OK	OK	OK	
TIME CALIBRATED:	0650	0650	0655	0655	
CALIBRATED BY:	GR/DH	GR/DH	GR/DH	GR/DH	
CALIBRATION CHECK:					
TIME:	1355	1353	1635	1330	
BY:	DH	DH	GR	DH	
STATUS:	94	93	6.97/6.95/1008	7.12/10.03/993	
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 8/21/95

INSTRUMENT (1)	OVA-FID	~~OVA pH PEN~~	Hydac COND PEN	~~Hydac CGI~~	HNu-PID
MODEL NUMBER	128	128	910	910	
SERIAL / ID NUMBER	A42171	A42858	2511	2619	
CALIBRATION STANDARD					
MANUFACTURER	Canaan	Canaan	Hach	Hach	
IDENTIFICATION (LOT #)	88-14736	88-14736			
CONCENTRATION	98.5 CH4 ppm	98.5 CH4 ppm	7/10/996	7/10/996	
READING/ADJUSTMENT	91 ppm	100 ppm	7/10/996	7/10/996	
ZERO GAS:					
MANUFACTURER	Ambient	Ambient			
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT	0	0			
BATTERY CHECK:	OK	OK	OK	OK	
TIME CALIBRATED:	0655	0655	0705	0705	
CALIBRATED BY:	GL	GL	GL	GL	
CALIBRATION CHECK:					
TIME:	1356	1354	1348	1345	
BY:	DH	DH	DH	DH	
STATUS:	90	94	6.97/9.94/987	7.01/10.0/982	
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 9-5-95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER	128				
SERIAL / ID NUMBER	A41858				
CALIBRATION STANDARD					
MANUFACTURER	Eagle				
IDENTIFICATION (LOT #)	950751				
CONCENTRATION	95 ppm CH_4				
READING/ADJUSTMENT	78				
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	Ø				
READING/ADJUSTMENT	Ø				
BATTERY CHECK:	O/C				
TIME CALIBRATED:	1445				
CALIBRATED BY:	CR				
CALIBRATION CHECK:					
TIME:	1830				
BY:	CR				
STATUS:	90 ppm				
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 9-6-95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	~~CGI~~ pH	~~HNu-PID~~ cond
MODEL NUMBER	128	910	910	910	910
SERIAL / ID NUMBER	A41858	9305	9305	9303	9303
CALIBRATION STANDARD					
MANUFACTURER	Eagle	Fisher/HACH	Fisher	Fisher/HACH	Fisher
IDENTIFICATION (LOT #)	95D751	946626-24 922835-11	09-328-3	946626-24/ 22835-11	09-328-
CONCENTRATION	95 ppm CH_4	4/7	996	4/7	996
READING/ADJUSTMENT	78	4.01/7.00	996	4.02/7.05	996
ZERO GAS:					
MANUFACTURER	Ambient				
IDENTIFICATION (LOT #)	Ø				
READING/ADJUSTMENT	Ø				
BATTERY CHECK:	ok	ok	ok	ok	ok
TIME CALIBRATED:	~~0720~~ 0720	0745	0745	1350	1340
CALIBRATED BY:	cf	DLH	DLH	DLH	DLH
CALIBRATION CHECK:					
TIME:					
BY:					
STATUS:					
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 9-7-95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	pH ~~cal~~	Cond ~~HNU-PID~~
MODEL NUMBER	~~HyDac9~~ DH	HyDac910	HyDac910	HyDac910	HyDac910
SERIAL / ID NUMBER	____	9303	9303	9305	9305
CALIBRATION STANDARD					
MANUFACTURER	____	Fisher/HACH	Fisher	Fisher/HACH	Fisher
IDENTIFICATION (LOT #)	____	946626-24/ 228335-11	09-328-3	946626-24/ 228335-11	09-328-3
CONCENTRATION	____	4/7	996	4/7	996
READING/ADJUSTMENT	____	4.02/7.05	996	4.01/6.97	____
ZERO GAS:					
MANUFACTURER	____	~~—~~	~~—~~	~~—~~	~~—~~
IDENTIFICATION (LOT #)	____	~~—~~	~~—~~	~~—~~	~~—~~
READING/ADJUSTMENT	____	~~—~~	~~—~~	~~—~~	~~—~~
BATTERY CHECK:	____	ok	ok	ok	will not cal
TIME CALIBRATED:	____	0716	0716	0716	—
CALIBRATED BY:	____	DZH	DZH	DZH	DZH
CALIBRATION CHECK:					
TIME:	____	____	____	____	____
BY:	____	____	____	____	____
STATUS:	____	____	____	____	____
TIME:	____	____	____	____	____
BY:	____	____	____	____	____
STATUS:	____	____	____	____	____

