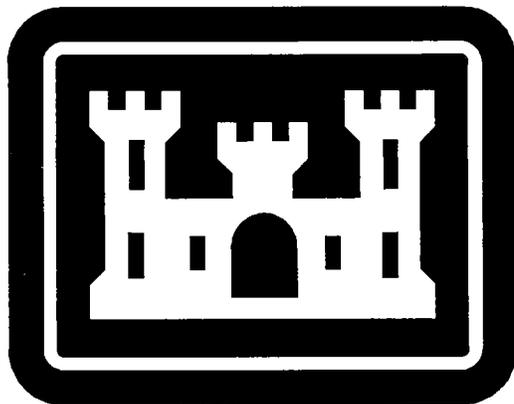


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DRAFT SITE INVESTIGATION REPORT INITIAL SITE INVESTIGATION AND DESIGN FOR  
UNDERGROUND STORAGE TANK REMOVAL BLOCK 600 WITH TRANSMITTAL LETTER  
FORT STORY VA  
12/1/1990  
JAMES M. MONTGOMERY CONSULTING ENGINEERS



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**U.S. ARMY CORPS OF ENGINEERS  
MISSOURI RIVER DIVISION, OMAHA DISTRICT**

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***DRAFT SITE INVESTIGATION REPORT***

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Initial Site Investigation and Design for Underground  
Storage Tank Removal, Block 600

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**FORT STORY, VIRGINIA**

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**DECEMBER 1990**

**JMM** James M. Montgomery  
Consulting Engineers Inc.

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**UNDERGROUND STORAGE TANK REMOVAL  
DRAFT SITE INVESTIGATION REPORT**

**INITIAL SITE INVESTIGATION AND DESIGN  
UNDERGROUND STORAGE TANK REMOVAL, BLOCK 600  
FORT STORY, VIRGINIA**

**Prepared for:**

**U.S. Army Corps of Engineers  
Missouri River Division  
Omaha District  
Omaha, Nebraska**

**Prepared by:**

**James M. Montgomery, Consulting Engineers, Inc.  
250 North Madison Avenue  
Pasadena, California**

**December 1990**

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### LIST OF ACRONYMS AND ABBREVIATIONS

A-E	Architect-Engineer
BLS	Below Land Surface
BTU	British Thermal Unit
BTU/lb	British Thermal Unit Per Pound
CFR	Code of Federal Regulation
DUP	Duplicate
EM	Electromagnetic
EPA	Environmental Protection Agency
FP	Free Product
FIP	Field Investigation Plan
GPR	Ground Penetrating Radar
HBPHC	High Boiling Point Hydrocarbons
ID	Inside Diameter
IRP	Army Installation Restoration Program
JMM	James M. Montgomery, Consulting Engineers, Inc.
LCS	Laboratory Control Samples
mg/kg	Milligrams Per Kilogram
mg/l	Milligrams Per Liter
ml	Milliliter
MRD	Missouri River Division
NA	Not Analyzed
ND	Not Detected
NGVD	National Geodetic Vertical Datum
NI	No Ignition
OD	Outside Diameter
PA/SI	Preliminary Assessment/Site Investigation
PCB	Polychlorinated Biphenyl
PID	Photo Ionization Detector
PVC	Polyvinyl Chloride
QCSP	Quality Control Sampling Plan
QCSR	Quality Control Summary Report
RB	Rinsate Blank
RI/FS	Remedial Investigation/Feasibility Study
SHERP	Safety, Health, and Emergency Response Plan
SI	Site Investigation
STP	Standard Penetration Test
TB	Trip Blank
TFH	Total Fuel Hydrocarbons
TOX	Total Organic Halogens
TWP	Temporary Well Point
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
UST	Underground Storage Tank
VOC	Volatile Organic Compound
µg/l	Micrograms Per Liter

## SECTION 1.0

### INTRODUCTION

#### 1.1 OBJECTIVES OF THE INVESTIGATION

James M. Montgomery, Consulting Engineers, Inc. (JMM) is the prime Architect-Engineer (A-E) contracted by the U.S. Army Corps of Engineers (USACE) to perform environmental work at Fort Story and Fort Eustis, Virginia, under the Army Installation Restoration Program (IRP). This project, the Fort Story Block 600 Underground Storage Tank (UST) Remedial Investigation/Feasibility Study (RI/FS), has been authorized under contract number DACW 45-89-D-0501 along with several other task orders distributed between Fort Story and Fort Eustis. The Block 600 UST RI/FS Design, Delivery Order 0006, is being performed concurrently with the other task orders included in this contract. The Block 600 area is alternatively referred to as Fort Story Site 10.

The objectives of this UST project are to determine the exact number and location of USTs at the site; sample the contents of all tanks identified; install and sample 10 temporary wellpoints; delineate the presence of groundwater contamination; prepare a Site Investigation (SI) Report of the findings including an exposure assessment; and prepare plans and specifications for removal of the USTs.

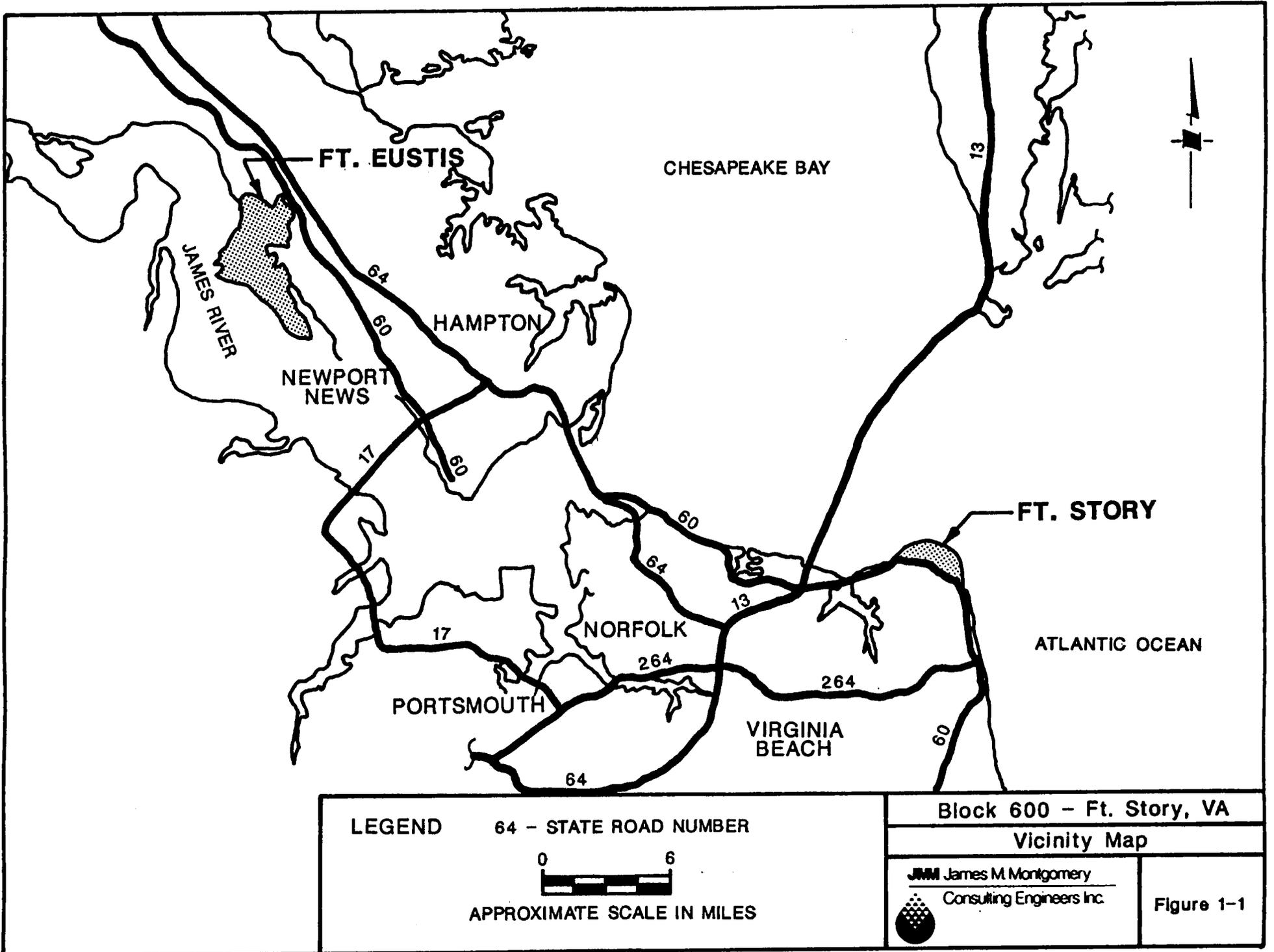
#### 1.2 SITE DESCRIPTION

Fort Story and Fort Eustis are located in southeastern Virginia. The location of these sites with respect to nearby cities and military installations is presented in Figure 1-1. Fort Story is a sub-Installation of Fort Eustis and is located on Cape Henry in Virginia Beach, Virginia. Fort Story is located approximately 2 miles north of the Virginia Beach resort area and is bounded by the Atlantic Ocean and the Chesapeake Bay to the north, and Virginia Seashore State Park to the south. An area map of Fort Story is presented in Figure 1-2. Block 600, located in the north central portion of the Fort Story area, is bounded by Cebu Island Road and Attu Road to the north and east, respectively, and by Hospital Road and Salerno Road to the south and west, respectively (Figure 1-3). The site currently exists as a flat, wide-open, mowed lawn area. The site is the former location of 39 enlisted men's barracks constructed prior to World War II. Recently (i.e., within the past approximately 5 years), all but two of the buildings were demolished by burning. Prior to demolition, all asbestos, asphalt shingles, windows, and interior furniture were removed and all utilities were disconnected. All unburnable debris left after the burning of the structures was delivered to Landfill 3. Though the plan for demolition also included removal of one fuel oil supply tank associated with each of the 39 barracks, this task was not accomplished.

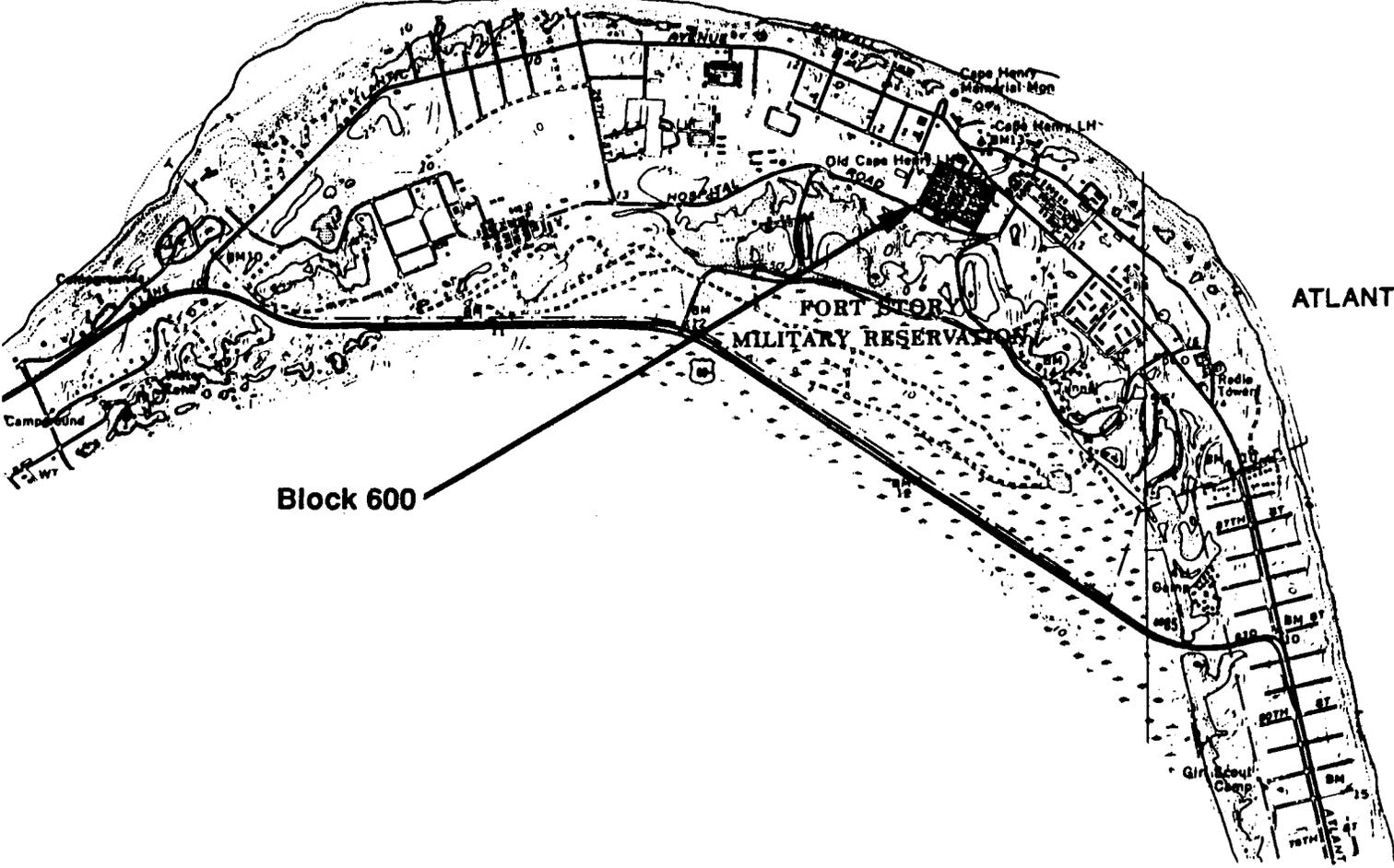
#### 1.3 SCOPE OF SERVICES

The Scope for the Block 600 SI included a physical and geophysical survey to locate the USTs at the site; uncovering 39 tanks and sampling the contents of the tanks; installation of 10 temporary wellpoints; and sampling and analysis of 10 groundwater samples.

A Safety, Health, and Emergency Response Plan (SHERP) (Reference 2) was also prepared prior to the field investigation. The SHERP identified possible site hazards and



CHESAPEAKE BAY

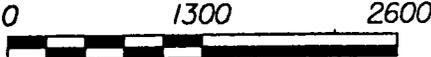


ATLANTIC OCEAN

Block 600

PORT STORY  
MILITARY RESERVATION

APPROXIMATE  
SCALE IN FEET

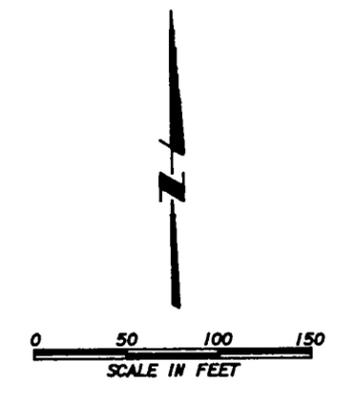
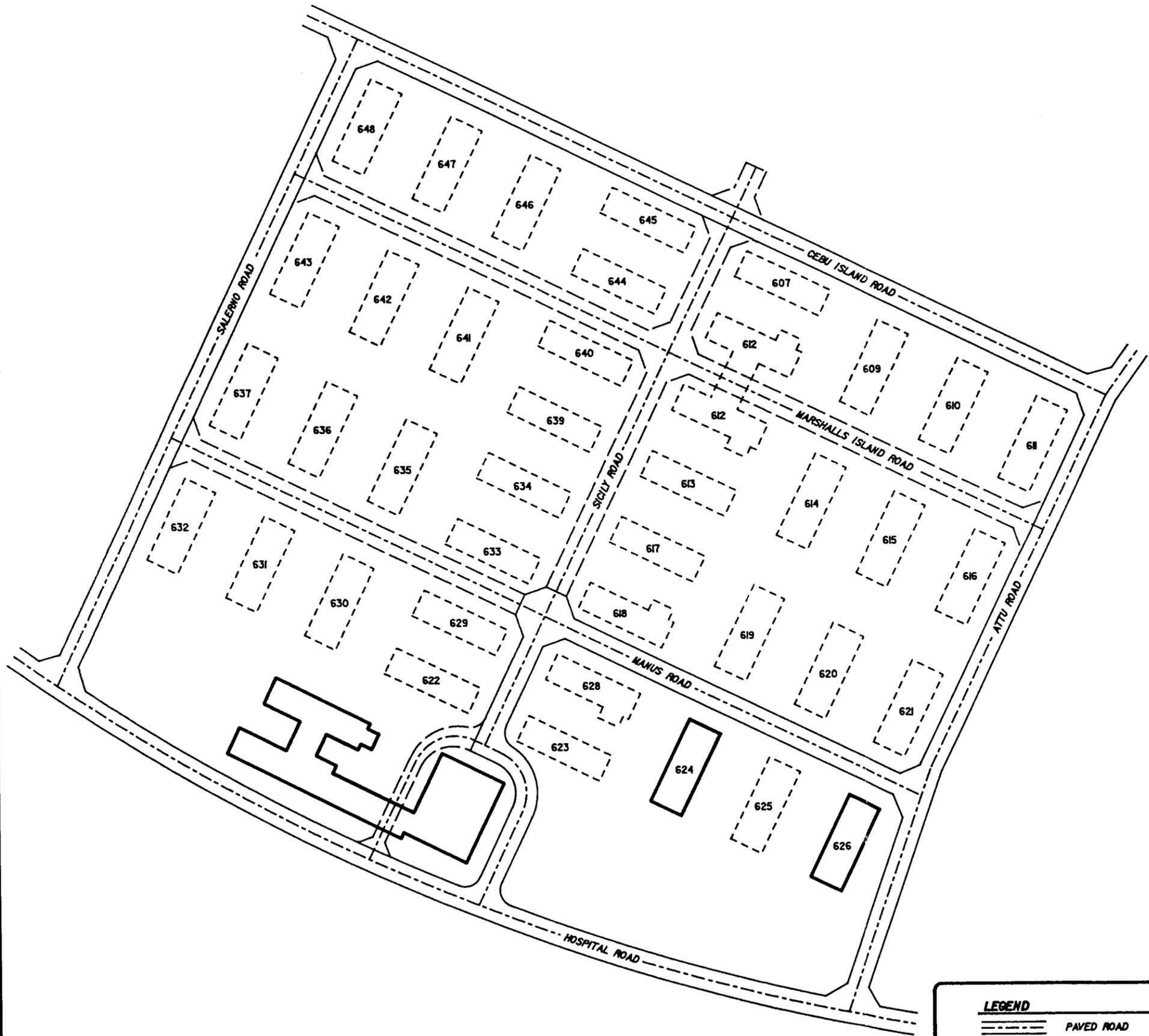


Block 600 - Ft. Story, VA

Project Site Location

 James M. Montgomery  
Consulting Engineers, Inc.