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

INSTRUMENT CALIBRATION

DATE: 9/8/95

INSTRUMENT (1)	OVA-FID	pH PEN	COND PEN	CGI	HNu-PID
MODEL NUMBER		HyDac 910	HyDac 910		
SERIAL / ID NUMBER		9303	9303		
CALIBRATION STANDARD					
MANUFACTURER		Fisher/HACH	Fisher		
IDENTIFICATION (LOT #)		946626.24 22835-11	09-328-3		
CONCENTRATION		4/7	996		
READING/ADJUSTMENT		4.01/7.08	996		
ZERO GAS:					
MANUFACTURER					
IDENTIFICATION (LOT #)					
READING/ADJUSTMENT					
BATTERY CHECK:		ok	ok		
TIME CALIBRATED:					
CALIBRATED BY:		DLH	DLH		
CALIBRATION CHECK:					
TIME:					
BY:					
STATUS:					
TIME:					
BY:					
STATUS:					

1. OVA-FED: Organic Vapor Analyzer, Flame Ionization Detector manufactured by Foxboro

   pH PEN: Electronic pH tester manufactured by Fisher Brand

   COND PEN: Total dissolved solids tester with automatic temperature correction. Manufactured by Fisher Brand.

   CGI: Combustible Gas Indicator manufactured by Industrial Scientific Devices.

   HNu-PID: Photo - Ionization Detector manufactured by HNu.

APPENDIX B

GEOLOGIC LOGS

Hole No. H710-HA01

DRILLING LOG

DIVISION

INSTALLATION: HAAF

SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF Building 710 - Confirmatory Sampling
2. LOCATION (Coordinates or Station): Savannah GA
3. DRILLING AGENCY: M+E
4. HOLE NO. (As shown on drawing title and file number): H710-HA01
5. NAME OF DRILLER: G. Rowell
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 4.0'
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 4'
10. SIZE AND TYPE OF BIT: Hand Auger / 3"
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: NA
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 4 | UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: 4'
16. DATE HOLE: STARTED 6-17-95 | COMPLETED 6-17-95
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: G. Rowell

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0	SM	Sand, <5% silt, light yellowish brown, 10YR6/4, loose, moist, medium grained, subround.			
	1	SM	Same as above			
	2	SM	Same as above			
	3	SM	Sand, light yellowish brown, 10YR6/4, loose, wet, fine grained, round, <5% silt			ODOR
	4		E.O.B. @ 4.0'			

Hole No. H710-HA02

DRILLING LOG

DIVISION

INSTALLATION: HAAF

SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF Building 710 - Confirmatory Sampling
2. LOCATION (Coordinates or Station): Savannah GA
3. DRILLING AGENCY: M+E
4. HOLE NO. (As shown on drawing title and file number): H710-HA02
5. NAME OF DRILLER: G. Rowell
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 3.0'
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 3'
10. SIZE AND TYPE OF BIT: Hand Auger/3"
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: NA
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2; UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: 2.5'
16. DATE HOLE: STARTED 6-17-95; COMPLETED 6-17-95
17. ELEVATION TOP OF HOLE: —
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: G. Rowell

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0	SM	Sand, grayish brown, 10YR 5/2, loose, dry, fine grained, round.			
	1	SM	Silty sand, 10% silt, black, 10YR 2/1, loose, wet, fine grained, round.			
	2		Saturated @ 2.5'. No sample			
	3		EOB @ 3.0'			

Hole No. H710-HA03

DRILLING LOG | DIVISION | INSTALLATION: HAAF | SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF Building 710 - Confirmatory Sampling
2. LOCATION (Coordinates or Station): Savannah GA
3. DRILLING AGENCY: M+E
4. HOLE NO. (As shown on drawing title and file number): H710-HA03
5. NAME OF DRILLER: G. Rowell
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 4.0
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 4'
10. SIZE AND TYPE OF BIT: Hand Auger / 3"
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: NA
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 4 | UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: 4'
16. DATE HOLE: STARTED 6-17-95 | COMPLETED 6-17-95
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: D. Rowell

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
		SM	Sand, brown, 10YR 5/3, loose, moist, poorly sorted, medium grained, subround to round, <5% silt			
	1	SM	Sand, grayish brown, 10YR 5/2, loose, moist, medium grained, subround, <5% silt			
	2	SM	Sand, yellowish brown, 10YR 5/4, loose, moist, medium grained, round, <5% silt			
	3	SM	same as above saturated			
	4		E.O.B @ 4.0'			

Hole No. H710-HA04

DRILLING LOG

DIVISION

INSTALLATION: HAAF

SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF Building 710 - Confirmatory Sampling
2. LOCATION (Coordinates or Station): Savannah GA
3. DRILLING AGENCY: M&E
4. HOLE NO. (As shown on drawing title and file number): H710-HA04
5. NAME OF DRILLER: G. Rowell
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 4.0'
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 4'
10. SIZE AND TYPE OF BIT: Hand Auger / 3"
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: NA
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 4 | UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: 4'
16. DATE HOLE: STARTED 6-17-95 | COMPLETED 6-17-95
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: G. Rowell

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0	SM	Sand, light yellowish brown, loose, moist, medium grained, round., <5% silt			
	1	SM	Same as above			
	2	SC	Clayey sand, 10% clay, (clay balls occasionally), very pale brown, 10YR 7/4, medium grained, round.			
	3	SM	Silty sand, 5%-10% silt, dark gray, loose, wet, medium to fine grained, round.			ODOR
	4		E.O.B @ 4.0			

Hole No. H718-HA05

DRILLING LOG

DIVISION

INSTALLATION: HAAF

SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF Building 718 - confirmatory sampling
2. LOCATION (Coordinates or Station): Savannah GA
3. DRILLING AGENCY: M+E
4. HOLE NO. (As shown on drawing title and file number): H718-HA05
5. NAME OF DRILLER: G. Rowell
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 3.5'
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 3.5'
10. SIZE AND TYPE OF BIT: Hand Auger / 3"
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: NA
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3; UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: 3.5'
16. DATE HOLE: STARTED 6-17-95; COMPLETED 6-17-95
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: G. Rowell

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
		SM	Sand, light yellowish brown, 10YR 6/4, loose, moist, medium grained, subround			
	1	SM	Sand, brown, 10YR 4/3, loose, moist, medium grained, subround.			
	2	SM	Sand, very pale brown, 10YR 7/4, loose, wet, fine grained, round.			
	3		No Sample			
			E.O.B @ 3.5'			
	4					

Hole No. H718-HA06

DRILLING LOG

DIVISION

INSTALLATION: HAAF

SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF Building 718 - confirmatory sampling
2. LOCATION (Coordinates or Station): Savannah GA
3. DRILLING AGENCY: MTE
4. HOLE NO. (As shown on drawing title and file number): H718-HA06
5. NAME OF DRILLER: G. Rowell
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 4.0'
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 4.0'
10. SIZE AND TYPE OF BIT: Hand Auger / 3"
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: NA
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 4; UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: 4'
16. DATE HOLE: STARTED 6-17-95; COMPLETED 6-17-95
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: G. Rowell

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0	SM	sand, yellowish brown, 10YR5/4, loose, moist, medium grained, sub-round			
	1	SM	same as above			
	2	SM	sand, yellow, 10YR7/6, medium grained loose, moist, subround.			
	3	SM	same as above saturated			
	4		E.O.B @ 4.0'			

Hole No. H710-HA07

DRILLING LOG

DIVISION

INSTALLATION: HAAF

SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF Building 710 - Confirmatory Sampling
2. LOCATION (Coordinates or Station): Savannah GA
3. DRILLING AGENCY: M+E
4. HOLE NO. (As shown on drawing title and file number): H710-HA07
5. NAME OF DRILLER: G. Rowell
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 4.0
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 4'
10. SIZE AND TYPE OF BIT: Hand Auger / 3"
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: NA
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 4 / UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: 4'
16. DATE HOLE: STARTED 6-17-95 / COMPLETED 6-17-95
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: G. Rowell

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0–1	SM	Sand, brown, 10YR 5/3, loose, moist, medium grained, subround.			
	1–2	SM	Same as above			
	2–3	SM	Sand, light yellowish brown, 10YR 6/4, loose, moist, medium grained, subround.			3'-4' taken from offset located 18" east
	3–4	SM	Same as above saturated.			
	4		E.O.B @ 4.0'			

Hole No. H710-HA08

DRILLING LOG

DIVISION

INSTALLATION: HAAF

SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF Building 710 Confirmatory Sampling
2. LOCATION (Coordinates or Station): Savannah GA
3. DRILLING AGENCY: MACTEC
4. HOLE NO. (As shown on drawing title and file number): H710-HA08
5. NAME OF DRILLER: G. Rowell
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 4.0
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 4'
10. SIZE AND TYPE OF BIT: Hand Auger / 3"
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: NA
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 4 | UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: 4'
16. DATE HOLE: STARTED 6-17-95 | COMPLETED 6-17-95
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: G. Rowell