Figure 1-2



<b>LEGEND</b> PAVED ROAD DIRT ROAD 624 EXISTING STRUCTURE 617 FORMER STRUCTURE		<b>Fort Story/Block 600</b> <b>Underground Storage Tank</b> <b>Removal</b>	
		<b>Site Plan</b>	
		James M. Montgomery Consulting Engineers, Inc.	<b>Figure 1-3</b>

## Introduction

monitoring requirements; established site personnel training and medical surveillance requirements; established decontamination procedures; and described site safety and emergency response procedures.

The Quality Control Sampling Plan/Field Investigation Plan (QCSP/FIP) (Reference 1) was prepared prior to the field investigation to establish field and laboratory procedures for the site investigation. The QCSP/FIP described sampling locations, frequency, and analytes; defined drilling, sampling, and decontamination procedures; identified analytical procedures, detection limits, and quality control criteria; and established both field and laboratory record keeping and reporting requirements.

The QCSP/FIP provided for sampling multiple (two) phases in the tanks if present, therefore, 78 tank samples were planned. All tank content samples collected were analyzed for the following as specified in the QCSP/FIP:

- Total fuel hydrocarbons (TFH)
- Total organic halide (TOX)
- Metals (arsenic, cadmium, chromium, and lead)
- Polychlorinated Biphenyls (PCBs)
- Moisture
- British Thermal Unit (BTU) content

In addition, free product samples were analyzed for flash point.

A combined Quality Control Summary Report (QCSR) for the Block 600 RI/FS Design and three other separate task orders is being submitted under separate cover and will discuss quality control activities in both the field and laboratory programs. The report will also present a comparison of field and laboratory duplicates, an evaluation of the rinsate and trip blank data, and a summary of the daily quality control reports.

Data obtained during the SI is undergoing final validation. Validated data will be presented in the QCSR. The final SI Report shall discuss differences, if any, between the data presented herein and the final validated data.

This SI Report will provide a description and evaluation of the field efforts undertaken at Block 600. The report organization is discussed below.

### 1.4 REPORT ORGANIZATION

This report includes a discussion of the following:

- Section 2.0 – Physical Characteristics
- Section 3.0 – Investigative Techniques
- Section 4.0 – Analytical Results
- Section 5.0 – Exposure Assessment
- Section 6.0 – Summary and Recommendations

Included in Section 2.0 are descriptions of the physiography, meteorology, geology, hydrogeology and regional planning of the area surrounding Fort Story. This information is provided as background information for Fort Story, to assist in evaluating potential contamination, and in completing the exposure assessment.

## Introduction

Section 3.0 contains information describing techniques and procedures used throughout the SI field activities. Geophysical survey (tank location) techniques and tank sampling methods are described, as are the drilling and installation techniques for the soil borings and the temporary wellpoints.

Section 4.0 presents the analytical results of the tank and groundwater samples collected at the site. This section also presents an evaluation based on limited data as to the extent of contamination at the site.

Section 5.0 presents an exposure assessment for the Block 600 area with respect to the current and potential future exposures to site contaminants if no action is taken to remove or prevent contaminant migration. The exposure assessment addresses the following:

1. Physical and chemical characteristics of substances including toxicity, persistence and potential for migration of contaminants from the site.
2. Hydrogeologic characteristics of the facility and surrounding areas.
3. Proximity and quality of nearby surface water and groundwater as well as future users.
4. Potential effects of residual contamination on surface water and groundwater.
5. Exposure (potential exposure pathways and receptor populations).

Section 6.0 summarizes the results of the site investigation and the analytical data for the site and presents recommendations for further investigation either prior to or concurrent with tank removal.

## **SECTION 2.0**

### **PHYSICAL CHARACTERISTICS**

#### **2.1 PHYSIOGRAPHY**

Fort Story is located in the outer portion of the Atlantic Coastal Plain physiographic province. The installation is situated on Cape Henry, which roughly divides the waters of the Chesapeake Bay from those of the Atlantic Ocean. The dominant landforms encountered on the installation include sand dunes, sand flats, and swamp. Swampy areas are generally confined to and extend southward of the southern margin of the installation. Land elevations across the installation range from sea level in the beach areas to in excess of 85 feet National Geodetic Vertical Datum (NGVD) in the high dunes. Located within the sand flats area of the installation, the Block 600 area is characterized by land elevations ranging from 11 to 14 feet NGVD.

#### **2.2 CLIMATE**

Fort Story is located in an area that has an oceanic climate influenced by the nearby Atlantic Ocean and Chesapeake Bay. The average annual temperature for the region is approximately 60°F (Reference 3). The area typically experiences mild winters with winter temperatures rarely reaching 32°F and daily highs approaching 50°F. Summers are relatively cool with average daily July temperatures ranging from 75 to 87°F.

The number of frost-free days per day for the region averages 245. The first killing frost occurs around November 21, and the last frost occurs around March 21. Annual precipitation for the area averages 45 inches based on precipitation data collection at Norfolk International Airport over a 40-year period. Although rainfall is well distributed throughout the year, some of the heaviest precipitation occurs in the late summer (Reference 3). Snowfall in the region averages 7.3 inches per year. Hurricanes occur in the region an average of once every seven years, but the region is usually unaffected by northern or tropical storms (Reference 3).

#### **2.3 SURFACE WATER HYDROLOGY**

The sandy surface soils typical of the Fort Story area result in the direct infiltration of a large percentage of the precipitation received at the installation. Surface runoff that is generated is either collected in ponds or wetland areas, or is routed through the installation storm sewer system to one of three outfalls. The outfalls, in turn, discharge to either the Atlantic Ocean or Chesapeake Bay.

#### **2.4 GEOLOGY**

The Cape Henry area is underlain by marine sediments consisting of unconsolidated sands, gravels, silts, and clays. These sediments are occasionally interbedded with deposits of limestone, shells, and peat. Ranging from Quaternary to Tertiary in age, these sediments encountered at Fort Story are characterized by predominantly sandy lithologies with infrequently interbedded peat, silt, and clay lenses.

## Physical Characteristics

Groundwater within the Block 600 area is encountered between depths of 6 and 7 feet below ground surface. The depth to groundwater marks the upper limit of the water table aquifer. The hydraulic conductivity of the medium grained, poorly sorted sand that is the characteristic lithology of the water table aquifer in the Fort Story area averages 0.009 centimeters per second. This value represents the average hydraulic conductivity computed from slug test data from 28 monitoring wells installed at Fort Story during the James M. Montgomery, Consulting Engineers, Inc. (JMM) field effort for the Preliminary Assessment/Site Investigations (PA/SI), Remedial Investigations/Feasibility Studies (RI/FS), and NIKE PA/SI investigations.

Depths to groundwater were obtained from each of the wellpoints installed for the investigation (see Table 3-4). Groundwater elevations range from in excess of 5.8 feet NGVD in the vicinity of Hospital Road and Salerno Road along the southwestern boundary of the site to less than 5.0 feet NGVD along Cebu Island Road and Sicily Road to the north. Figure 2-1 indicates the water table elevation contours based on these data. These data indicate that the general direction of groundwater flow is in a north-northeast direction toward the Atlantic Ocean.

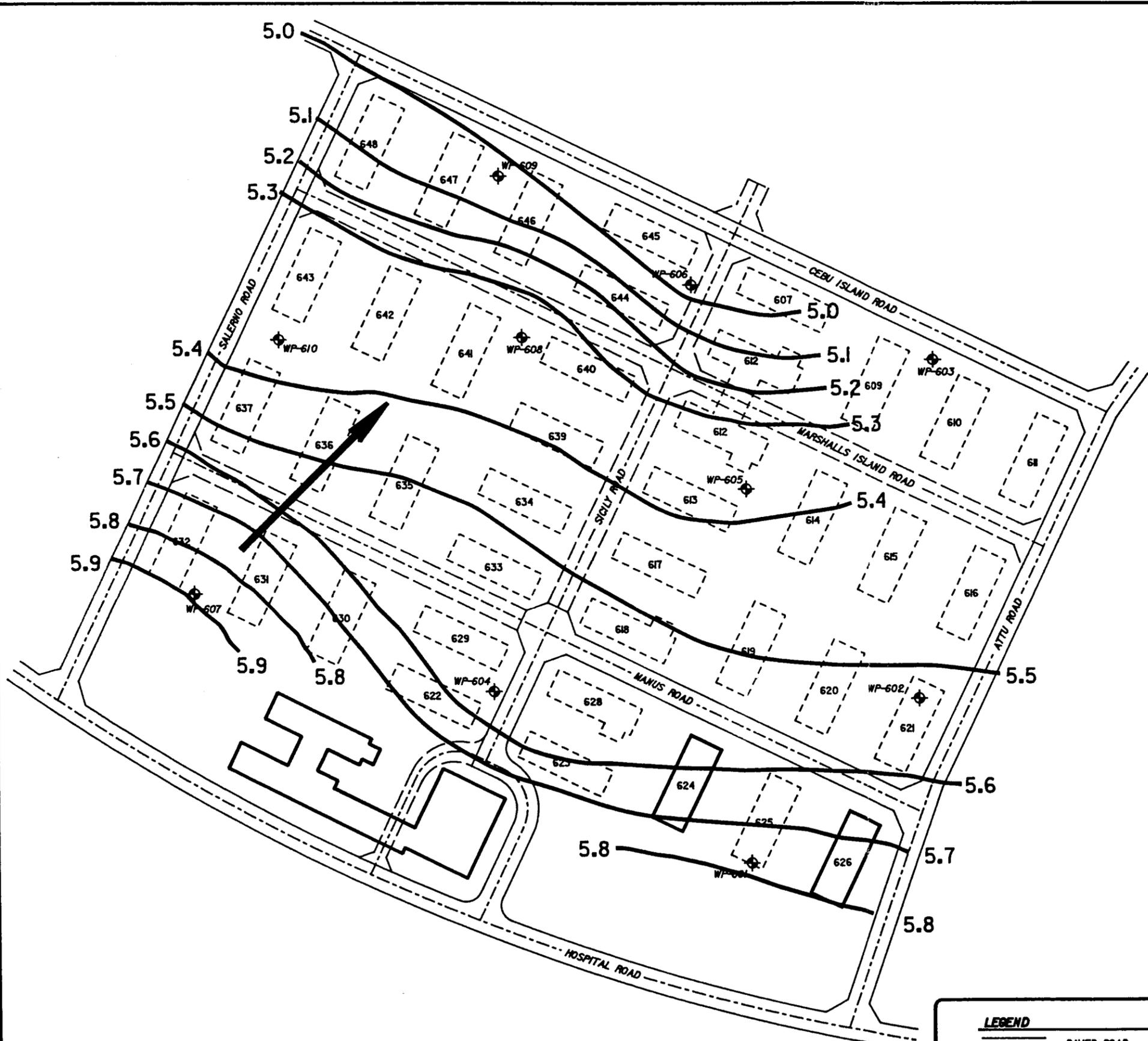
### 2.6 REGIONAL PLANNING

Fort Story is located within the Hampton Roads region of southern Virginia and, therefore, benefits from the high level of accessibility characteristic of this area. U.S. Route 60 traces the southern boundary of Fort Story and provides direct access to the installation. Principal highway access to the Virginia Beach area is provided by Interstate Highway 64 and the Virginia Beach-Norfolk Expressway (State Highway 44). In addition, the region is served by the Norfolk International Airport. Deep water port access to the area is provided by the harbor facilities in the neighboring Cities of Norfolk and Newport News.

#### 2.6.1 Demography

Located within the corporate boundary of the City of Virginia Beach, Fort Story occupies an area of approximately 1,450 acres. Virginia Beach, in turn, occupies an areas of 310 square miles and is bordered to the west and southwest by the Cities of Norfolk and Chesapeake, respectively, and to the south by the State of North Carolina. Based on 1990 estimates, the population of Virginia Beach is approximately 398,500, while the Cities of Norfolk and Chesapeake report respective populations of 284,000 and 155,000. Virginia Beach was experiencing explosive growth during the early to mid 1980s. The height of the growth period occurred during 1985-1986 when approximately 1,000 new residents were added to the city per month. The population has, however, stabilized at the current level during the late 1980s.

Approximately 30 percent of the residents of Virginia Beach are employed by the military. Additional significant sectors of the city economy include the tourism-convention industry, agri-business, construction-real estate, retail-wholesale sales, and business industries. Roughly 2.5 million tourists visit Virginia Beach annually. The business industries sector of the economy is predominantly characterized by service industries with only minor amounts of manufacturing.



LEGEND			
	PAVED ROAD	WP-609	WELL POINT
	DIRT ROAD		GROUNDWATER CONTOUR ELEVATION (DATUM=NGVD)
	EXISTING STRUCTURE		DIRECTION OF GROUNDWATER FLOW
	FORMER STRUCTURE		

**Fort Story/Block 600  
Underground Storage Tank  
Removal**

**Groundwater Contour Map**

James M. Montgomery  
Consulting Engineers, Inc.

**Figure 2-1**

## Physical Characteristics

### 2.6.2 Land Use

Fort Story is bordered on the south and west by Seashore State Park and to the east by a residential portion of Virginia Beach. Because of its expansive beach fronts, the primary function of the installation is the provision of training for amphibious operations.

Land use changes that have occurred at the installation reflect changes in the mission of the installation through its history. The installation was initially established in 1916 as a garrison for several artillery companies. The purpose of the garrison was the defense of the adjacent harbor areas. With the arrival of World War II, Fort Story began an extensive period of development. In excess of 50 percent of the existing facilities were constructed between 1940 and 1945 (Reference 3). The mission of Fort Story was redirected from being a heavily fortified coast artillery garrison to being a convalescent hospital for returning World War II veterans. The hospital operated during the interval from 1944 to 1946. Additionally, with the ending of World War II, Fort Story transitioned into its current role of amphibious training.

The Block 600 complex was constructed during the World War II era expansion of Fort Story. Within the past five years, the barracks buildings were demolished by burning. The resulting debris was removed from the Block 600 site and landfilled on the installation. The site is currently inactive and has been reclaimed with a grassy covering.

### 2.6.3 Water Use

Though at least one production well exists at Fort Story, all water utilized by the installation is obtained via the Virginia Beach water distribution system from the City of Norfolk. In addition, the majority of the water supplies for both the Cities of Virginia Beach and Chesapeake is obtained from the City of Norfolk. On an average annual basis, Virginia Beach obtains roughly 32 million gallons per day (mgd) from this source. Approximately 20,000 Virginia Beach residents obtain their water from private wells. In addition, residents commonly obtain water for lawn irrigation from private wells.

## SECTION 3.0

### INVESTIGATIVE TECHNIQUES

The field program for this Site Investigation (SI) consisted of a geophysical survey to locate underground storage tanks (USTs), uncovering the USTs and sampling the contents of each tank, and the installation and sampling of temporary wellpoints. A total of 30 tanks were identified and sampled. Where two phases of liquids were found in measurable/collectable quantities in a tank, both phases were sampled; 38 free product and aqueous samples were collected. In addition, 10 temporary wellpoints were installed to a depth of 10 feet at various locations in Block 600. Groundwater samples were collected from each of the wellpoints and analyzed for total fuel hydrocarbons (TFH). Field procedures for the location and sampling of the tanks and the installation and sampling of the wellpoints are discussed below.

#### 3.1 GEOPHYSICAL TECHNIQUES

Two geophysical methods, magnetics and electromagnetics, were used to detect and locate the USTs. A reconnaissance-type surveying technique was used for both the electromagnetic (EM) and magnetic methods. Since neither method requires ground contact, measurements may be taken rapidly. This provided a fast, yet more than adequate, survey of each UST area. Based on a background data investigation including record searches and verbal communications with U.S. Army Corps of Engineers (USACE) and Fort Story military personnel, James M. Montgomery, Consulting Engineers, Inc. (JMM) understood that approximately thirty-nine 1,000-gallon metal USTs were buried beneath a shallow soil cover in the area of the former barracks buildings. Prior to data acquisition, the approximate location of each of the former barracks buildings had been surveyed and the corners of each staked and flagged. In addition, the fill tubes for several of the USTs were exposed and spotted on a map with the surveyed building locations. A systematic relationship between the barracks buildings and the locations of the USTs was identified. As a result of this information, a detailed geophysical survey consisting of grids with many sampling points was not necessary.

An EG&G GeoMetrics G-856 proton precession magnetometer was used for magnetic surveying at each UST location. A Geonics Limited EM-31 conductivity meter was used for all EM surveying. The G-856 and EM-31 are one-man portable instruments; the EM-31 has a fixed inter-coil spacing of 3.7 meters (12 feet) which yields effective exploration depths of up to approximately 6 meters (20 feet). The exploration depth for the G-856 is many thousands of feet.

Using both types of instrumentation, a semicontinuous profiling technique was used to detect and locate the USTs. A two-man team was used to scan along the sides of the former barracks buildings, taking frequent observations every few feet until an anomalous reading was noted. The other geophysical instrument was then used to confirm the presence of the anomaly. The predicted location of the UST was then determined by running north-south and east-west profiles over each anomaly using both instruments. If both indicated an UST was present, using the expected magnitude and spatial characteristics of a UST, the location was staked and noted on a site map. Output from both

## Investigative Techniques

instruments was taken directly from built-in displays. Representative profiles were taken over several USTs and digitally recorded with data loggers.

### 3.2 TANK LOCATIONS AND INFORMATION

Following completion of the physical and geophysical surveys, only 30 tanks were identified. However, JMM received indications from the installation that several tanks at Block 600 may have been aboveground tanks or underground tanks that were subsequently removed.

All tank locations were surveyed into State planar coordinates. Tank locations are shown on Figure 3-1, and Table 3-1 provides the state planer coordinates for each of the tanks.