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
		SM	Sand, <5% silt, very dark grayish brown, 10YR 3/2, loose, moist, fine grained, round.			
	1	SM	Sand, dark grayish brown, 10YR 4/2, fine grained, round, moist,			
	2	SM	Same as above			
	3	SM	Sand, <5% silt, dark gray, 10YR 4/1, loose, saturated, fine grained, round.			
	4		E.O.B @ 4.0'			

Hole No. H710-HA10

DRILLING LOG

DIVISION

INSTALLATION: HAAF

SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF Building 710. Confirmation Sampling
2. LOCATION (Coordinates or Station): Savannah, GA
3. DRILLING AGENCY: MACTEC
4. HOLE NO. (As shown on drawing title and file number): H710-HA10
5. NAME OF DRILLER: G. Rowell
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 2.5'
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 2.5'
10. SIZE AND TYPE OF BIT: Hand Auger / 3"
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: NA
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 | UNDISTURBED Ø
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: 2.5'
16. DATE HOLE: STARTED 6-28-95 | COMPLETED 6-28-95
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: G. Rowell

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0	SM	Sand, yellowish brown, 10YR 5/4, loose, moist, fine grained, round			
	1	SM	Sand, very dark gray, 10YR 3/1, loose, wet, fine grained, round.			
	2		No Sample			
			EOB @ 2.5'			
	3					

Hole No. B710-SB1

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF
2. LOCATION (Coordinates or Station): Sav. GA
3. DRILLING AGENCY: PSI
4. HOLE NO. (As shown on drawing title and file number): H710-SB1
5. NAME OF DRILLER: M. Gribble
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 14.01
8. DEPTH DRILLED INTO ROCK: 0
9. TOTAL DEPTH OF HOLE: 14.0'
10. SIZE AND TYPE OF BIT: 6 1/4" ID HSA
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: Diedrich D-120
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 6; UNDISTURBED —
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: —
16. DATE HOLE: STARTED 8/5/95; COMPLETED 8/5/95
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: D. Humphries

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
	2		SAND: med, Gr-Br 10YR 5/2 to v. pale Br - 7/4 dry - well sorted, subang, s/lt 5-15% (SW/SM)	Post Hole to 3'	1	BLOWS: No blows due to Overhead Lines	OVA: ppm Headspace: 0
	4		: as above to V. DK. GR 10YR 3/1, well sorted, s/lt-15% wet at bottom. tr. organics + clay balls. (SM) No odor	100	2	▽ Initial wet sample	150 LAB SAMPLE
	6		: as above - clayey 10-30%, wet, roots/wood, non plastic (SC)	50	3	← Geotech ▽ 6.7 bgs @ 2hrs.	Not Collected
	8		as above: - (SC) - roots SAND: mostly med gr, Lt Gr 2.5Y 7/2, tr. mica tr. glauconite, wet, tr. silt (SW)	50	4		N.C.
	10		: as above Gr-Br 2.5Y 5/2, s/lty 10-25%, tr. clay thin laminae. (SM)	79	5		N.C.
	12		as above, less s/lty 5-15%. (SW/SM)	21	6		N.C.
	14		as above	—	—	↕ Auger	
	16		E.O.B. @ 14.01				
	18						
	20						

Hole No. H 710-SB2

DRILLING LOG

DIVISION

INSTALLATION

SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF
2. LOCATION (Coordinates or Station): Sav. GA.
3. DRILLING AGENCY: PSI
4. HOLE NO. (As shown on drawing title and file number): H710-SB2
5. NAME OF DRILLER: M. Gribble
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 14.0'
8. DEPTH DRILLED INTO ROCK: 0
9. TOTAL DEPTH OF HOLE: 14.0'
10. SIZE AND TYPE OF BIT: 6 1/4" ID HSA
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: Diedrich D120
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 6; UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: —
16. DATE HOLE: STARTED 8/5/95; COMPLETED 8/5/95
17. ELEVATION TOP OF HOLE: —
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: D. Humphus

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	2		SAND: fine-med gr, Pk 6r Br 10YR 4/2, silty 10%, most, well sorted, subang. (SM) Obstruction @ 3.5' - offset 10' South	Post Hole to 3'	1	Blows: None. OVA, ppm Headspace 1.0
	4		: fine-med; Lt Gr 2.5Y7/1, tr. silt, loose-firm, well sorted, subang. tr. glauconite, damp to wet	100	2	8-8-8-12 Use 3" spoon for sample volume. Lab Sample 0
	6		as above - 1/2" diam. root, wet tr. clay film laminae. (SW)	100	3	7-10-6-13 3" spoon ▼ initial wet spoon ▼ 5.8 @ 2hr. Not Collected
	8		: as above, tr. MgO/FeO nodules at bottom. v loose. loose. (SW)	54	4	7-7-8-6 2' spoon NC
	10		As above - grading to - Bluish Gr - 5/B Gley 2, clayey 5-20% well sorted, v. loose-firm, tr. mica, glauc.	95	5	2-5-10-11 NC
	12		As above:	82	6	9-9-7-14 NC
	14			-	-	↕ Auger
			E.O.B @ 14.0'			
	16					
	18					

Hole No. H710-SB3

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

1. PROJECT: HUNTER AAF
2. LOCATION (Coordinates or Station):
3. DRILLING AGENCY: PSI
4. HOLE NO. (As shown on drawing title and file number): H710-SB3
5. NAME OF DRILLER: Tom Finkenbinder
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 14'
8. DEPTH DRILLED INTO ROCK: 0'
9. TOTAL DEPTH OF HOLE: 14'
10. SIZE AND TYPE OF BIT: 6 1/4 ID HSA
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: Dietrich D120
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 6; UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: —
16. DATE HOLE: STARTED 5 Aug 95; COMPLETED 5 Aug 95
17. ELEVATION TOP OF HOLE: —
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: Ralph Ruhl

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Grassy soil, 30% gravel			Posthole dig to 3 ft
	1		Fine sand, trace silt, sm dk grey brn, 10YR3/2, mod fuel oil odor, well sorted, subangular, slightly moist.	—	#1	Headspace >1000 ppm
	3		Fine sand, trace to 10% silt, SM, grey 10YR5.5/1 to dk grey 10YR3.5/1, mod. fuel oil odor, well sorted, subangular, sample wet.	18/24 ▽ sample wet	#2	Begin 2" split spoon 4-10-13-18 Headspace >1000 ppm
	5		Clayey silty fine sand, SC, dk grey 10YR3.5/1, 20% clay, grading to fine sand, trace silt, SM, grey 10YR5.5/1, well sorted, subangular, firm, wet.	22/24	#3	7-18-15-18 Headspace Not Collected (NC)
	7		Fine sand, trace silt, sm grey 10YR6/1, well sorted, subangular, firm to very firm	22/24	#4	18-22-21-20 NC
	9		Fine sand, trace silt, sm grey 10YR5/1, well sorted, subangular, firm	18/24	#5	17-14-14-18 NC
	11		Sand as above	13/24	#6	6-14-16-22 NC
	13		as above	—	—	Auger to 14' End of Boring 14'
	14					

Hole No. H710-SB4

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

1. PROJECT: Hunter AAF
2. LOCATION (Coordinates or Station):
3. DRILLING AGENCY: PSI
4. HOLE NO. (As shown on drawing title and file number): H710-SB4
5. NAME OF DRILLER: Tom Finkenbinder
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 14'
8. DEPTH DRILLED INTO ROCK: 0'
9. TOTAL DEPTH OF HOLE: 14'
10. SIZE AND TYPE OF BIT: 10" HSA
11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
12. MANUFACTURER'S DESIGNATION OF DRILL: Diedrich D120
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 6 | UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES:
15. ELEVATION GROUND WATER:
16. DATE HOLE: STARTED 5 Aug 95 | COMPLETED 5 Aug 95
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Todd Zuk

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Grassy soil, 10% gravel			Posthole dig to 1'
	1		Medium to Fine Sand, SW, lt. yel brn 10YR6/4, well sorted, subangular, slightly moist, loose.		#1	Headspace = 0
	3		Sand as above, minor dark staining, sample moist	12/24	#2	Begin 3" split spoon direct push - no blow count Headspace = 0 Pipe @ 5' - offset, auger to 5'
	5		Medium to Fine Sand, SW, lt. yel-brn 10YR6/5, well sorted, subangular, loose to firm, sample wet, fuel oil or gas odor.	▽ sample wet 12/24	#3	Headspace = 62 (New location)
	7		Fine sand, trace silt, SM lt. grey 10YR7/1 with dark grey 10YR3.5/1 staining, well sorted, subangular, firm.	12/24	#4	Begin 2" split spoon Fuel oil/gas on auger cuttings and spoon. No sample collected for headspace (NC)
	9		Fine sand, trace silt, SM brown 10YR4/3 to v. dark grey 10YR3/1 (staining), fuel oil odor, well sorted, subangular, firm.	14/24	#5	NC Auger refusal @ 10.5' - offset, auger to 11'
	11		Fine sand, trace silt, SM Grey 10YR6/1 to dk grey 10YR3/1 (staining). Well sorted, subangular, loose to firm. Increasing clay and silt at bottom of spoon.	14/24	#6	(New location) NC
	13		as above	—	—	Auger to 14'
	14'					End of Boring 14'