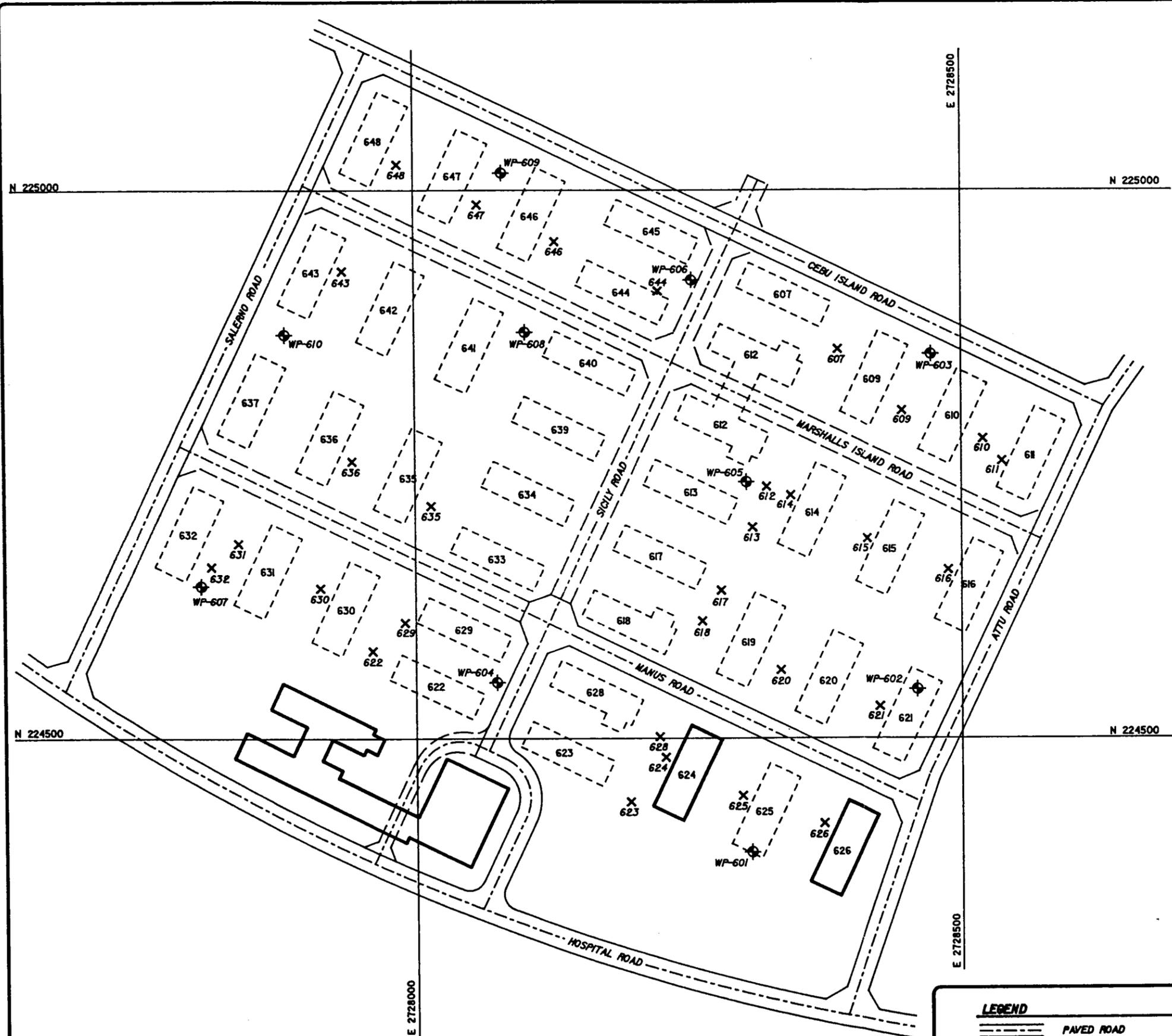
The USTs are identified and numbered based on their respective location to the former/existing barracks. The barracks numbering system corresponds to the installation's numbering system identified on a site plan obtained from the USACE. USTs associated with the following barracks could not be located: 619, 633, 634, 637, 639, 640, 641, 642, and 645.

All 30 tanks identified were uncovered to the top of the tank to conduct sampling of the tank contents. The depth of cover over the tanks varied from 6 inches to approximately 3 feet with the average being approximately 2 feet. Table 3-1 provides a summary of the tank depths below ground surface. The tanks reportedly all have a capacity of 1,000 gallons. The diameter of all 30 tanks identified was approximately 4 feet with the exception of Tank 622. The diameter of Tank 622 was measured to be 3.5 feet. It could not be determined whether the tank had been deformed or whether this was the actual diameter. Tank lengths were checked on a number of randomly selected tanks. All tanks checked were 11 feet long. Based on information from a tank manufacturing firm, dimensions of 4 feet (diameter) by 11 feet (length) are standard dimensions for a 1,000-gallon tank. A tank diameter of 3.5 feet is not a standard diameter, according to the tank manufacturer. It is assumed, therefore, that Tank 622 is slightly deformed and is actually a 4-foot-diameter, 1,000-gallon tank.

It was initially anticipated that the tanks may contain sludge on the bottom as well as a liquid (free product) phase. Sampling of the tanks revealed that none of the tanks contained a discernable sludge layer. Tank 612 contained approximately 1 foot of clean white sand in the bottom of the tank. The remainder of Tank 612 was full of water. There was no free product present. No other tanks contained measurable quantities of sand.

Two liquid phases were found in 17 tanks. The liquids were either a free product-type material or an aqueous (water) phase. Table 3-2 provides a summary of the phases found in each tank including the respective depths of each phase. Table 3-2 provides an estimate of the volume of free product and/or aqueous phase found in each tank. The total volume of free product found in all 30 tanks is approximately 3,500 gallons. The total volume of the aqueous phase found in all 30 tanks is approximately 4,100 gallons.

With the exception of Tank 626, none of the soil excavated to sample the tanks appeared to be contaminated. The soil around the fill pipe to Tank 626 was stained and had an oily odor. Based on the limited excavation performed as part of this Scope, it did not appear that the soil contamination was extensive.



WELL POINT OR TANK LOCATION	STATE PLANNER COORDINATE	
WP-601	N 224396.76	E 2728307.25
WP-602	N 224545.20	E 2728459.41
WP-603	N 224851.05	E 2728472.65
WP-604	N 224551.44	E 2728073.00
WP-605	N 224734.00	E 2728303.55
WP-606	N 224918.65	E 2728253.35
WP-607	N 224639.18	E 2727802.78
WP-608	N 224871.08	E 2728100.56
WP-609	N 225016.18	E 2728080.25
WP-610	N 224868.51	E 2727881.15
607	N 224854.70	E 2728387.87
609	N 224799.37	E 2728446.37
610	N 224773.56	E 2728520.03
611	N 224753.35	E 2728537.56
612	N 224730.06	E 2728322.33
613	N 224692.92	E 2728309.15
614	N 224721.93	E 2728343.79
615	N 224682.32	E 2728414.06
616	N 224654.20	E 2728488.03
617	N 224635.25	E 2728280.41
618	N 224607.40	E 2728263.12
620	N 224562.77	E 2728334.42
621	N 224529.56	E 2728425.26
622	N 224580.05	E 2727960.38
623	N 224442.33	E 2728196.04
624	N 224483.19	E 2728228.94
625	N 224447.94	E 2728297.99
626	N 224422.84	E 2728373.27
629	N 224606.15	E 2727990.05
630	N 224637.37	E 2727912.57
631	N 224678.12	E 2727837.42
632	N 224656.65	E 2727812.80
635	N 224712.44	E 2728014.63
636	N 224752.69	E 2727942.45
643	N 224926.24	E 2727934.85
644	N 224908.76	E 2728223.45
646	N 224953.62	E 2728128.73
647	N 224987.30	E 2728057.87
648	N 225023.75	E 2727985.55

**LEGEND**

- PAVED ROAD
- DIRT ROAD
- EXISTING STRUCTURE
- FORMER STRUCTURE
- WP-609 WELL POINT
- 368 X TANK LOCATION

**Fort Story/Block 600  
Underground Storage Tank  
Removal**

**UST/Wellpoint Location Map**

James M. Montgomery  
Consulting Engineers, Inc.

**Figure 3-1**

## Exposure Assessment

As discussed in Paragraph 5.1, testing of the tank contents found low levels of several metals. Even though low levels of metals were found in the tanks, the precise significance of this finding cannot be determined until soil sampling is completed at the time of tank removal. Soil sampling at that time will indicate if there is need for further investigation. The removal of the tanks will eliminate the tanks as a potential source of contamination. Levels of metals found in soil are not expected to be significant, based on concentrations found in the tanks. In addition, if metals are present, they generally bind to soils which limits further migration potential into groundwater.

### 5.9 SUMMARY

The potential receptor populations for exposure pathways of this site is limited. Three receptor populations are considered to have any likelihood or potential of exposure to site contaminants. The three potential exposure populations are construction/remediation workers, base personnel/casual visitors, and workers/residents of any future development of the site.

Physical and chemical characteristics of the compounds detected at the site indicate relatively low mobilization, low volatilization, and moderate to low toxicity. Thus, any impact to public health and the environment is considered to be minimal.

Hydrogeologic characteristics, as noted in Section 3, of the facility and surrounding area indicate that there may be a possible lateral movement of contaminants in groundwater toward the nearby surface waters of the Chesapeake Bay and Atlantic Ocean. If migration does occur, the low concentrations of TFH found in groundwater is not expected to significantly impact these nearby water bodies.

The potential for completed exposure pathways due to contact with groundwater or soil exists both for current and future time periods. However, the nature of the compounds and the low levels found in groundwater samples would not indicate significant concern for public health or the environment.

The potential for impact due to residual contamination on surface water and groundwater appears small. The removal of the tank will substantially reduce the source of contamination. Also, visual inspection of tanks during sampling activities showed no widespread staining of soils and all of the tanks appeared to be intact. The levels detected in groundwater do not indicate substantial migration of contaminants from the storage tanks. No soil data is available at this time, but the levels are not expected to be significant. Impact to surface water would occur through runoff and groundwater discharges to the water bodies. Neither of these are expected to be important due to the physical and chemical characteristics of the compounds detected and the magnitude of the concentrations.

The potential for ecological impact was also considered. Given the present developed condition of the site and the only current consideration of contaminated environmental media as groundwater, significant impact to potential environmental receptors is not expected. That is, development has already replaced habitat potential, therefore, no receptors appear to be present. There also appears to be no apparent mechanism for exposure to environmental receptors from contaminated groundwater. Likewise, there is no indication that future site plans would reinstate habitat and thereby recreate potential for environmental receptors.

## **Exposure Assessment**

**This qualitative risk assessment provides the initial framework for a descriptive exposure assessment. This initial framework does not include an evaluation of the magnitude, frequency, and duration of exposures or estimates of concentrations for constituents therefore, no numerical calculation of potential exposures and risk have been made in this process.**

**Investigative Techniques**

**TABLE 3-1**

**BLOCK 600 — RI/FS DESIGN  
STATE PLANAR COORDINATES FOR UST LOCATIONS**

<b>Tank Number</b>	<b>North Coordinate</b>	<b>East Coordinate</b>	<b>Depth of Tank (Feet bgs)</b>
607	224854.70	2728387.87	2.0
609	224799.38	2728446.38	2.2
610	224773.57	2728520.03	2.0
611	224753.35	2728537.56	2.5
612	224730.06	2728322.34	1.7
613	224692.92	2728309.16	1.7
614	224721.93	2728343.79	2.2
615	224682.32	2728414.07	1.8
616	224654.20	2728488.04	1.7
617	224635.25	2728280.42	1.5
618	224607.40	2728263.12	1.5
620	224562.77	2728334.42	1.9
621	224529.56	2728425.26	1.4
622	224580.06	2727960.38	2.1
623	224442.33	2728196.04	2.7
624	224483.20	2728228.95	1.7
625	224447.95	2728298.99	1.8
626	224422.85	2728373.27	2.0
628	224502.10	2728223.75	2.0
629	224606.15	2727990.06	1.7
630	224637.37	2727912.58	1.2
631	224678.13	2727837.42	1.5
632	224656.66	2727812.80	1.5
635	224712.45	2728014.64	1.8
636	224752.69	2727942.45	1.5
643	224926.24	2727934.85	2.4
644	224908.76	2728223.45	3.5
646	224953.62	2728128.73	2.0
647	224987.30	2728057.88	2.5
648	225023.76	2727985.55	2.4

bgs: below ground surface

**Investigative Techniques**

**TABLE 3-2**

**BLOCK 600 - RI/FS DESIGN  
TANK INFORMATION SUMMARY**

<b>Tank I.D.</b>	<b>Thickness of Free Product (feet)</b>	<b>Volume of Free Product (gallons)</b>	<b>Thickness of Aqueous Phase (feet)</b>	<b>Volume of Aqueous Phase (gallons)</b>
607	4.00	1034	0.00	0
609	0.04	13	2.03	517
610	0.07	13	0.33	41
611	0.10	19	0.30	41
612	0.00	0	4.00	1034
613	0.02	2	0.13	14
614	0.12	19	0.20	20
615	0.00	0	0.12	5
616	0.02	5	0.76	134
617	0.02	2	0.15	14
618	1.78	490	0.18	14
620	0.05	14	0.20	14
621	0.03	13	0.27	28
622	0.05	24	1.60	381
623	0.10	14	0.13	14
624	3.07	855	0.00	0
625	0.02	2	0.17	14
626	2.92	808	0.03	0
628	0.50	75	0.00	0
629	0.00	0	0.80	156
630	0.10	5	0.00	0
631	0.00	0	0.10	5
632	0.00	0	0.30	41
635	0.05	13	0.80	156
636	0.20	32	0.35	44
643	0.00	0	0.50	75
644	0.00	0	4.00	1034
646	0.20	46	0.50	75
647	0.00	0	0.85	156
648	0.00	0	0.55	93
<b>TOTALS</b>		<b>3498</b>		<b>4120</b>

## Investigative Techniques

### 3.3 TANK SAMPLING PROCEDURES

The USTs at Block 600 were sampled during two separate field efforts in order to collect the appropriate samples required for the project. Tank sampling procedures varied slightly between the sampling efforts. The basic reasoning behind the two efforts is described herein and the actual procedures discussed below. Table 3-3 provides a summary of the dates the tanks were sampled, the depth of either free product and/or the aqueous phase, and whether samples were collected.

According to the Field Investigation Plan (FIP), if liquid and/or solid phases were present in the tanks in measurable/collectable quantities, samples were to be collected of all phases and analyzed assuming two phases per tank. No sludge or solid phase was detected in any of the tanks identified. Multiple (two) liquid phases were identified in 17 tanks but only 5 tanks contained multiple phases in measurable/collectable quantities. In all, 38 tank samples were collected; 15 free product samples (including two duplicates) and 23 aqueous phase samples (including two duplicates). Sixteen tanks contained an aqueous phase only; eight tanks contained free product only; five tanks contained both; and one tank did not contain a sufficient volume of either phase to sample.

Sampling of tanks with two liquid phases provided a greater challenge than originally anticipated. In several tanks, collection efforts were hindered by the thinness of one or both phase(s). In addition, in tanks where both phases were found in thin layers, collection efforts tended to emulsify layers that were not particularly discrete to begin with, causing samples to contain various ratios of both phases once they were allowed to settle.

The initial sampling effort occurred the week of March 19, 1990. During this effort, all 30 tanks identified during the geophysical survey were uncovered and sampled. The volumes of the aqueous phase samples collected were insufficient for analysis by the laboratory, and a second sampling effort was undertaken to resample the 24 tanks from which aqueous phase samples were initially collected.

The second sampling effort took place on April 22, 1990. During the second sampling effort, the laboratory only sent 22 sets of sample containers to resample 24 tanks and two tanks (Tanks 623 and 631) could not be resampled for the aqueous phase at that time. An attempt was made to resample the remaining two tanks on June 10, 1990. Tank 623 did not physically have enough aqueous phase in it to sample on June 10. Tank 631, which had a minimal quantity of the aqueous phase present, was sampled, but the sample containers used to collect the sample were not appropriate for the analyses to be performed and did not provide sufficient volume.

One more attempt was made to obtain a sample from Tank 631 on August 8, 1990. During this attempt to collect a sample, it was clear that insufficient liquid in the tank made it physically impossible to retrieve a sufficient volume of aqueous sample from the tank. Subsequently, while every effort was made to obtain a sample using a variety of methods, no aqueous samples were collected from either Tank 623 or 631. A free product sample was collected from Tank 623 during the initial effort. Tank 631 did not contain a collectable volume of free product.

## Investigative Techniques

TABLE 3-3

**BLOCK 600 - RI/FS DESIGN  
TANK SAMPLING SEQUENCE/SUMMARY**

Tank I.D.	Laboratory Performing Analysis	Sample Date	Depth of Free Product (Feet)	Free Product Sample Collected	Depth of Aqueous Phase (Feet)	Aqueous Phase Sample Collected
607	JMM	3/22/90	4.00	yes	0.00	no
	JMM (DUP)	3/24/90	4.00	yes	0.00	no
	MRD	3/22/90	4.00	yes	0.00	no
609	JMM	3/22/90	0.04	no	2.03	yes (a)
	JMM	3/24/90	0.04	yes	2.03	no
	JMM	4/22/90	0.04	no	2.03	yes
610	JMM	3/22/90	0.07	yes	0.33	yes (a)
	JMM	4/22/90	0.07	no	0.33	yes
611	JMM	3/22/90	0.10	no	0.30	no
	JMM	4/22/90	0.10	no	0.30	yes
612	JMM	3/22/90	0.00	no	4.00	yes (a)
	JMM (DUP)	3/24/90	0.00	no	4.00	yes (a)
	MRD	3/24/90	0.00	no	4.00	yes (a)
	JMM	4/22/90	0.00	no	4.00	yes
	JMM (DUP)	4/22/90	0.00	no	4.00	yes
613	JMM	3/23/90	0.02	no	0.13	yes (a)
	JMM	4/22/90	0.02	no	0.13	yes
614	JMM	3/22/90	0.12	no	0.20	no
	JMM	3/24/90	0.12	yes	0.20	no
	JMM	4/22/90	0.12	no	0.20	no
615	JMM	3/22/90	0.00	no	0.12	yes (a)
	JMM	4/22/90	0.00	no	0.12	yes
616	JMM	3/23/90	0.02	no	0.76	yes (a)
	JMM	4/22/90	0.02	no	0.76	yes
617	JMM	3/23/90	0.02	no	0.15	yes (a)
	JMM	4/22/90	0.02	no	0.15	yes
618	JMM	3/23/90	1.78	yes	0.18	no
620	JMM	3/23/90	0.05	yes	0.20	yes (a)
	JMM	4/22/90	0.05	no	0.20	yes
621	JMM	3/23/90	0.03	no	0.27	yes (a)
	JMM	4/22/90	0.03	no	0.27	yes

## Investigative Techniques

TABLE 3-3 (Continued)

**BLOCK 600 - RI/FS DESIGN  
TANK SAMPLING SEQUENCE/SUMMARY**

Tank I.D.	Laboratory Performing Analysis	Sample Date	Depth of Free Product (Feet)	Free Product Sample Collected	Depth of Aqueous Phase (Feet)	Aqueous Phase Sample Collected
622	JMM	3/23/90	0.05	no	1.60	yes (a)
	JMM (DUP)	3/23/90	0.05	no	1.60	yes (a)
	MRD	3/23/90	0.05	no	1.60	yes
	JMM	3/24/90	0.05	yes	1.60	no
	JMM	4/22/90	0.05	no	1.60	yes
	JMM (DUP)	4/22/90	0.05	no	1.60	yes
623	JMM	3/23/90	0.10	yes	0.13	no
	JMM	6/10/90	0.10	no	0.13	no
624	JMM	3/23/90	3.07	yes	0.00	no
625	JMM	3/23/90	0.02	no	0.17	yes (a)
	JMM	4/22/90	0.02	no	0.17	yes
626	JMM	3/23/90	2.92	yes	0.03	no
	JMM (DUP)	3/24/90	2.92	yes	0.03	no
628	JMM	3/21/90	0.50	yes	0.00	no
629	JMM	3/21/90	0.00	no	0.80	yes (a)
	JMM	4/22/90	0.00	no	0.80	yes
630	JMM	3/21/90	0.10	yes	0.00	no
631	JMM	3/21/90	0.00	no	0.10	yes (a)
	JMM	6/10/90	0.00	no	0.10	yes (b)
	JMM	8/8/90	0.00	no	0.00	no
632	JMM	3/21/90	0.00	no	0.30	yes (a)
	JMM	4/22/90	0.00	no	0.30	yes
635	JMM	3/20/90	0.05	no	0.80	yes (a)
	JMM	4/22/90	0.05	no	0.80	yes
636	JMM	3/20/90	0.20	yes	0.35	yes (a)
	JMM	4/22/90	0.20	no	0.35	yes
643	JMM	3/21/90	0.00	no	0.50	yes (a)
	JMM	4/22/90	0.00	no	0.50	yes
644	JMM	3/20/90	0.00	no	4.00	yes (a)
	JMM	4/22/90	0.00	no	4.00	yes

## Investigative Techniques

TABLE 3-3 (Continued)  
BLOCK 600 - RI/FS DESIGN  
TANK SAMPLING SEQUENCE/SUMMARY

Tank I.D.	Laboratory Performing Analysis	Sample Date	Depth of Free Product (Feet)	Free Product Sample Collected	Depth of Aqueous Phase (Feet)	Aqueous Phase Sample Collected
646	JMM	3/20/90	0.20	no	0.50	yes (a)
	JMM	4/22/90	0.20	no	0.50	yes
647	JMM	3/20/90	0.00	no	0.85	yes (a)
	JMM	4/22/90	0.00	no	0.85	yes
648	JMM	3/21/90	0.00	no	0.55	yes (a)
	JMM (DUP)	3/21/90	0.00	no	0.55	yes (a)
	MRD	3/21/90	0.00	no	0.55	yes
	JMM	4/22/90	0.00	no	0.55	yes
	JMM (DUP)	4/22/90	0.00	no	0.55	yes

(a) Aqueous phase samples were not collected in sufficient volume for analysis.  
Sample discarded and recollected on 4/22/90.