Hole No. H710-SB5

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF
2. LOCATION (Coordinates or Station): SAV. GA
3. DRILLING AGENCY: PSI
4. HOLE NO. (As shown on drawing title and file number): H710-SB5
5. NAME OF DRILLER: M. Gribble
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 14.0'
8. DEPTH DRILLED INTO ROCK: Ø
9. TOTAL DEPTH OF HOLE: 14.0'
10. SIZE AND TYPE OF BIT: 6¼" ID HSA
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: Diedrich D120
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 6 | UNDISTURBED —
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: —
16. DATE HOLE: STARTED 8/5/95 | COMPLETED 8/5/95
17. ELEVATION TOP OF HOLE: —
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: D. Humphrey

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	2		SAND: fine-medium DK GR 10YR 3/1, tr. silt, dry, well sorted, subang. (SW)	Post hole to 3'	1	BLOWS -None- OVA, ppm Headspace 80
	4		: as above, wet at middle, organics black 10YR 2/1, v. loose, silty 25%. (SM)	100	2	1-1-2-1 ▼ initial wet sample w.c. @ 15hr ▼ Lab sample. 200
	6		as above, silt/fer - 35%, organics, v.loose-loose. grading to Lt. Br Gr 2.5Y 6/2, mostly med. Sand, tr. glauconite, silt 5%, well sorted. (SW)	100	3	1-2-5-7 Not Collected
	8		: as above, tr. mica, v. loose-firm. tr. clay thin laminae. (SW)	63	4	2-11-14-17 Not Collected
	10		: as above, v. loose-firm ← 1" clay layer (SW)	50	5	2-6-14-21 Not Collected
	12		: as above, loose-firm. (SW)	46	6	5-7-10-15 Not Collected
	14			—	—	↕ Auger
			E.O.B @ 14.0'			
	16					
	18					

Hole No. H710-SB6

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT: HAAF
2. LOCATION (Coordinates or Station): SAV. GA
3. DRILLING AGENCY: PSI
4. HOLE NO. (As shown on drawing title and file number): H710-SB6
5. NAME OF DRILLER: M. Gribble
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 14.0'
8. DEPTH DRILLED INTO ROCK: 14.0'
9. TOTAL DEPTH OF HOLE: 14.0'
10. SIZE AND TYPE OF BIT: 6 1/4" ID HSA
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: Diedrich D120
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 6; UNDISTURBED —
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: —
16. DATE HOLE: STARTED 8/6/95; COMPLETED 8/6/95
17. ELEVATION TOP OF HOLE: —
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: D. Humphries

ELEVATION a	DEPTH b	LEGEND	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
	2		SAND: f-med gr., V. Dk Gr 10YR 3/1, well sorted, subang. dry., silt 15%. (SM)	Post Hole to 3'	1	Blows — None —	OVA, ppm Headspace 0
	4		: as above : moist becoming wet, v. loose-loose, organics 15% (SM)	100	2	1-2-5-10 ▽ Initial wet sample	Lab 0.5
	6		: as above, grading to Pale Br. 10YR6/3, well sorted, silt 5%, tr. glauconite (SW) v. loose-firm.	100	3	3-11-19-20 ▽ W.L. @ 3hr	Not Collected
	8		: as above, tr. mica, wood piece 1" long v. loose-firm. (SW)	33	4	2-7-9-11	N.C.
	10		: as above, Lt. Yell Br 2.5Y 6/3, mostly med. gr. (SW)	63	5	3-7-11-11	NC
	12		: as above - V. Dk GR 2.5Y 3/1 to Lt. Yell Br - 6/3, tr. organics.	75	6	4-7-19-21	NC
	14			—	—	↕ Auger	
			E.O.B. @ 14.0'				
	16						
	18						

APPENDIX C

SOIL AND GROUNDWATER SAMPLING SHEETS

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 6/17/95 Location H710-HA1

Samplers Used D. Howard, K Shinkus, G Rowell

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)

Weather Sunny, temp 80°F, slight breeze

Soil/sediment sampling parameters:

Description of sample see boring log

Time of sample collection 1130

Depth of ~~water (for sediment sampling)~~ boring total: 4ft, ~~sample~~: 4ft.

Decontamination (page number reference) CDAP B-37

Spoons or spatulas ~~spoon~~

Trowel

Hand corer

Hand auger ✓

Bowls

Split spoons

Photograph frame numbers

Signature (of field team personnel making data entry)

Daniel Howard

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 6/17/95 Location H710-HA2

Samplers Used D. Howard, K Shimkus, G Rowell

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)

Weather Sunny, temp 75-80°F, slight breeze

Soil/sediment sampling parameters:

Description of sample see boring log

Time of sample collection 1106

Depth of ~~water (for sediment sampling)~~ boring total: 2 ft, sample: 2ft

Decontamination (page number reference) QAPP B-37

Spoons or spatulas spoon

Trowel

Hand corer

Hand auger ✓

Bowls

Split spoons

Photograph frame numbers

Signature (of field team personnel making data entry)

Daniel Howard

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 6/17/95 Location H710-HA5 DH3 + Dup H710-HA9

Samplers Used D Howard, K Shimkus, G Rowell

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)

Weather Sunny, temp 75-80°F, slight breeze

Soil/sediment sampling parameters:

Description of sample see boring log

Time of sample collection 1031

Depth of ~~water (for sediment sampling)~~ boring total: 4ft sample: 4ft

Decontamination (page number reference) CDAP B-37

Spoons or spatulas spoon

Trowel

Hand corer

Hand auger ✓

Bowls

Split spoons

Photograph frame numbers

Signature (of field team personnel making data entry)

Daniel Howard

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 6/17/95 Location H710-HA4

Samplers Used D Howard, K Shimkus, G Rowell

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)

Weather Sunny, temp 75-80°F, slight breeze

Soil/sediment sampling parameters:

Description of sample see boring log

Time of sample collection 1009.

Depth of ~~water (for sediment sampling)~~ boring total: 4 ft, sample: 4 ft.

Decontamination (page number reference) QAP B-37

Spoons or spatulas spoon

Trowel

Hand corer

Hand auger ✓

Bowls

Split spoons

Photograph frame numbers

Signature (of field team personnel making data entry)

Daniel Howard

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 6/17/95 Location H710-HA5

Samplers Used D Howard, K Shimkus, G Rowell

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)

Weather Sunny, temp 75-80°F, slight breeze

Soil/sediment sampling parameters:

Description of sample see boring log

Time of sample collection 0950

Depth of ~~water (for sediment sampling)~~ Boring total: 3 ft, sample: 1 ft.

Decontamination (page number reference) CDAP B-37

Spoons or spatulas spoon

Trowel

Hand corer

Hand auger ✓

Bowls

Split spoons

Photograph frame numbers

Signature (of field team personnel making data entry)

Daniel Howard

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 6/17/95 Location H710-HA6

Samplers Used D Howard, G Rowell, K Shimkus

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)

Weather sunny, temp 75°F, slight breeze

Soil/sediment sampling parameters:

Description of sample see boring log

Time of sample collection 0930

Depth of ~~water (for sediment sampling)~~ boring total: 4ft, sample: 2ft.

Decontamination (page number reference) COAP B-37

Spoons or spatulas spoon

Trowel

Hand corer

Hand auger ✓

Bowls

Split spoons

Photograph frame numbers

Signature (of field team personnel making data entry)

, Daniel Howard

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 6/17/95 Location H710-HA7

Samplers Used D Howard, G Rowell, K Shimkus

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)

Weather Sunny, temp. 75°F, slight breeze

Soil/sediment sampling parameters:

Description of sample see boring log

Time of sample collection 0902

Depth of ~~water (for sediment sampling)~~ boring Total: 4 ft, sample: 4ft

Decontamination (page number reference) CDAP B-37

Spoons or spatulas spoon

Trowel

Hand corer

Hand auger ✓

Bowls

Split spoons

Photograph frame numbers

Signature (of field team personnel making data entry)

Daniel Howard

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 6/17/95 Location H710-HA8

Samplers Used D Howard, G Rowell, K Shinkus

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)

Weather Sunny, temp 70°F, slight breeze

Soil/sediment sampling parameters:

Description of sample boring ~~see log book~~ log

Time of sample collection 0832

Depth of ~~water (for sediment sampling)~~ boring total: 4ft, sample: 4ft

Decontamination (page number reference) CDAP B-37

Spoons or spatulas ~~spoon~~

Trowel

Hand corer

Hand auger ✓

Bowls

Split spoons

Photograph frame numbers

Signature (of field team personnel making data entry)

Daniel Howard

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 6/28/95 Location H710-HA10-9

Samplers Used G Rowell, K Shinkus

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)

Weather Clear, temp. ≈ ~~85~~ 70° F DH

Soil/sediment sampling parameters:

Description of sample see boring log

Time of sample collection 0830

Depth of ~~water (for sediment sampling)~~ boring total: 2 ft, sample 2 ft.