(b) Aqueous phase sample was not collected in sufficient volume for analysis.  
Sample discarded and tank resampled on 8/8/90.

JMM: Sample analyzed by Montgomery Laboratories/Microbac.

MRD: Sample analyzed by USACE Missouri River Division Laboratory.

DUP: Duplicate Sample.

## Investigative Techniques

### 3.3.1 Initial Field Effort

The USTs were uncovered using a rubber tired backhoe. Due to the shallow depth of the tanks, shoring or benching of the excavation was not necessary. Once the tanks were uncovered it was possible to sample all of the tanks through the former fill pipe openings or tank vent openings.

A Flexi-Dip oil/water interface probe was used to determine the existence and depth of multiple phases of liquids, if any, in the tanks. The Flexi-Dip provided different audible and visual signals when in contact with either oil or water, thereby determining both the presence and thickness of the oil and water phases. The Flexi-Dip and/or glass rods were utilized to determine the presence or absence of sludge on the bottom of the tank and to confirm the diameters of the tanks.

The Flexi-Dip probe and tape were decontaminated prior to the initial use and between each use using the following procedures:

- Alconox and water wash
- Tap water rinse
- Methanol rinse
- Triple distilled water rinse

Following use in tanks containing free product, the probe was also rinsed with pesticide-grade acetone to remove any product which was adhering to the probe. The acetone rinse preceded the distilled water rinses. Methanol and acetone rinse water was contained and placed in a 55-gallon drum.

Free product and aqueous phase samples were collected using either a teflon bailer or glass rods. The bailer was decontaminated prior to initial use and between each use using the procedure described above for the Flexi-Dip. Fishing line was used to lower the bailer into the tanks. This line was then removed prior to cleaning the bailer and a new length attached prior to collecting the next sample.

In some tanks it was necessary to allow the bailer to lay on its side on the bottom of the tank to fill. If two phases were present, they were briefly allowed to separate in the bailer prior to placing the samples in the appropriate containers.

Glass rods (thiefs) were also utilized to sample the tanks by inserting the rod into the tank plugging the exposed end with a thumb or hand and withdrawing the thief. Thiefs utilized for sampling were used once and then discarded.

Free product samples were collected from tanks with several inches of water and only a thin layer of product by attaching a 40-milliliter (ml) vial to the bottom of a glass rod and submersing the vial just below the surface of the free product. In this manner the free product was skimmed off into the vial without collecting any water. This procedure was repeated until the required sample volume was obtained. Both the glass rod and vial were discarded between tanks.

Sample preservation, labeling, and shipping was handled as specified in the QCSP/FIP. Appropriate chain-of-custody documentation was also completed as specified in the QCSP/FIP.

## **Investigative Techniques**

Tank openings were covered using a 1-foot square piece of galvanized sheet metal prior to covering the tank back up.

Duplicate samples for quality control were inadvertently not collected when the tanks were first uncovered during the week of March 19. Duplicates were therefore collected from the required tanks at the end of the week. As the tanks are a contained body of water/free product, collection of the duplicates several days after the original should still provide a representative duplicate sample.

### **3.3.2 Second Sampling Effort**

The procedures for uncovering the tanks and checking the depth of liquid and the presence of free product were the same for the second sampling effort conducted on April 22, 1990 as for the initial sampling effort. Only aqueous samples were collected during the second sampling effort. Samples, however, were collected using a peristaltic pump and not with a bailer or glass rod. Tygon tubing was used in the peristaltic pump to collect the samples. Tubing was discarded following each use, and a new piece used to sample the next tank. Samples were decanted in the field where necessary to reduce or eliminate free product from the samples. Where the introduction of free product into the sample was unavoidable, the laboratory was instructed on the chain-of-custody form to sample only the aqueous portion of the sample.

Sample handling and closing the excavation were handled in a similar manner as during the initial sampling effort.

The sampling attempts conducted on June 10 and August 8 differed from the second sampling effort in that the tanks had to be uncovered by hand. The remaining sampling procedures/equipment were the same as for the second sampling effort.

## **3.4 SOIL BORING/WELLPOINTS INSTALLATION PROCEDURES**

Ten temporary wellpoints were installed at Block 600. The wellpoint locations are shown on Figure 3-1. Table 3-4 provides the State planar coordinates for each wellpoint. Project specifications for wellpoint construction require that the wellpoint screens be 5 feet in length, and that the top of the screens be placed 2 feet above the water table. Soil samples were collected during the construction of the wellpoint soil borings for lithologic logging purposes only. Analytical soil samples were not collected from the wellpoint soil borings.

### **3.4.1 Boring Installation**

Soil borings were completed using the hollow-stem auger drilling technique. Soil borings were constructed for the purpose of wellpoint installation. Hollow-stem augering involves construction of the borehole by simultaneously rotating and axially advancing the auger column into unconsolidated or poorly consolidated formations. The auger flights convey the cuttings produced by the lead auger upward to the surface. Augers having inside diameters (ID) and outside diameters (OD) of 4.25 and 8.25 inches, respectively, were used for drilling. When the borehole was advanced to a desired sampling depth, sampling tools were inserted through the axis of the hollow stem column. The formation sample was then obtained by driving a split-spoon sampler into the formation materials. A 2-inch-diameter, split-spoon sampler, driven by a 140-pound hammer, was utilized in the soil investigation for the Block 600 project.

## Investigative Techniques

TABLE 3-4

**BLOCK 600 - RI/FS DESIGN  
STATE PLANAR COORDINATES FOR WELLPOINT LOCATIONS**

<b>Wellpoint Number</b>	<b>North Coordinate</b>	<b>East Coordinate</b>	<b>Top of Casing Elevation (feet, NGVD)</b>	<b>Groundwater Elevation (feet, NGVD)</b>
601	224396.76	2728307.25	14.19	5.79
602	224545.20	2728459.41	13.33	5.53
603	224851.06	2728472.65	13.27	ND
604	224551.45	2728073.01	13.46	5.56
605	224734.00	2728303.56	13.29	5.39
606	224918.65	2728253.35	12.05	4.95
607	224639.18	2727802.79	12.30	5.90
608	224871.08	2728100.56	12.28	5.38
609	225016.19	2728080.26	11.87	5.07
610	224868.52	2727881.16	11.85	5.35

NGVD: National Geodetic Vertical Datum

ND: No data, WP-603 could not be located in the field at the time groundwater measurements were taken.

## Investigative Techniques

All drill pipe, the drill rig, and sampling equipment were steam-cleaned prior to use at each site. All drilling and sampling tools were steam cleaned between individual holes and the rig was routinely examined for any hydraulic fluid leaks. During all drilling operations, air quality in and near the open borehole was continually monitored using a photo-ionization detector (PID) for personnel health and safety purposes.

Spoil materials produced by drilling were placed in properly labeled, EPA-approved drums. The drums were stored temporarily at each site and eventually moved to a central location within the Fort Story installation. As analytical soil samples were not obtained from the wellpoint soil borings, selection of the appropriate means for disposal of the cuttings is under consideration at the time of this submittal.

Soil samples were collected in a stainless-steel, split-spoon sampler. Split-spoon samplers were steam-cleaned prior to the collection of each soil sample. Each sample was field screened with a PID and classified utilizing the Unified Soil Classification System (USCS). Lithologic data, PID screening data, standard penetration test (SPT) blow counts, and depths to distinct strata were recorded by the field geologist on the appropriate boring log forms (Appendix C). In addition, comments describing PID instrumentation, sampling irregularities, or difficulties encountered during drilling were indicated on the boring logs.

### 3.4.2 Wellpoint Construction Procedures

Following the construction of the wellpoint boreholes, the wellpoints were installed by emplacing the riser pipe and screen assembly together with the sand filter pack material through the axis of the auger string. The riser pipe and screen assembly consisted of nominal 2-inch-ID, Schedule 40, potable water grade, PVC pipe and well screen. Factory-slotted well screens, 5 feet in length and having six slots per foot, were utilized in the construction of each wellpoint. Additionally, flush-joint, threaded couplings were utilized for joining the screen and riser pipe. A closed shoe was fitted to the bottom of the screen to prevent the entry of foreign material into the wellpoint. PVC glues were not used during wellpoint construction.

A well screen slot size of 0.020 inch and sand filter pack material designated as No. 2 Morrie Sand were utilized in the construction of each wellpoint. Sand having a No. 2 grading is 98 percent retained on a 0.020-inch slot screen. In order to permit the sampling of floating product, the top of the wellpoint screen was placed 2 feet above the depth of the water table encountered during drilling. The water table was encountered between the depths of 6 and 7 feet below ground surface in the Block 600 area. The total depths of wellpoints, therefore, ranged from 9 to 10 feet, respectively. Gravel pack material was emplaced around the wellpoint riser pipe and screen assemblies to a depth of 2 feet below ground surface. From the depth of 2 feet to ground surface, the wellpoint annular space was backfilled with granular bentonite. The wellpoint riser pipes were extended approximately 2 feet above ground level and were fitted with locking, water-tight caps. Project specifications for the wellpoints did not require the construction of surface completion structures or the performance development procedures. For each of the 10 wellpoints, construction summary sheets were prepared indicating the drilling method, personnel involved, elevations, well design, and well materials (Appendix D).

## **Investigative Techniques**

### **3.5 GROUNDWATER SAMPLING PROCEDURES**

#### **3.5.1 General**

Sample containers and preservation methods for the samples were provided in the Quality Control and Sampling Plan (QCSP), as were the analytical methods utilized and other quality assurance information. Preservatives were added to the water sample bottles as necessary at JMM's laboratory prior to shipment to the site. JMM purchases precleaned sample containers from I-Chem Service or Eagle-Pichen.

Sample labels were affixed to the containers and completed with indelible ink. Once samples were collected, the sample bottle and jar lids, other than those for volatile organic compounds (VOCs), were sealed with a tamper-evident tape. Since the VOC sample containers may have been subject to contamination by the tape, they were secured within a "zip-lock" plastic bag and the plastic bag sealed with a tamper-evident tape.

As each sample was collected, it was stored in a durable ice chest containing frozen blue-ice. All blue-ice was sealed in double plastic bags to prevent leakage. All containers were wrapped in plastic bubble pack bags and additional packing material as necessary to prevent breakage during shipping.

#### **2.5.2 Collection Methods**

Wellpoints were not developed or purged prior to groundwater sampling. Samples were collected using a teflon bailer. The bailer was decontaminated prior to initial use and between each use as previously discussed. Fishing line was used to lower the bailer into the wells. The fishing line was replaced following each use to prevent cross-contamination between wells.

The initial bailer of water collected from each wellpoints was observed for the presence of free product. No free product was detected in any sample. A sheen was detected on the sample collected from Wellpoint (WP) 610.

A duplicate sample was collected from WP-601. A rinsate blank (RB) for analysis by the USACE Missouri River Division Laboratory (MRD) was collected from the bailer following sampling of all wellpoints. No trip blanks (TB) were scheduled to be collected during this field effort.

#### **3.5.3 Groundwater Elevations**

Groundwater levels were collected subsequent to sample collection and referenced to the National Geodetic Vertical Datum (NGVD) following survey of the top of casing elevation of the wellpoints. Table 3-4, presented earlier, provides the top of casing elevations of the wells and the water level elevations measured referenced to NGVD. A discussion of the hydrogeology was provided in Section 2.0.

## SECTION 4.0

### ANALYTICAL RESULTS

#### 4.1 TANK CONTENTS

Initially, it was assumed that two phases may be present in the tanks, a free product phase and a sludge, both fuel related. This was the reason the parameters that were analyzed for were chosen and were the same for both phases. As previously discussed, no solids or sludges were detected in any tank, with the exception of Tank 612. Approximately 1 foot of clean white sand was found in Tank 612. No sample was collected of the sand. Liquids were detected in two phases, aqueous and free product. Samples were collected of all measurable/collectable quantities of liquids found in the tanks.

Sixteen tanks contained an aqueous phase only in a sufficient volume to sample; eight tanks contained free product only in sufficient volumes to sample; and five tanks contained both an aqueous phase and a free product phase in sufficient volume to sample. One tank contained insufficient volumes of either free product or aqueous phases to sample (see Table 2-1 presented earlier).

##### 4.1.1 Aqueous Phase

Initially, both phase samples were to be analyzed for total organic halogens (TOX), British thermal unit (BTU) content, metals (arsenic, cadmium, chromium and lead), polychlorinated biphenyls (PCBs), moisture, flash point, and total fuel hydrocarbons (TFH). When it was determined that one phase was an aqueous layer, it was decided not to perform flash point analyses on aqueous samples. The U.S. Army Corps of Engineers (USACE) and James M. Montgomery, Consulting Engineers, Inc. (JMM) agreed to delete the analysis from the sampling program since it would not provide significant data. Aqueous samples collected for BTU content and moisture were analyzed by Microbac Laboratories prior to the determination by JMM and the USACE that it was not necessary to sample aqueous samples for these parameters. The initial samples collected for analysis by Microbac were in the appropriate containers and of sufficient volume to analyze. The resampling efforts at Block 600 did not require resampling for these two parameters.

**4.1.1.1 Total Organic Halogens (TOX).** The aqueous samples collected from the underground storage tanks (USTs) were analyzed for TOX. The TOX analysis is an analysis for a whole group of chlorinated compounds. Twenty-two aqueous phase samples were analyzed for TOX. The concentrations detected ranged from 20 to 490 micrograms per liter ( $\mu\text{g/l}$ ). The average concentration was 129  $\mu\text{g/l}$  and the median concentration was 98  $\mu\text{g/l}$ . The results are summarized in Table 4-1 and the analytical report forms are presented in Appendix D. The analytical report forms include the detection limits for each of the samples analyzed.

**4.1.1.2 Polychlorinated Biphenyls (PCBs).** The aqueous phase samples collected were analyzed for seven PCBs. The PCBs analyzed for included:

- Arochlor 1016
- Arochlor 1221

## Analytical Results

- Arochlor 1232
- Arochlor 1242
- Arochlor 1248
- Arochlor 1254
- Arochlor 1260

No PCBs were detected in any sample. The results of the analyses are summarized in Table 4-1 and the analytical report forms are presented in Appendix D. The analytical report forms include the detection limits for each of the parameters and samples analyzed.

**4.1.1.3 Total Fuel Hydrocarbons (TFH).** TFH is an analysis to determine the hydrocarbon content of a given samples that is attributed to the presence of petroleum compounds in the range of 8 to 32 carbons (C8 to C32). These hydrocarbons are heavier and less volatile than those found in gasoline, and are more typical of No. 1 and No. 2 fuel oil , kerosene, and diesel fuel. TFH is run by gas chromatography with a flame ionization detector (GC/FID). The TFH analysis can be modified to analyze the light end (principally C8 to C22) of the carbon compounds (referred to as TFH-light) or can include the heavy end (C8 to C32) compounds (referred to as TFH-heavy). TFH-heavy is also referred to as high boiling point hydrocarbons (HBPHC). Twenty-one aqueous phase samples plus two duplicates were collected and analyzed for TFH-heavy.

Ten of the samples collected had a laboratory control sample (LCS) outside the acceptable range on the date the samples were initially extracted. All samples were run, but because an LCS was below the minimum acceptable limit, the data must be labeled as questionable. The samples affected include 610, 611, 615, 616, 632, 635, 636, 644, 646, and 648. The concentrations detected ranged from 1.2 milligrams per liter (mg/l) to 740,000 mg/l.

The 10 samples affected were re-extracted and re-analyzed. With the exception of sample 610, re-analysis correlated fairly well with the initial results. Sample heterogeneity and how the sample aliquots were taken out of the sample bottles probably were the main contributing factors to any differences noted in the values. Initially, the oil floating on the samples was drained off before sampling the water. In the subsequent extraction, the organic phase could not be separated from the aqueous phase due to low sample volume.

Both sets of data are included in Table 4-1. While the data from the first extraction for the 10 samples in question are considered unreliable due to low LCS data, it may still be more representative of the aqueous phase only. The data from the second extraction, while acceptable from a quality control perspective, may not be representative of the aqueous phase since a good separation of the aqueous and organic phases could not be obtained in several cases. The concentrations detected ranged from below detection limits (<0.05 mg/l) to 140,000 mg/l.

The solubility of No. 2 fuel oil in water is 3.2 mg/l (Reference 6). The solubilities of the individual compounds (C8 to C32), which are analyzed as part of the TFH analysis, vary. Further analysis of the aqueous phase would be necessary to determine whether the TFH concentrations detected are due, at least in part, to the presence of free organics in the sample aliquot. Based on the analytical results, it would appear that at least four samples (610, 613, 620, and 622, which had TFH concentrations of 140,000, 74,000, 40,000, and 17,000 mg/l, respectively) were not pure aqueous samples, but contained free product. The concentrations of TFH detected in the free product samples collected ranged from 940,000 to 1,150,000 mg/l.