Decontamination (page number reference) CDAP B-37

Spoons or spatulas spoon

Trowel

Hand corer

Hand auger ✓

Bowls

Split spoons

Photograph frame numbers

Signature (of field team personnel making data entry)

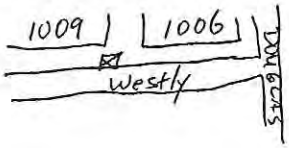
Daniel Howard

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 8/5/95 Location H710-SB1

Samplers Used split spoon, SS spoon

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)



Weather PC, Hot, humid

Soil/sediment sampling parameters:

Description of sample Dr. Br silty Sand

Time of sample collection 0823 .3-5'

Depth of water (for sediment sampling)

Decontamination (page number reference) Workplan CDAP

Spoons or spatulas p B-37

Trowel

Hand corer

Hand auger

Bowls

Split spoons p B-37

Photograph frame numbers

Signature (of field team personnel making data entry)

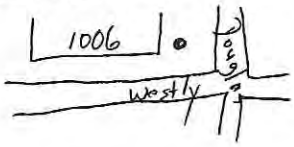
D. Humphrey

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 8/5/95 Location H710-SB2

Samplers Used split-spoon, SS spoon

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)



Weather Mostly Sunny, Hot, Humid

Soil/sediment sampling parameters:

Description of sample Brown sand

Time of sample collection 1157 · 3-5'

Depth of water (for sediment sampling)

Decontamination (page number reference) Workplan QAPP

Spoons or spatulas pB-37

Trowel

Hand corer

Hand auger

Bowls

Split spoons pB-37

Photograph frame numbers

Signature (of field team personnel making data entry)

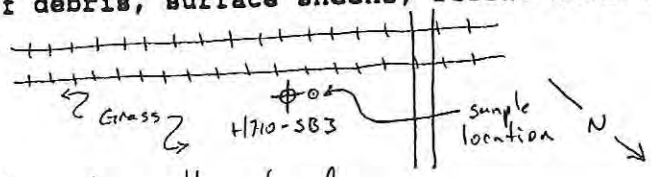
D. Humphrey

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 5 Aug 95 Location H710-SB3, 3-5'

Samplers Used Stainless steel spoon, split spoon

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)



Weather Hot, humid, partly cloudy

Soil/sediment sampling parameters:

Description of sample Fine sand, trace silt

Time of sample collection ~~0755~~ RAL 1005

Depth of water (for sediment sampling) —

Decontamination (page number reference) Work plan CDAP

Spoons or spatulas CDAP B-37

Trowel

Hand corer

Hand auger

Bowls

Split spoons CDAP B-37

Photograph frame numbers

Signature (of field team personnel making data entry)

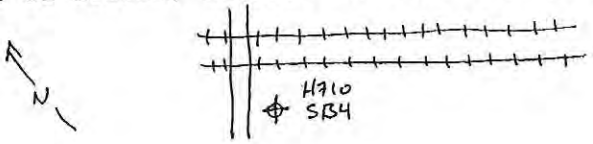
Robert A. Lee

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 5 Aug 95 Location H710-SB4, 5-7'

Samplers Used Split spoon sampler

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)



Weather Hot, humid, partly cloudy

Soil/sediment sampling parameters:

Description of sample Silty sand

Time of sample collection 1220

Depth of water (for sediment sampling) —

Decontamination (page number reference) Work Plan CDAP

Spoons or spatulas CDAP B-37

Trowel

Hand corer

Hand auger

Bowls

Split spoons CDAP B-37

Photograph frame numbers

Signature (of field team personnel making data entry)

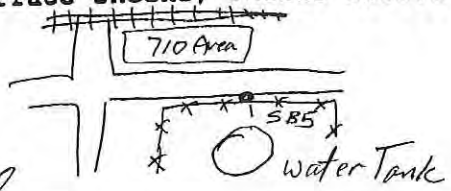
Robert D. Lee

FIELD LOGBOOK SOIL/SEDIMENT SAMPLING DATA

Date 8/5/95 Location H710-SB5

Samplers Used split spoon, SS spoon

Drawing of sampling location (including location description as well as the presence of debris, surface sheens, recent excavations, vegetation, etc.)



Weather PC, Hot, Humid

Soil/sediment sampling parameters:

Description of sample DK Br: clayey Sand

Time of sample collection 1620 . 3-5'

Depth of water (for sediment sampling) _____

Decontamination (page number reference) Workplan CDAP

Spoons or spatulas pB-37

Trowel _____

Hand corer _____

Hand auger _____

Bowls _____

Split spoons pB-37

Photograph frame numbers _____

Signature (of field team personnel making data entry) D. Humphus