**TABLE 4-1**  
**BLOCK 600 - RI/FS DESIGN**  
**SUMMARY OF UST SAMPLING ANALYTICAL RESULTS — AQUEOUS PHASE**

Parameter	Tank No.												
	609	610	611	612	612 Dup	613	615	616	617	620	621	622	622 Dup
<b>Montgomery Laboratories</b>													
PCBs (µg/l) (a)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TFH-H (mg/l)													
First Extraction	24	164	37	2.2	3	74000	24	7.4	24	44000	140	17000	1400
Second Extraction	NA	140000	77	NA	NA	NA	32	27	NA	NA	NA	NA	NA
TOX (µg/l)	25	170	150	22	31	170	89	84	160	100	98	240	290
<b>Metals (mg/l)</b>													
Arsenic	<0.025	<0.10	<0.10	<0.025	<0.025	<0.10	<0.10	<0.025	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	<0.005	<0.005	0.019	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	<0.010	0.01	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.01	<0.010
Lead	0.031	0.15	4.9	0.01	0.03	0.37	0.39	0.06	0.022	0.03	0.14	0.39	0.28
<b>Microbac Laboratories, Inc.</b>													
BTU Content (BTU/lb)	NI	NI	NI	NI	NI	1612	NI	NI	463	NI	NI	NI	—
Moisture (%)	83	95	97	96	96.5	62.5	94	97.5	85	39	98.7	75.2	—

(a) Samples were analyzed for seven PCBs. Specific compounds and their respective detection limits are shown on the laboratory report forms in Appendix F.

ND: Not Detected  
 NI: No Ignition  
 NA: Not Analyzed

**TABLE 4-1 (Continued)**  
**BLOCK 600 - RI/FS DESIGN**  
**SUMMARY OF UST SAMPLING ANALYTICAL RESULTS -- AQUEOUS PHASE**

Parameter	Tank No.									
	625	629	632	635	636	643	644	646	647	648
<b>Montgomery Laboratories</b>										
PCBs (µg/l) (a)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TFH-H (mg/l)										
First Extraction	32	1.2	100	—	46	460	3.2	26	520	11
Second Extraction	NA	NA	81	54	7.8	NA	<0.05	4.5	NA	7.1
TOX (µg/l)	49	40	150	27	280	160	20	130	66	61
<b>Metals (mg/l)</b>										
Arsenic	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005
Chromium	<0.010	0.01	<0.010	<0.010	<0.010	0.013	<0.010	<0.010	0.012	<0.010
Lead	0.8	0.15	0.46	0.06	0.18	0.57	<0.01	0.05	0.28	0.12
<b>Microbac Laboratories, Inc.</b>										
BTU Content (BTU/lb)	893	NI	NI	NI	NI	747.8	NI	NI	NI	NI
Moisture (%)	88.5	91	66	86	94	66.5	71	96.5	79	96.5

(a) Samples were analyzed for seven PCBs. Specific compounds and their respective detection limits are shown on the laboratory report forms in Appendix F.

ND: Not Detected

NI: No Ignition

NA: Not Analyzed

## Analytical Results

The results of the analyses are summarized in Table 4-1 and the analytical report forms are presented in Appendix D. The analytical report forms include the detection limits for each of the samples analyzed.

**4.1.1.4 Metals.** The aqueous phase samples were analyzed for four metals: arsenic, cadmium, chromium, and lead. Various metals occur naturally in oil. Metals may also have been added in low concentrations as part of the oil processing procedure, or may have been introduced as contaminants. The results of the analyses are summarized in Table 4-1 and the analytical report forms are presented in Appendix D. The analytical report forms include the detection limits for each of the parameters and samples analyzed.

**a. Arsenic.** None of the aqueous samples analyzed contained arsenic in concentrations above the detection limit. The detection limit for arsenic was either 0.10 mg/l or 0.25 mg/l, depending on the dilution required for analysis.

**b. Cadmium.** Two samples contained cadmium in concentrations at or above the detection limit of 0.005 mg/l. Samples from Tanks 611 and 646 contained cadmium at a concentration of 0.019 mg/l and 0.005 mg/l, respectively.

**c. Chromium.** Six samples contained chromium in concentrations at or above the detection limit of 0.010 mg/l. Chromium was detected in Tank 610 at a concentration of 0.010 mg/l, Tank 611 at a concentration of 0.013 mg/l, Tank 622 at a concentration of 0.010 mg/l, Tank 629 at a concentration of 0.010 mg/l, Tank 643 at a concentration of 0.013 mg/l, and Tank 647 at a concentration of 0.012 mg/l.

**d. Lead.** Lead was detected in the aqueous samples collected from all tanks, except one. The concentration of lead in Tank 644 was below the detection limit of 0.01 mg/l. The concentration of lead in the remaining tanks ranged from 0.01 mg/l to 4.9 mg/l. Tank 611, however, was the only tank in which the concentration was greater than 1.0 mg/l. The next highest value was 1.0 mg/l detected in Tank 625. The average concentration of lead detected in all tanks was 0.41 mg/l. The median concentration of lead detected was 0.15 mg/l.

**4.1.1.5 Moisture.** The values for percent moisture detected in the aqueous samples collected from the USTs ranged from 39 to 98.7 percent. The average value was 81 percent and the median concentration was 88 percent. Analyzing the percent moisture of an aqueous sample does not provide a significant amount of usable data. The original scope provided for analyzing for percent moisture assuming that the matrix to be analyzed would be a sludge or free product. When an aqueous phase was found as opposed to a sludge, the analyses provided for in the Quality Control and Sampling Plan/Field Investigation Plan (QCSP/FIP) were still run. The results indicate that although the sample collected was to be representative of the aqueous portion of the tank contents, the samples with moisture values less than 97 to 98 percent contained other material such as free product and/or miscellaneous particulate matter. This free product and/or miscellaneous particulate matter adversely impacted the analytical results causing the moisture values to be less than the anticipated results. The results of the analyses are summarized in Table 4-1 and the analytical report forms are presented in Appendix D.

**4.1.1.6 BTU Content.** Eighteen of the 23 aqueous samples collected were not ignitable. The remaining five samples had BTU contents ranging from 463 to 6,065 BTUs per pound (BTUs/lb). While care was taken to separate phases and collect only an aliquot from the

## Analytical Results

aqueous phase, several samples contained an emulsion of oil and water, which could not be separated. Aqueous samples should not be ignitable. No. 2 fuel oil has a BTU content of 19,440 BTUs/lb. The samples that were ignitable obviously contained free product in addition to the aqueous portion of the sample. The results of the analyses are summarized in Table 4-1 and the analytical report forms are presented in Appendix D.

**4.1.1.7 Summary.** Excluding samples with obvious free product contamination, the aqueous tanks samples, on an average, contained less than 100 milligrams per liter (mg/l) of TFH. Total organic halogens (TOX) were present in the aqueous samples with concentrations averaging less than 115 micrograms per liter ( $\mu\text{g/l}$ ). None of the aqueous samples contained PCBs. All but one aqueous sample contained lead and seven of the samples contained one or more of the other three metals analyzed (arsenic, cadmium, and chromium). The volume of aqueous material found in the USTs total approximately 4,100 gallons. A Norfolk, Virginia, oil reclamation firm has indicated that they can treat and dispose of this material as a non-hazardous wastewater. Forty-four gallons of wastewater found in the three tanks with a high lead content will require special treatment as will any washwater used to clean these three USTs prior to disposal.

### 4.1.2 Free Product

Fifteen free product samples (including two duplicates) were collected from the 13 USTs at Block 600 containing sufficient volume of free product to sample and were analyzed for the following parameters:

- TOX
- TFH
- PCBs
- Metals (arsenic, cadmium, chromium, and lead)
- Flash Point
- Moisture
- BTU Content

**4.1.2.1 Total Organic Halogens (TOX).** The free product samples collected from the USTs were analyzed for TOX. The TOX analysis is an analysis for a whole group of chlorinated compounds. TOX do not occur naturally in oil, and therefore should not be present unless the oil had, at some point either prior to or subsequent to delivery to the base, been contaminated. The detection limit for the analysis was 100 milligrams per kilogram (mg/kg). All free product samples analyzed were below the detection limit. The results of the analyses are summarized in Table 4-2 and the analytical report forms are presented in Appendix D.

**4.1.2.2 Total Fuel Hydrocarbons (TFH).** The concentrations of TFH in the free product samples ranged from 940,000 mg/kg to 1,115,000 mg/kg. These results indicate the free product samples were essentially 100 percent TFH. Variations in the results (i.e., less than or greater than 100 percent [1,000,000 mg/kg]) are probably due to the amplification of differences that occurred as part of the dilution process. In order to analyze the samples, the aliquots had to be diluted 10,000 fold. Once an analytical result was obtained, the value had to be multiplied by 10,000 to obtain the final concentration. When samples have to be diluted to this extent, small differences in concentration are greatly magnified when the results are multiplied by the dilution factor, resulting in some concentrations greater than

TABLE 4-2

**BLOCK 600 - RI/FS DESIGN  
SUMMARY OF UST SAMPLING ANALYTICAL RESULTS - FREE PRODUCT PHASE**

Parameter	Tank No.							
	607	607 DUP	609	610	614	618	620	622
<b>Montgomery Laboratories</b>								
PCBs (µg/kg) (a)	ND	ND	ND	ND	ND	ND	ND	ND
TFH-H (mg/kg)	1050000	1180000	1060000	1020000	940000	960000	1150000	1000000
TOX (mg/kg)	<100	<100	<100	<100	<100	<100	<100	<100
<b>Metals (mg/kg)</b>								
Arsenic	<0.25	<0.25	<0.25	<1.0	<0.5	<0.25	<0.25	<0.25
Cadmium	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lead	<0.1	<0.1	<0.1	<1.0	0.1	0.1	1	0.1
Flash Point (°F)	138	134	127	>140	>140	137	>140	135
<b>Microbac Laboratories, Inc.</b>								
Moisture (%)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5
BTU Content (BTU/lb)	19,468	19,387	19,457	17,003	19,545	19,520	19,480	19,443

(a) Samples were analyzed for seven PCBs. Specific compounds and their respective detection limits are shown on the laboratory report forms in Appendix F.

ND: Not Detected

**TABLE 4-2 (Continued)**  
**BLOCK 600 - RI/FS DESIGN**  
**SUMMARY OF UST SAMPLING ANALYTICAL RESULTS - FREE PRODUCT PHASE**

Parameter	Tank No.						
	623	624	626	626 Dup	628	630	636
<b>Montgomery Laboratories</b>							
PCBs (µg/kg) (a)	ND	ND	ND	ND	ND	ND	ND
TFH-H (mg/kg)	1100000	1030000	1130000	1100000	1030000	1090000	1100000
TOX (mg/kg)	<100	<100	<100	<100	<100	<100	<100
<b>Metals (mg/kg)</b>							
Arsenic	0.25	<0.25	<0.25	<0.25	<0.25	<1.0	<0.25
Cadmium	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	0.18	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lead	43	<0.1	<0.1	<0.1	13	<1.0	58
Flash Point (°F)	>140	137	>140	137	130	>140	>140
<b>Microbac Laboratories, Inc.</b>							
Moisture (%)	1.3	<0.5	<0.5	<0.5	<0.5	<0.5	27.2
BTU Content (BTU/lb)	1,654	19,560	19,611	19,557	19,471	19,560	14,235

(a) Samples were analyzed for seven PCBs. Specific compounds and their respective detection limits are shown on the laboratory report forms in Appendix F.

ND: Not Detected

## Analytical Results

(or less than) 100 percent. Variations may also have been due to slight water contamination. The results of the analyses are summarized in Table 4-2 and the analytical report forms are presented in Appendix D. The analytical report forms include the detection limits for each of the samples analyzed.

**4.1.2.3 Polychlorinated Biphenyls (PCBs).** The free product samples collected were analyzed for seven PCBs. The PCBs analyzed included:

- Arochlor 1016
- Arochlor 1221
- Arochlor 1232
- Arochlor 1242
- Arochlor 1248
- Arochlor 1254
- Arochlor 1260

No PCBs were detected in any sample. The detection limits were either 2 mg/kg or 4 mg/kg, depending on the PCB analyzed. The results of the analyses are summarized in Table 4-2 and the analytical report forms are presented in Appendix D. The analytical report forms include the detection limits for each of the parameters and samples analyzed.

**4.1.2.4 Metals.** The free product samples were analyzed for four metals: arsenic, cadmium, chromium, and lead. As discussed previously, various metals are found naturally in oil. Metals may also have been added in low concentrations as part of the oil processing procedure or may have been introduced as contaminants. The results of the analyses are summarized in Table 4-2 and the analytical report forms are presented in Appendix D. The analytical report forms include the detection limits for each of the metals and samples analyzed.

**a. Arsenic.** Arsenic was detected in one of 15 free product samples analyzed. Arsenic was detected in Tank 623 at a concentration of 0.25 mg/kg. The concentration of arsenic was below detection limits for the remaining samples. Detection limits varied from 0.25 mg/kg to 1.0 mg/kg.

**b. Cadmium.** Cadmium was detected in one of 15 free product samples analyzed. Cadmium was detected in Tank 623 at a concentration of 0.10 mg/kg. The concentration of cadmium was below detection limits for the remaining samples. The detection limit for cadmium in all samples was 0.05 mg/kg.

**c. Chromium.** Chromium was detected in one of 15 free product samples analyzed. Chromium was detected in Tank 623 at a concentration of 0.18 mg/kg. The concentration of chromium was below the detection limit of 0.1 mg/kg for the remaining samples.

**d. Lead.** Lead was detected in six of the 15 free product samples analyzed. Concentrations ranged from 0.1 mg/kg to 58 mg/kg. Lead was detected in Tank 614 at a concentration of 0.1 mg/kg, Tank 618 at a concentration of 0.10 mg/kg, Tank 620 at a concentration of 1.0 mg/kg, Tank 623 at a concentration of 43 mg/kg, Tank 628 at a concentration of 134 mg/kg and Tank 636 at a concentration of 58 mg/kg.

## Analytical Results

**4.1.2.5 Flash Point.** The flash points determined for the free product samples collected ranged from 127°F to >140°F. Eight samples were quantifiable with concentrations between 127°F and 139°F. The remaining seven samples were all greater than 140°F. The flash point for No. 2 fuel oil is 136°F (Reference 7). The free product samples with flash points less than 140°F were all within 10 percent of the flash point for fuel oil. Those samples with flash points greater than 140°F may have been impacted by water in the sample aliquot. The results of the analyses are summarized in Table 4-2 and the analytical report forms are presented in Appendix D. The analytical report forms include the detection limits for each of the analyses performed.

**4.1.2.6 Moisture.** Three of the fifteen free product samples analyzed contained a measurable moisture content, the remaining samples were below detection limits. The sample collected from Tank 620 contained 1 percent moisture. The sample collected from Tank 623 contained 1.3 percent moisture and the sample collected from Tank 636 contained 27.2 percent moisture. Moisture content in free product should be non-detectable. The three samples with a measurable moisture content apparently contained various quantities of the aqueous phase. The results of the analyses are summarized in Table 4-2 and the analytical report forms are presented in Appendix D. The analytical report forms include the detection limits for each of the samples analyzed.

**4.1.2.7 BTU Content.** The BTU content of the free product samples was determined to range from 1,654 to 19,611 BTUs/lb. Twelve of the 15 samples had heat content values between 19,387 and 19,611 BTUs/lb. The remaining three samples had values of 1,654 BTUs/lb, 14,235 BTUs/lb, and 17,003 BTUs/lb. Based on these data, the average heat content of the "pure" free product samples is approximately 19,500 BTUs/lb. The BTU content of No. 2 fuel oil to be 19,440 BTUs/lb (Reference 7). The three samples with BTU values less than 19,000 BTUs/lb apparently contained various amounts of the aqueous phase which impacted the results of the analysis. The heat content of the free product from these tanks would be expected to be similar to the remaining samples had a pure free product sample been analyzed. The results of the analyses are summarized in Table 4-2 and the analytical report forms are presented in Appendix D. The analytical report forms include the detection limits for each of the analyses performed.

**4.1.2.8 Summary.** Flash point and heat content data for the free product analyzed in the tanks corresponds to values presented in the literature for No. 2 fuel oil (home heating oil). Free product samples consisted of an average of 100 percent total fuel hydrocarbons (TFH). Metals were present in low concentrations in the free product samples with lead being the metal detected most often. Three tanks contained free product with lead in excess of 5 milligrams per kilogram (mg/kg). According to the Virginia Department of Waste Management, based on the lead content of this material, it would be considered a hazardous waste. The total volume of free product involved is approximately 120 gallons. The volume of free product found in the remaining 27 USTs is approximately 3,480 gallons and can be disposed of at an oil reclamation facility. Low levels of various metals were found in the free product. These metals may be naturally occurring, may have been added in low concentrations as part of the oil processing procedure, or may have been introduced as a contaminant. No polychlorinated biphenyls (PCBs) were detected in any of the free product samples.

## Analytical Results

### 4.2 GROUNDWATER SAMPLES

One groundwater sample was collected from each of the 10 temporary wellpoints installed at Block 600. In addition, a duplicate sample was collected from a randomly selected wellpoint, WP-601. The samples collected were analyzed for TFH-heavy only. Eight samples analyzed contained less than 0.05 mg/l TFH. Based on these data, the background concentration of TFH in the Block 600 area is less than 0.05 mg/l. Three samples collected contained TFH above the detection limit of 0.05 mg/l. These samples included: WP-604 at a concentration of 0.3 mg/l, WP-608 at a concentration of 0.1 mg/l and WP-609 at a concentration of 0.1 mg/l. The results of the analyses are summarized in Table 4-3 and the analytical report forms are presented in Appendix E. The analytical report forms include the detection limits for each of the sampled analyzed.

### 4.3 EXTENT OF CONTAMINATION

Minimal data are available for determining the extent of contamination at the Block 600 site. The only data available are the TFH data in groundwater. There are no groundwater standards for TFH. The tank data provide an indication of potential groundwater contaminants and information required for the disposal of the tank contents but do not provide data regarding contamination at the Block 600 site.

TFH is an analysis for a wide range of compounds. Specific analytical data is required which provides information regarding the specific compounds detected as part of the TFH analysis. In addition, analysis of the tank contents identified four metals in the aqueous and free product phases. Analysis of groundwater samples for these parameters should be conducted as well. Section 6.0 provides specific recommendations for additional sampling.

The concentrations of TFH detected in the groundwater are limited in extent and do not appear to indicate the occurrence of a major spill or a leaking UST in the Block 600 area. TFH concentration is low and samples containing detectable levels of TFH are limited in area. Block 600 consists of approximately 9 acres. Ten wellpoints are located within this area. If the contamination detected in the three wellpoints was more than just localized "hot spots," TFH would have been detected in other wellpoints. The actual impact on the groundwater and the environment due to this TFH contamination cannot be determined without information regarding what compounds are present in the TFH and whether other contaminants may be present.

The TFH data in groundwater could be interpreted in a number of ways. A small spill, leak or overfill may have occurred in the vicinity of WP-604 and the resulting low level contamination has migrated downgradient to WP-608 and WP-609. The local groundwater flow at the site, however, does not support this theory. If the contamination found in WP-608 and WP-609 was a result of migrating contamination, additional wellpoints, such as WP-610 and WP-606, should also have been impacted but were not. Another possibility is that a larger spill or tank leak had occurred at some point in the past in the vicinity of WP-604 and the contamination detected at WPs 604, 608, and 609 are the remnants of contamination remaining after the majority of the pollution has migrated from the site. Another explanation for the contamination is that small spills or leaks occurred in the vicinity of each of the wellpoints, affecting the immediate groundwater only.

## Analytical Results

TABLE 4-3

**BLOCK 600 - RI/FS DESIGN  
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS**

<b>Wellpoint No.</b>	<b>TFH (mg/l)</b>
601	<0.05
601 Dup	<0.05
602	<0.05
603	<0.05
604	0.3
605	<0.05
606	<0.05
607	<0.05
608	0.1
609	0.1
610	<0.05

## SECTION 5.0

### EXPOSURE ASSESSMENT

The purpose of this section is to assess current and future potential exposures to site contaminants for the scenario of no action taken following the removal of the underground storage tanks (USTs) at Block 600. The assessment identifies potential receptors and evaluates the possible pathways of exposure.

An assessment of a site containing USTs as governed by the Final Underground Storage Tank Regulations (40 CFR Part 280.66) is required to address several areas. At this point in time, James M. Montgomery, Consulting Engineers, Inc. (JMM) has no information to indicate that the State of Virginia has developed regulations more stringent than the Federal laws. The Scope provided for addressing, at a minimum, the following areas:

1. Physical and chemical characteristics of substances.
2. Hydrogeologic characteristics of the installation and surrounding area.
3. Potential effects of residual contamination on surface water and groundwater.

In addition, JMM also evaluated the following areas:

1. Proximity, quality, and future users of nearby surface water and groundwater.
2. Exposure assessment including potential exposure pathways and receptor populations.

This is a qualitative report based on the available data. A qualitative summary of potential risk from this site and the uncertainties inherent in this exposure assessment and associated data gaps are discussed in subsequent sections as well.

#### 5.1 SELECTION OF CONTAMINANTS OF CONCERN

Site historical information indicates that this site known as Block 600 is a former barracks area of 39 buildings each with an individual UST used for the storage of heating fuel oil. Thirty-seven of the barracks have been demolished. Ten temporary wellpoints were placed in the area and one round of sampling was conducted to obtain information on the underlying groundwater.

Based on this historical information, groundwater samples were analyzed for total fuel hydrocarbons (TFH), which would include hydrocarbons having carbon chain lengths of 8 to 32. TFH are also commonly referred to as high boiling point hydrocarbons (HBPHC). A review of the literature indicates that heating fuels are generally of carbon chain lengths of 8 to 16.

In this round of sampling, three wellpoints had concentrations of TFH above the detection limit. Wellpoints with concentrations above detection limits were WP-604 reporting a concentration of 0.3 milligrams per liter (mg/l), and WP-608 and WP-609 both with a concentration of 0.1 mg/l.

## Exposure Assessment

The contents of the USTs were analyzed for TFH, metals, total organic halogens (TOX), and polychlorinated biphenyls (PCBs). No PCBs were detected in either the free product or aqueous phase samples. TOX concentrations in the aqueous phase samples ranged from 20 to 490 micrograms per liter ( $\mu\text{g/l}$ ). TOX concentrations in the free product samples were below the detection limit of 100 milligrams per kilogram ( $\text{mg/kg}$ ) for all samples. The range of concentration of metals is as follows:

<u>Metals</u>	<u>Concentration Range Free Product (<math>\text{mg/kg}</math>)</u>	<u>Concentration Range Aqueous (<math>\text{mg/l}</math>)</u>
Arsenic	<0.25 to <1.0	<0.025 to <0.10
Cadmium	<0.05 to 0.10	<0.005 to 0.019
Chromium	<0.10 to 0.18	<0.01 to 0.013
Lead	<0.10 to 58	<0.01 to 4.9

Analysis of the groundwater and the contents of the USTs was designed to provide a general indication of potential contamination at the site and to determine how to handle the tanks and contents during design. The sampling design was primarily directed at confirming that the major constituents in the tanks were indeed heating fuel and the major potential pathway to be groundwater. The selected contaminant of concern was TFH.

This assessment is intended to provide information and background regarding the areas outlined above.

### 5.2 PHYSICAL AND CHEMICAL CHARACTERISTICS

The physical, chemical, and toxic characteristics of compounds provide valuable information on the potential of the compounds to migrate in the environment or potentially cause harm to the environment or to a human population. A qualitative assessment of the toxicity, persistence, and potential for migration of the compounds of concern is presented in order to provide a background of understanding to better evaluate the site. The following information of the physical and chemical characteristics of high boiling point hydrocarbons is taken from Patty's Handbook of Industrial Hygiene and Toxicology (Reference 8).

Petroleum products are naturally occurring compounds which are used for a variety of purposes including combustion of fuel for engines and heating as well as other industrial and residential uses. The specific compound varies depending on the number of carbons in the chain, linear or branched arrangement and the addition of other factors such as sulfur. Natural petroleum products are distilled to produce several "fractions" each with a general range of characteristics such as boiling point, vapor pressure, persistence toxicity and use.

The hydrocarbons with lower boiling point are those with fewer carbons and higher potential for volatilization. The compounds include such things as natural gas and some gasolines. The "middle distillate fraction" includes longer length carbon chains (6 carbons and above) which are less volatile. Many are used as fuel oils, solvents, cleaning agents, thinners and varnishes. The fraction of compounds with the highest boiling points are hydrocarbons of the greatest carbon number, generally of 17 carbons and greater. The

## Exposure Assessment

"highest boiling point hydrocarbon" compounds are used as lubricating oils, waxes, and asphalts. The high boiling point hydrocarbons as indicated in analysis are considered to be hydrocarbons of 8 carbons or greater. Commonly used products containing HBPHC are No. 1 fuel oil, No. 2 fuel oil, kerosene and diesel fuel. The range of number of carbons for the types of hydrocarbons listed above are generally 8 to 16, with boiling points ranging approximately from 200°C to 350°C (420°F to 630°F). Compounds in this range of number of carbons are flammable liquids with moderate to low toxicity.

The toxicity of the hydrocarbons varies. The process of "deodorizing" or "refining" hydrocarbons removes olefins, aromatics, and sulfur oxides producing less toxic compounds especially useful for indoor heating purposes. This process is used in the production of kerosenes. Inhalation of hydrocarbons such as kerosene or No. 2 fuel oil may produce toxic symptoms such as increased rate of respiration, cyanosis and tachycardia followed by pulmonary edema, hemorrhage and pneumonitis. In some cases kidney function may also be damaged. Kerosene as well as most other fuel oils are not sufficiently volatile to present the potential for acute toxicity via inhalation exposure. If in the event that the liquid hydrocarbons are put into aerosol form, they may cause some mucosal irritation or pneumonitis as stated above. The severity of effects due to inhalation of aerosol will vary depending on droplet size. It is generally recognized that the irritant potential increases with the presence of additives.

Ingestion of 8 to 16 carbon hydrocarbons can result in rapid gastrointestinal absorption and produce a variety of systemic effects. Typical symptoms following ingestion of large quantities of these hydrocarbons include gastrointestinal irritation, diarrhea, vomiting as well as central nervous system depression, with severity of symptoms increasing with increasing dosage. Most cases of ingestion poisoning are through accidental ingestion by children. Data gathered in animal experimentation indicates low oral toxicity in rats, rabbits, and chickens, especially for exposures to deodorized kerosene. Preferred treatment of poisoning through ingestion is by absorption to charcoal in the gastrointestinal tract or administration of milk. The induction of vomiting or the use of lavage is not suggested due to the potential for aspiration of the compound into the lungs during removal.

Dermal application of compounds such as kerosene or No. 2 fuel oil produces a defatting of the skin potentially leading to irritation, infection, dermatitis, and blistering. Absorption through intact skin is limited but prolonged or repeated dermal exposure causes increased injury and potential for systemic effects. Even though these hydrocarbons can produce dermal irritation they are not considered to be eye irritants.

Heavier hydrocarbons referred to as residuals or heavy oils are generally of lower toxicity. However due to a higher aromatic content of these compounds, dermal toxicity may be increased upon prolonged exposure through increased defatting properties.

The potential for migration and biodegradation varies greatly depending on the specific compound. In general terms, the greater the number of carbons and the greater the molecular weight of the compound, the more stable in the environment it will be. The lighter, more volatile hydrocarbons with fewer carbons in the chain will be more likely to migrate and/or biodegrade in the environment. Compounds such as kerosene or No. 2 fuel oil and other similar carbon length compounds are considered relatively to moderately relatively degradable.

### 5.3 HYDROGEOLOGIC CHARACTERISTICS

The hydrogeological characteristics of the site have an influence on the boundaries of groundwater movement as well as the potential movement of site contaminants. In the same regard as specific compound characteristics, the general hydrogeological traits of the site are presented to provide useful background information on the potential of the site contaminants to affect a population or the environment.

The Block 600 UST site, as is Fort Story, Virginia as a whole, is located in the eastern portion of Atlantic Coastal Plain physiographic province. The topography of the land is mostly sand dunes, sand flats and marsh areas with elevations ranging from sea level to 85 feet mean sea level. The area generally consists of a 2,000- to 4,000-foot-thick wedge of seaward thickening inter-layered sand, clay, and silts with some gravel layers typical of most marine sediments. Clay-bearing sediments containing quartz sands and limes are estimated to lie 650 to 1,000 feet below ground surface. The depth of groundwater at the Block 600 site is in the range of 7 to 8 feet below ground surface. The water table aquifer averages 50 feet in thickness. Vertical movement of contaminants in groundwater in the Fort Story area into deeper aquifers is retarded due to hydrogeological characteristics (semi-confining layers). However, lateral movement of groundwater produces the possibility of contaminant migration and eventual discharge to the Chesapeake Bay and Atlantic Ocean.

A full description of the site can be found in Sections 1.0 and 2.0.

### 5.4 PROXIMITY, QUALITY, AND FUTURE USE OF NEARBY WATERS

Information regarding the surface and groundwater of the area is also needed and useful in the evaluation of a site with USTs present as it would be in most other situations. The general quality of the surrounding waters in addition to current and potential future uses provides a key piece of any exposure pathway assessment. The following presents a brief discussion of such information.

The Fort Story military installation has only one well which was put in place in 1982. It is designated for use of the motor pool wash rack only with no intent for use as a potable water source. The well is located approximately 0.5 miles west of Block 600.

Fort Story is located in Virginia Beach, Virginia on Cape Henry. It is bounded to the north by the Atlantic Ocean and the Chesapeake Bay. The northern boundary of the Block 600 site is a few hundred yards from the ocean with Atlantic Avenue located between the site and the ocean. It is unlikely that there is any direct discharge to surface water from the site and no streams or ponds between the site and the ocean.

The discharge of groundwater, if any, from Block 600 into the Chesapeake Bay or the Atlantic Ocean is not expected to impact the quality of those water bodies significantly. Any potential input from direct groundwater discharge would be small and rather insignificant as compared to the size of the water bodies themselves. In addition, the current and future use of the surface waters is not expected to be highly recreational. Nearby surface water may, however, be used by base personnel for amphibious training activities. If such activities occur the amount of contact and exposure is expected to be minimal.

## Exposure Assessment

### 5.5 POTENTIAL EFFECTS OF RESIDUAL CONTAMINATION ON SURFACE WATER AND GROUNDWATER

This preliminary assessment addresses only a "no action" scenario, therefore contamination present is considered residual because contamination detected in the environment (soil or groundwater) will not be remediated to any lower levels at this time. The concentrations of high boiling point hydrocarbons found in groundwater are low and do not indicate substantial movement of tank contaminants and constituents into the environment. In addition, visual observation of the soil during prior activities did not indicate widespread staining and contamination of the soil around the USTs. Most tanks appeared to be intact. The planned removal of the tanks will further reduce the potential for contamination by removing those contaminants contained in the tanks and preclude any possible future leakage or migration. The effect of site contaminants on surface water and groundwater is not expected to be significant.

### 5.6 EXPOSURE ASSESSMENT

A qualitative exposure assessment is conducted to identify potential transport pathways (e.g., groundwater, surface water, air); potential routes of exposures (ingestion, inhalation, dermal contact); and potential on-site and off-site receptor populations. The assessment takes into account all information obtained on the site. Exposure assessment involves the consideration of particular transport pathways and routes of exposure to potential receptors. Transport routes typically include groundwater, soil, surface water, and the atmospheric transport of chemicals. Receptors can include current users of the site, as well as adjacent populations which may be exposed to chemicals that have been transported off-site. Receptors may also include aquatic and terrestrial biota.

One of the first steps in evaluating a site is to identify potential transport pathways and routes of exposure for chemicals-of-interest. This information provides the basis for constructing site-specific exposure scenarios.

Basic sources of information considered in the development of site-specific exposure scenarios includes information on the site and surrounding area and any state-specific guidelines with respect to exposure and risk assessments. Future site-specific scenarios are based on information from the present landowner.

For this site, two sources of potential current and future exposure to contamination are evident: groundwater and soil. Potential groundwater exposure would be to users of the groundwater as drinking water, direct discharge to nearby surface water, environmental receptors, and remediation and construction workers. Potential exposure through the inhalation of contaminants in groundwater is not likely due to the low volatility of the compounds. Any potential ingestion of soil or groundwater would be considered incidental and no more than minimal exposure.

Remediation or construction workers who may come in contact with contaminated groundwater or soil during future excavation activities such as removal of the USTs or other construction activities may be exposed to low levels of contaminants. Inhalation is highly unlikely due to the non-volatile properties of the compounds and ingestion would be considered only incidental. Potential for dermal exposure of remediation workers would be further reduced through the use of protective measures such as clothing and other devices. Construction workers may not be required under normal circumstances to

## Exposure Assessment

institute such protective measures. The exposure pathway of either groundwater or soil to remediation/construction workers is considered to be potentially complete. However, the impact to this group of receptors is not expected to be significant. On-site safety issues during construction will be addressed in design.

The other groups cited as potential receptors via groundwater exposure are users of the groundwater as drinking water, users of nearby surface waters, and the environment itself. The groundwater is not used as a drinking water source at the present time nor is it planned to be used as such in the future. This pathway is therefore not considered a complete pathway or to present a risk to public health.

The slight possibility that contaminated groundwater may discharge to area surface waters presents no significant risk to either users for recreational or military training purposes. The concentrations of high boiling point hydrocarbons in groundwater are very low. In addition, direct discharge of high concentrations of contaminants into the Chesapeake Bay or Atlantic Ocean is considered to be unlikely. If in the case that groundwater contaminants enter these area surface waters, the significance of any impact is low to negligible due to the low concentrations of contaminants.

The effects on the environment and ecology surrounding the site is not expected to be significant. Previous development of Block 600 essentially eliminated this site as a wildlife habitat. Possible receptors would be limited to vegetation recolonizing in the area, insects and small animals capable of inhabiting this vegetation, and occasional predators feeding on these insects and small animals. It is not likely that plants or animals currently present on or near Block 600 would have access to groundwater, thus this exposure route would not be completed. Continued succession of colonizing plant communities would be expected to include trees with roots capable of reaching groundwater; however, the low concentrations, low toxicity, and the potential for biodegradation of the hydrocarbons detected in groundwater de-emphasize the possible effects of these potential future receptors. Similarly, effects to Atlantic Ocean/Chesapeake Bay biota via migrating groundwater would be further de-emphasized due to the dilution of already low concentrations of migrating hydrocarbons.

The other exposure pathways via potentially contaminated soil contact by current base personnel/casual visitor or future use by residents or workers at the site are uncertain as to their significance or completion. With the exception of a small area around Tank 626, there was no apparent surficial soil contamination. If soil contamination is present, it would be subsurface contamination and relatively inaccessible. Therefore, the contamination is not expected to significantly affect either human or environmental receptors except potentially during construction activities. Inhalation of any soil contaminants is not expected to occur due to the low volatilization properties of high boiling point hydrocarbons used as fuel oil. Ingestion, if it occurs, is only expected to be incidental. In addition, soil concentrations of contaminants are not known at this time to provide an indication of the potential magnitude of soil contamination. Current use by base personnel is therefore not considered a complete pathway if the soil is in fact not contaminated. If the soil contains contaminants, levels are not known at this time and the assessment is uncertain as to the level of significance to public health. However, impact to public health is expected to be low.

Future use of the site includes several possibilities. Development, following activities such as removal of the tanks, could include residential, commercial, or industrial. Industrial

## Exposure Assessment

development of the site is not considered likely upon consideration of the present owner. The base may, however, use the land for base housing or other non-residential purposes such as a park, playground, or administrative or commercial building. Future use is more likely to be controlled by the base and the management thereof. Plans for shutdown of the base are not indicated at this time. As previously discussed, soil data is not available at this time so further quantification is not possible. Soil sampling is planned to take place upon removal of the USTs. Upon analysis of those soil samples, the possible exposure pathways via contact with contaminated soil can be re-addressed and uncertainties more defined.

The pathway of contaminants carried from soil to nearby surface waters via the base's stormwater runoff and discharge system is not considered a complete pathway. The USTs are buried an average of 2 feet below ground surface. Any leakage from the tanks would therefore occur below that point. Any potential migration of contaminants would be expected to be downward, not up toward the surface. Contaminants are not expected to be on the surface and therefore not be carried into the stormwater runoff system and discharged into nearby waters.

Tables 5-1 and 5-2 define current and future exposure pathways and potential receptors to various site sources. The likelihood as to the completion of each of these pathways is also presented.

### 5.7 UNCERTAINTIES

There are inherent uncertainties within this assessment process to qualitatively characterize risk due to exposure from Block 600. These uncertainties primarily focus on assumptions made to predict exposure pathways, assumptions made regarding the relative toxicity of compounds, interpretation of physical and chemical characteristics to indicate fate and transport properties, and assumptions of the behavioral patterns of people associated with the site.

There is further uncertainty surrounding the assessment of Block 600 due to lab analysis and remaining data gaps. As stated previously, analytical work performed on groundwater samples was conducted for only high boiling point hydrocarbons in order to confirm whether heating fuel may have been released from the USTs. This is considered to be representative of the site even though no other constituents were analyzed for. Additional analyses would be required to determine if other contaminants present in the tanks had been released to the environment.

### 5.8 DATA GAPS

The two primary data gaps associated with the Block 600 area are the limited groundwater data and the absence of soil sampling. As discussed previously, one sampling round of the 10 temporary wellpoints was carried out with one duplicate analysis on one well. Eleven data points are therefore the extent of the database used for groundwater evaluation. High boiling point hydrocarbons were chosen as the parameters of analysis because it was thought to be representative of the possible contaminants of the site. However, soil data is scheduled to be taken at the time of tank removal. The levels are not expected to be significant because visual inspection of soil did not show extensive staining indicating soil contamination. Until those data are available, further qualification of any exposure pathway through contact with soil is not possible.

**TABLE 5-1**  
**BLOCK 600 - RI/FS DESIGN**  
**CURRENT POTENTIAL EXPOSURE PATHWAYS**

<b>Source</b>	<b>Potential Receptor</b>	<b>Potential Exposure Route</b>	<b>Pathway Significant or Likely to Occur?</b>
Groundwater used as drinking water	Users of the groundwater as drinking water	Inhalation, ingestion, dermal	No. Groundwater is not used as a drinking water source currently nor is it planned to be used as such in the future.
Groundwater discharge to surface water	Training/recreational users Ecology/environment	Inhalation, ingestion, dermal	No. Low input into the large nearby water bodies is not expected to produce significant pathway exposure.
Groundwater	Remediation/construction workers	Inhalation, ingestion, dermal	Yes. Dermal contact or incidental ingestion may occur if or when remediation or construction activities take place. Inhalation is not likely due to low volatility of compounds.
Soil	Remediation/construction worker	Inhalation, ingestion, dermal	Yes. Dermal contact or incidental ingestion more likely than inhalation potential. Inhalation is not likely due to low volatility of compounds.
Soil	Base personnel/casual visitor	Inhalation, ingestion, dermal	Uncertain. Soil concentration data are not known at this time.
Soil to surface water	Training/recreational users Ecology/environment	Base stormwater runoff and discharge	No. Contaminants are not expected to be at the surface and available for entering stormwater runoff system.

**TABLE 5-2  
BLOCK 600 - RI/FS DESIGN  
FUTURE POTENTIAL EXPOSURE PATHWAYS**

<b>Source</b>	<b>Potential Receptor</b>	<b>Potential Exposure Route</b>	<b>Pathway Significant or Likely to Occur?</b>
Groundwater used as drinking water	Users of the groundwater as drinking water	Inhalation, ingestion, dermal	No. Groundwater is not used as a drinking water source currently nor is it planned to be used as such in the future.
Groundwater discharge to surface water	Training/recreational users Ecology/environment	Inhalation, ingestion, dermal	No. Low input into the large nearby water bodies is not expected to produce significant pathway exposure.
Groundwater	Remediation/construction workers	Inhalation, ingestion, dermal	Yes. Dermal contact or incidental ingestion may occur if or when remediation or construction activities take place. Inhalation is not likely due to low volatility of compounds.
Soil	Remediation/construction worker	Inhalation, ingestion, dermal	Yes. Dermal contact or incidental ingestion more likely than inhalation potential. Inhalation is not likely due to low volatility of compounds.
Soil	Base personnel/casual visitor	Inhalation, ingestion, dermal	Uncertain. Soil concentration data are not known at this time.
Soil to surface water	Training/recreational users Ecology/environment	Base stormwater runoff and discharge	No. Contaminants are not expected to be at the surface and available for entering stormwater runoff system.
Soil - upon any future use of land	Residential Commercial	Inhalation, ingestion, dermal	Uncertain. Soil concentration data not known at this time.

## SECTION 6.0

### SUMMARY AND RECOMMENDATIONS

#### 6.1 SUMMARY

A field program consisting of locating 30 underground storage tanks (USTs) used to store fuel oil, sampling the contents of the tanks, and the installation and sampling of 10 temporary wellpoints was conducted. Location of the USTs involved the use of two separate geophysical methods. Samples of the tank contents were collected as part of two separate field efforts conducted in March and April of 1990. Groundwater samples were collected during the March 1990 field effort.

The main purpose of this site investigation was to locate the USTs and to provide information on the contents of the tanks for use in the preparation of plans and specifications for the removal of the tanks. In addition, the groundwater samples provided a general indication regarding the extent of contamination in the surficial groundwater. An exposure assessment was completed to assess current and future potential exposures to site contaminants. The assessment also identified potential receptors and valued the possible pathways of exposure.

The contents of the tanks consisted of an aqueous phase and/or a free product phase. No discernable quantities of sludge were detected in any of the tanks. The depth of liquid in the tanks ranged from 0.1 feet to completely full (4 feet). The thicknesses of the liquid phases varied from tank to tank.

The tanks all appeared to be in good condition based on observations made during sampling. Stained soil was observed around the fill pipe to one tank, Tank 626, but did not appear to be extensive. Stained soil around the fill pipe is indicative of overfills and spills which occurred during filling of the tank and not from a leaking tank.

Flash point and heat content data for the free product analyzed in the tanks corresponds to values presented in the literature for No. 2 fuel oil (home heating oil). Free product samples consisted of an average of 100 percent total fuel hydrocarbons (TFH). Metals were present in low concentrations in the free product samples with lead being the metal detected most often. Three tanks contained free product with lead in excess of 5 milligrams per kilogram (mg/kg). According to the Virginia Department of Waste Management, based on the lead content of this material, it would be considered a hazardous waste. The total volume of free product involved is approximately 120 gallons. The volume of free product found in the remaining 27 USTs is approximately 3,480 gallons and can be disposed of at an oil reclamation facility. Low levels of various metals were found in the free product. These metals may be naturally occurring, may have been added in low concentrations as part of the oil processing procedure, or may have been introduced as a contaminant. No polychlorinated biphenyls (PCBs) were detected in any of the free product samples.

Excluding samples with obvious free product contamination, the aqueous tanks samples, on an average, contained less than 100 milligrams per liter (mg/l) of TFH. Total organic halogens (TOX) were present in the aqueous samples with concentrations averaging less than 115 micrograms per liter ( $\mu\text{g/l}$ ). None of the aqueous samples contained PCBs. All

## Summary and Recommendations

but one aqueous sample contained lead and seven of the samples contained one or more of the other three metals analyzed (arsenic, cadmium, and chromium). The volume of aqueous material found in the USTs total approximately 4,100 gallons. A Norfolk, Virginia, oil reclamation firm has indicated that they can treat and dispose of this material as a non-hazardous wastewater. Forty-four gallons of wastewater found in the three tanks with a high lead content will require special treatment as will any washwater used to clean these three USTs prior to disposal.

Based on the limited analytical data available, groundwater contamination by TFH at the site is minimal and appears to be isolated to two small areas; one around WP-604 and one around WP-608 and 609. The only parameter analyzed for in groundwater was TFH. The concentration of TFH detected in WP-604 was 0.3 mg/l and the concentration of TFH in both WP-608 and 609 was 0.1 mg/l. No soil data are available at this time.

The exposure assessment concluded that the potential receptor populations for exposure pathways of the Block 600 site is limited. The nature of the compounds and the low levels found in groundwater samples would not indicate significant concern for public health or the environment.

### 6.2 RECOMMENDATIONS

Additional sampling of the groundwater at the Block 600 site is recommended. TFH data provide preliminary indications of contamination at the site. It appears this contamination is very limited in nature but sufficient analytical data is not available to confirm this conclusively. It is recommended that additional groundwater samples be collected from five of the Block 600 wellpoints. The proposed wellpoints to be sampled would include the three wellpoints with TFH concentrations above detection limits (WP-604, 608, and 609), and two others. The samples should be analyzed for TFH; volatile organic compound (VOC) (EPA Method 8240); base neutral and acid (BNA) extractable compounds (EPA Method 8270); and metals (arsenic, cadmium, chromium, and lead). The TFH would confirm the results of the initial analysis and provide data for comparison of current TFH concentrations to the VOC and BNA results. The VOC analysis would provide an indication of the presence of the lighter, more volatile aromatic hydrocarbons, as well as halogenated hydrocarbons. The BNA analysis would provide a better indication of the components of fuel oil present in the groundwater. Metals were detected in both the free product samples and the aqueous tank samples. The presence or absence of metals in the groundwater should be confirmed.

This sampling should be completed prior to the submission of the final design documents in order that the findings can be incorporated into the tank removal specifications, primarily from a health and safety point of view. If the groundwater is contaminated, potential worker exposure must be evaluated prior to bidding and/or tank excavation.

Soil sampling is to be performed at the time the tanks are removed. If soil contamination is found to exist, a reassessment of the area will be required to determine the proper course of action to pursue.

## APPENDIX A

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**APPENDIX B**  
**BORING LOGS**

BORING/WELL NUMBER WP-601

CLIENT U.S. ARMY CORP OF ENGINEERS

PAGE 1 OF 1

DATE STARTED 3/23/90 COMPLETED 3/23/90

PROJECT FORT STORY IRP

ELEVATION 16.43 FEET, MSL

GEOLOGIST GARY B. ENLOE

DEPTH (feet)	SAMPLE	SAMPLE INTERVAL (ft)	BLOWS/6 IN	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS	
0	LITH	0-2	2 3 3 4			SM	Vegetation, roots; dark brown, sandy SILT, moist topsoil Brown silty SAND, moist	No analytical soil samples collected from boring	
5	LITH	5-7	3 3 5 4			SP	Buff fine SAND, subrounded, poorly graded, increasing moisture with depth, grading to medium SAND at 5 feet; water at 7 feet		
7	LITH	7-9	3 5 5 4						
10	Total depth of boring=10 feet								

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. Montgomery Consulting Engineers, Inc.

DRILLER HARDIN AND HUBER, INC.

WELL COMPLETION DEPTH 10 FEET

Consulting Engineers, Inc.

METHOD OF DRILLING HOLLOW STEM AUGER

WELL DIAMETER 2 INCHES

HOLE DIAMETER 8 1/4 INCHES

WELL MATERIAL SCHEDULE 40 PVC

TOTAL DEPTH 10 FEET



BORING/WELL NUMBER WP-602

CLIENT U.S. ARMY CORP OF ENGINEERS

PAGE 1 OF 1

DATE STARTED 3/23/90 COMPLETED 3/23/90

PROJECT FORT STORY IRP

ELEVATION 16.1 FEET, MSL

GEOLOGIST GARY B. ENLOE

DEPTH (feet)	SAMPLE	SAMPLE INTERVAL (ft)	BLOWS/6 IN	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
0	LITH	0-2	4 4 3 5			SM	Vegetation, roots; Brown silty SAND, moist	No analytical soil samples collected from boring
5	LITH	5-7	1 2 3 4			SP	Tan to buff fine SAND, subrounded, poorly graded, dark seam at 6 feet, moist, water at 8 feet	
7	LITH	7-9	3 3 7 1				Buff medium SAND, poorly graded, subrounded	
10							Total depth of boring=10 feet	
15								
20								
25								

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. Montgomery

DRILLER HARDIN AND HUBER, INC.

WELL COMPLETION DEPTH 10 FEET

Consulting Engineers, Inc.

METHOD OF DRILLING HOLLOW STEM AUGER

WELL DIAMETER 2 INCH

HOLE DIAMETER 8 1/4 INCHES

WELL MATERIAL SCHEDULE 40 PVC

TOTAL DEPTH 10 FEET



BORING/WELL NUMBER WP-603

CLIENT U.S. ARMY CORP OF ENGINEERS

PAGE 1 OF 1

DATE STARTED 3/23/90 COMPLETED 3/23/90

PROJECT FORT STORY IRP

ELEVATION 15.4 FEET, MSL

GEOLOGIST GARY B. ENLOE

DEPTH (feet)	SAMPLE	SAMPLE INTERVAL (ft)	BLOWS/6 IN	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
0	LITH	0-2	3 3 3 4	5.0		SP	Vegetation, roots; tan fine SAND, subrounded, poorly graded	PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm  No analytical soil samples collected from boring
5	LITH	5-7	2 2 2 4	4.0			Tan fine SAND, poorly graded, subrounded, moist	
7	LITH	7-9	1 1 1 1	6.0			Buff medium SAND, subrounded, poorly graded, water at 7 feet	
10							Gray coarse SAND, poorly graded, subrounded	
							Total depth of boring=10 feet	
15								
20								
25								

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. Montgomery

DRILLER HARDIN AND HUBER, INC.

WELL COMPLETION DEPTH 10 FEET

Consulting Engineers, Inc.

METHOD OF DRILLING HOLLOW STEM AUGER

WELL DIAMETER 2 INCH

HOLE DIAMETER 8 1/4 INCHES

WELL MATERIAL SCHEDULE 40 PVC

TOTAL DEPTH 7 FEET



BORING/WELL NUMBER WP-604CLIENT U.S. ARMY CORP OF ENGINEERSPAGE 1 OF 1DATE STARTED 3/23/90 COMPLETED 3/23/90PROJECT FORT STORY IRPELEVATION 15.39 FEET, MSLGEOLOGIST GARY B. ENLOE

DEPTH (feet)	SAMPLE	SAMPLE INTERVAL (ft)	BLOWS/ 6 IN	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
0	LITH	0-2	3 5 6 7	3.0	[GRAPHIC LOG]	SM	Vegetation, roots; dark brown sandy SILT, organic material, moist	PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm  No analytical soil samples collected from boring
5	LITH	5-7	3 5 7 9	3.0		SP	Tan fine SAND, subrounded, poorly graded, moist  Brown medium SAND, subrounded, poorly graded, water at 7 feet	
10							Total depth of boring=10 feet	
15								
20								
25								

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. MontgomeryDRILLER HARDIN AND HUBER, INC.WELL COMPLETION DEPTH 10 FEET

Consulting Engineers, Inc.

METHOD OF DRILLING HOLLOW STEM AUGERWELL DIAMETER 2 INCHHOLE DIAMETER 8 1/4 INCHESWELL MATERIAL SCHEDULE 40 PVCTOTAL DEPTH 10 FEET

BORING/WELL NUMBER WP-605

CLIENT U.S. ARMY CORP OF ENGINEERS

PAGE 1 OF 1

DATE STARTED 3/23/90 COMPLETED 3/23/90

PROJECT FORT STORY IRP

ELEVATION 15.19 FEET, MSL

GEOLOGIST GARY B. ENLOE

DEPTH (feet)	SAMPLE	SAMPLE INTERVAL (ft)	BLOWS/6 IN	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
0	LITH	0-2	3 3 4 5	4.0		SM	Vegetation, roots; dark brown sandy SILT, moist	PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm  No analytical soil samples collected from boring
5	LITH	5-7	1 2 2 2	2.0		SP	Tan fine SAND, poorly graded, subrounded, moist - water at 6 feet  Buff medium SAND, subrounded, poorly graded	
10							Total depth of boring=9 feet	
15								
20								
25								

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. Montgomery

DRILLER HARDIN AND HUBER, INC.

WELL COMPLETION DEPTH 9 FEET

Consulting Engineers, Inc.

METHOD OF DRILLING HOLLOW STEM AUGER

WELL DIAMETER 2 INCH

HOLE DIAMETER 8 1/4 INCHES

WELL MATERIAL SCHEDULE 40 PVC

TOTAL DEPTH 9 FEET



BORING/WELL NUMBER WP-606

CLIENT U.S. ARMY CORP OF ENGINEERS

PAGE 1 OF 1

DATE STARTED 3/24/90 COMPLETED 3/24/90

PROJECT FORT STORY IRP

ELEVATION 13.83 FEET, MSL

GEOLOGIST GARY B. ENLOE

DEPTH (feet)	SAMPLE	SAMPLE INTERVAL (ft)	BLOWS/6 IN	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
0	LITH	0-2	2 4 4 3	2.2	100% SILT	SM	Vegetation, roots; dark brown sandy SILT, moist, rubble	PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm  No analytical soil samples collected from boring
5	LITH	5-7	1 1 1 1	3.2		SP	Tan fine SAND, subrounded, poorly graded, water at 6 feet  Buff medium SAND, subrounded, poorly graded	
10							Total depth of boring=10 feet	
15								
20								
25								

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. Montgomery

DRILLER HARDIN AND HUBER, INC.

WELL COMPLETION DEPTH 9 FEET

Consulting Engineers, Inc.

METHOD OF DRILLING HOLLOW STEM AUGER

WELL DIAMETER 2 INCH

HOLE DIAMETER 8 1/4 INCHES

WELL MATERIAL SCHEDULE 40 PVC

TOTAL DEPTH 10 FEET



BORING/WELL NUMBER WP-607

CLIENT U.S. ARMY CORP OF ENGINEERS

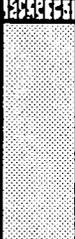
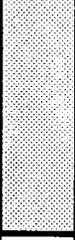
PAGE 1 OF 1

DATE STARTED 3/24/90 COMPLETED 3/24/90

PROJECT FORT STORY IRP

ELEVATION 14.59 FEET, MSL

GEOLOGIST GARY B. ENLOE

DEPTH (feet)	SAMPLE	SAMPLE INTERVAL (ft)	BLOWS/6 IN	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
0	LITH	0-2	4 6 9 11	2.2		SM	Vegetation, roots; dark brown sandy SILT, moist, firm	PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm  No analytical soil samples collected from boring
5	LITH	5-7	3 4 3 6	2.6		SP	Tan fine SAND, subrounded, poorly graded  Brown fine to medium SAND, subrounded, poorly graded, water at 6 feet	
10							Total depth of boring=10 feet	
15								
20								
25								

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. Montgomery DRILLER HARDIN AND HUBER, INC. WELL COMPLETION DEPTH 10 FEET

Consulting Engineers, Inc. METHOD OF DRILLING HOLLOW STEM AUGER WELL DIAMETER 2 INCH

HOLE DIAMETER 8 1/4 INCHES WELL MATERIAL SCHEDULE 40 PVC

TOTAL DEPTH 10 FEET



BORING/WELL NUMBER WP-608

CLIENT U.S. ARMY CORP OF ENGINEERS

PAGE 1 OF 1

DATE STARTED 3/23/90 COMPLETED 3/23/90

PROJECT FORT STORY IRP

ELEVATION 14.38 FEET, MSL

GEOLOGIST GARY B. ENLOE

DEPTH (feet)	SAMPLE	SAMPLE INTERVAL (ft)	BLOWS/6 IN	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
0-2	LITH	0-2	5 7 8 9	3.6		SM	Vegetation, roots; brown sandy SILT, blocky	PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm  No analytical soil samples collected from boring
						SC	Tan sandy CLAY, tight	
5-7	LITH	5-7	2 2 2 3	5.0		SP	Tan fine SAND, subrounded, poorly graded, water at 6 feet	
						SW	Buff medium SAND, subrounded, well graded	
							Total depth of boring=10 feet	

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. Montgomery  
Consulting Engineers, Inc.

DRILLER HARDIN AND HUBER, INC.

WELL COMPLETION DEPTH 10 FEET

METHOD OF DRILLING HOLLOW STEM AUGER

WELL DIAMETER 2 INCH

HOLE DIAMETER 8 1/4 INCHES

WELL MATERIAL SCHEDULE 40 PVC

TOTAL DEPTH 10 FEET



BORING/WELL NUMBER WP-609

CLIENT U.S. ARMY CORP OF ENGINEERS

PAGE 1 OF 1

DATE STARTED 3/24/90 COMPLETED 3/24/90

PROJECT FORT STORY IRP

ELEVATION 14.11 FEET, MSL

GEOLOGIST GARY B. ENLOE

DEPTH (feet)	SAMPLE	SAMPLE INTERVAL (ft)	BLOWS/6 IN	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
0	LITH	0-2	5 6 9 11	1.6		SM	Vegetation, roots; dark brown sandy SILT, blocky, moist	PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm  No analytical soil samples collected from boring
5						SW	Tan fine SAND, subrounded, well graded, iron staining at 6 feet, water at 6 feet	
5	LITH	5-7	1 2 3 1	2.2		SP	Tan medium SAND, subrounded, poorly graded, saturated	
10							Total depth of boring=10 feet	
15								
20								
25								

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. Montgomery

Consulting Engineers, Inc.

DRILLER HARDIN AND HUBER, INC.

METHOD OF DRILLING HOLLOW STEM AUGER

HOLE DIAMETER 8 1/4 INCHES

TOTAL DEPTH 10 FEET

WELL COMPLETION DEPTH 9 FEET

WELL DIAMETER 2 INCH

WELL MATERIAL SCHEDULE 40 PVC



BORING/WELL NUMBER WP-610

CLIENT U.S. ARMY CORP OF ENGINEERS

PAGE 1 OF 1

DATE STARTED 3/24/90 COMPLETED 3/24/90

PROJECT FORT STORY IRP

ELEVATION 13.57 FEET, MSL

GEOLOGIST GARY B. ENLOE

DEPTH (feet)	SAMPLE	SAMPLE INTERVAL (ft)	BLOWS/ 6 IN	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	COMMENTS
0	LITH	0-2	4	0.8	SM	SM	Vegetation, roots; dark brown sandy SILT, moist	PID Instrumentation PI 101 HNu Systems 10.2 eV lamp PID Background=0.0 ppm  No analytical soil samples collected from boring
5	LITH	5-7	1	0.6	SP	SP	Tan fine SAND, subrounded, poorly graded, moist, water at 6 feet  Buff medium SAND, poorly graded, subrounded, dark brown sandy SILT seams w/organic material  Brown medium SAND, subrounded, poorly graded	
10							Total depth of boring=10 feet	
15								
20								
25								

LITH=Lithology

▼ =Water table during drilling

**JMM** James M. Montgomery DRILLER HARDIN AND HUBER, INC. WELL COMPLETION DEPTH 9 FEET

Consulting Engineers, Inc. METHOD OF DRILLING HOLLOW STEM AUGER WELL DIAMETER 2 INCH

HOLE DIAMETER 8 1/4 INCHES WELL MATERIAL SCHEDULE 40 PVC

TOTAL DEPTH 10 FEET

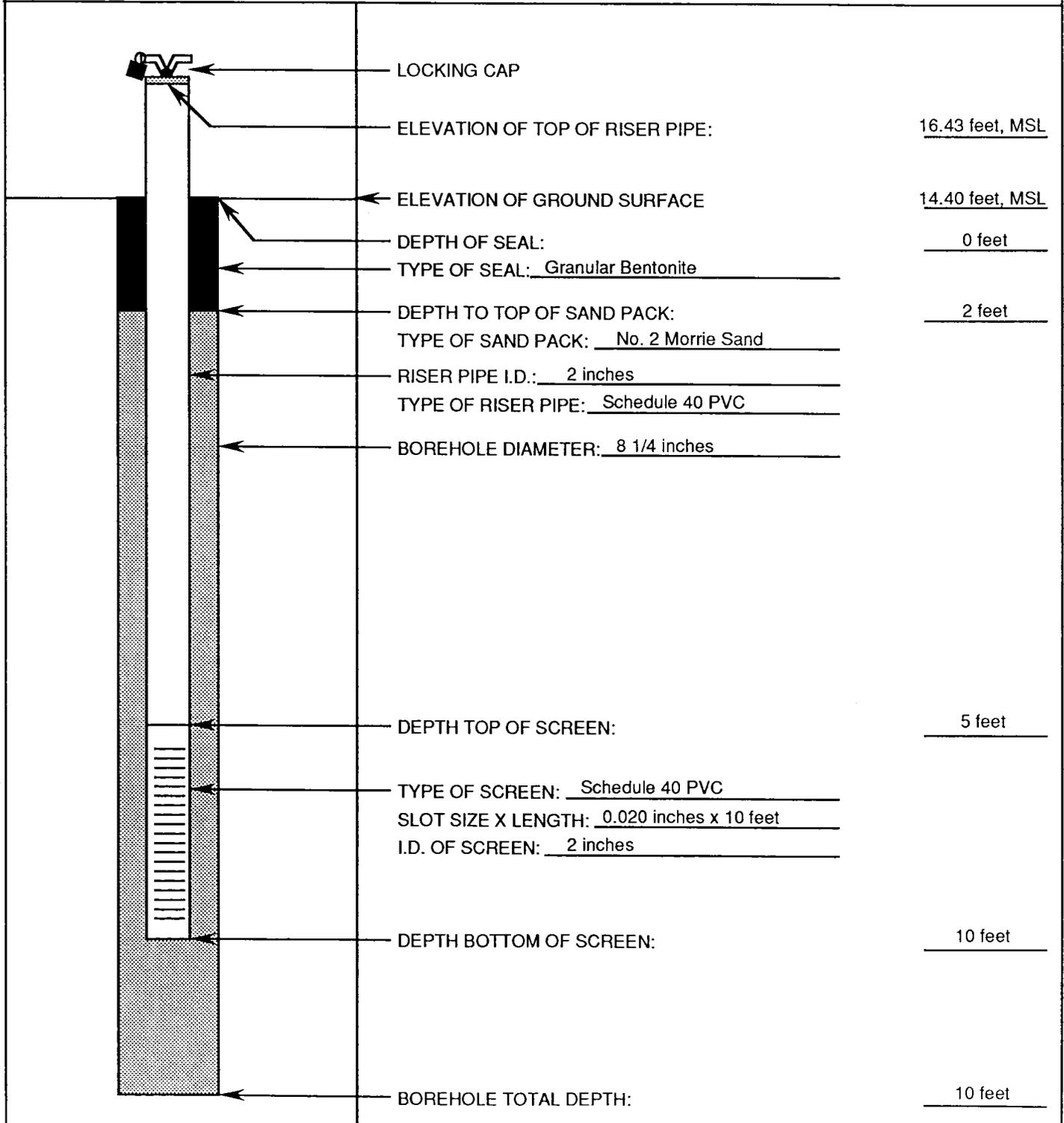


**APPENDIX C**  
**WELL CONSTRUCTION LOGS**



### WELLPOINT CONSTRUCTION DIAGRAM

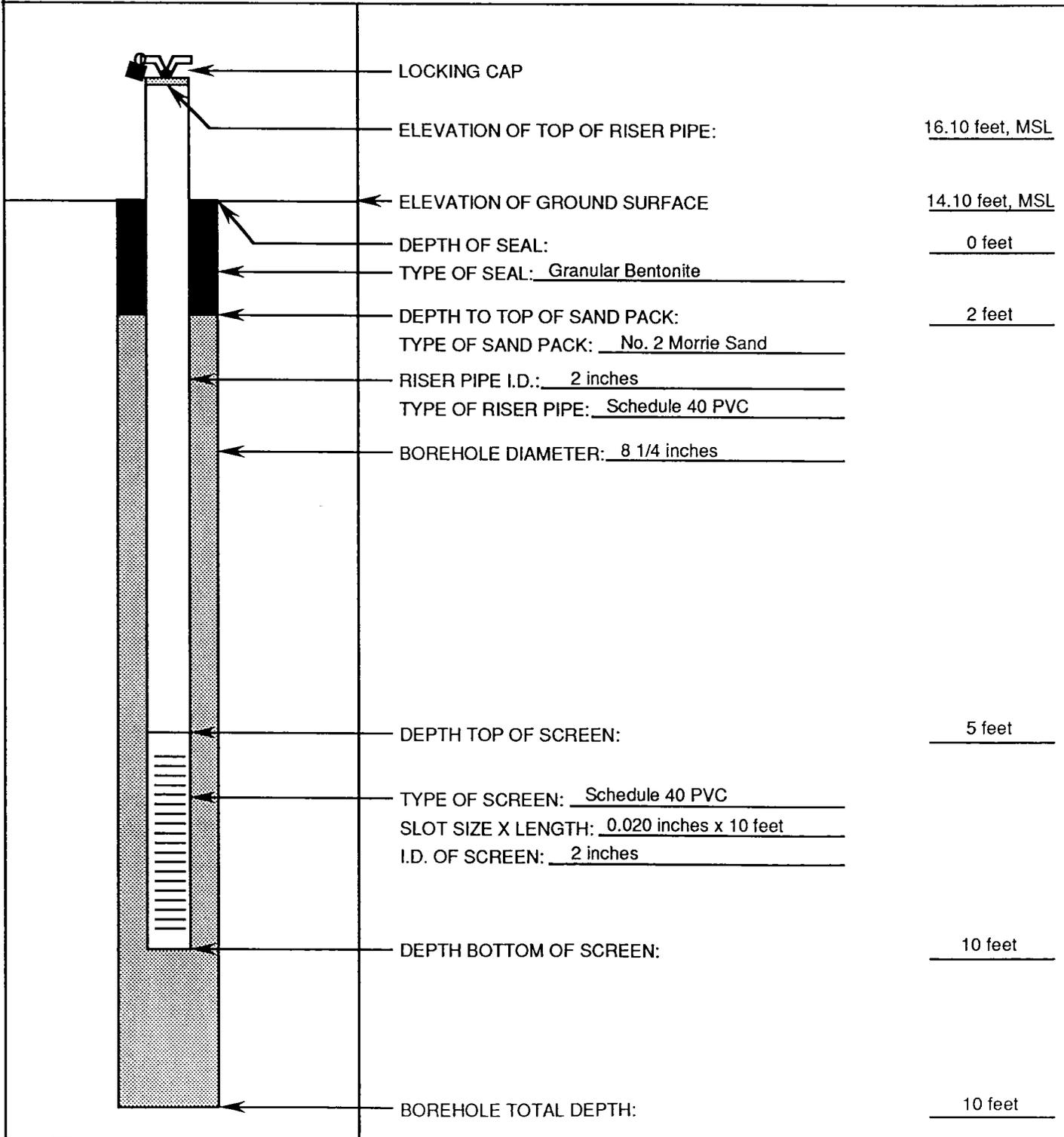
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DATE INSTALLED: 3/23/90 PROJECT: FORT STORY IRP METHOD OF DRILLING: HOLLOW STEM AUGER  
BORING NUMBER: WP-601 GEOLOGIST: GARY B. ENLOE METHOD OF DEVELOPMENT: N/A





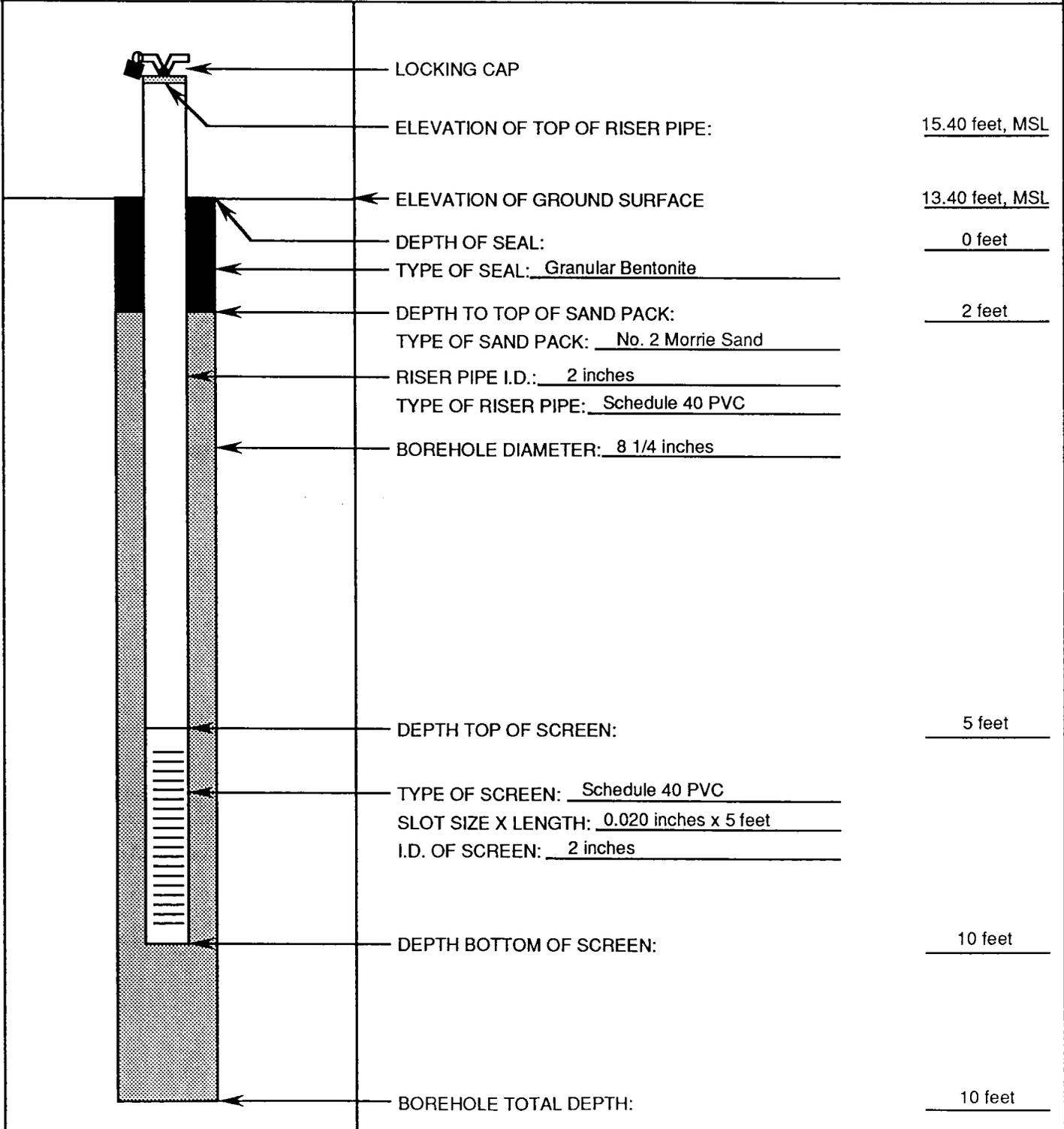
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WELL POINT NUMBER: WP-602 CLIENT: U.S. ARMY CORPS OF ENGINEERS DRILLER: HARDIN AND HUBER, INC.  
 DATE INSTALLED: 3/23/90 PROJECT: FORT STORY IRP METHOD OF DRILLING: HOLLOW STEM AUGER  
 BORING NUMBER: WP-602 GEOLOGIST: GARY B. ENLOE METHOD OF DEVELOPMENT: N/A



**WELLPOINT CONSTRUCTION DIAGRAM**

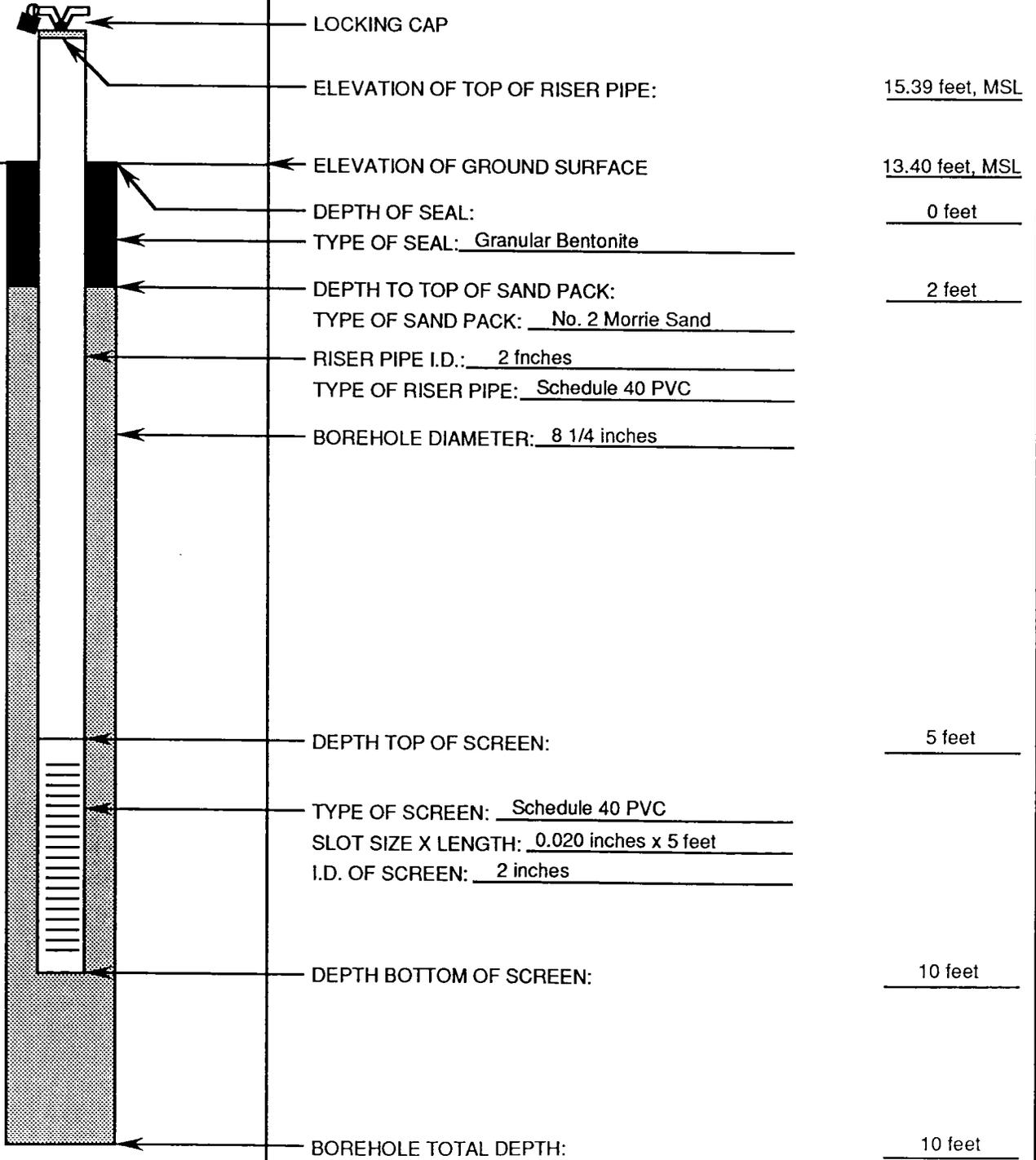
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 DATE INSTALLED: 3/23/90 PROJECT: FORT STORY IRP METHOD OF DRILLING: HOLLOW STEM AUGER  
 BORING NUMBER: WP-603 GEOLOGIST: GARY B. ENLOE METHOD OF DEVELOPMENT: N/A





### WELLPOINT CONSTRUCTION DIAGRAM

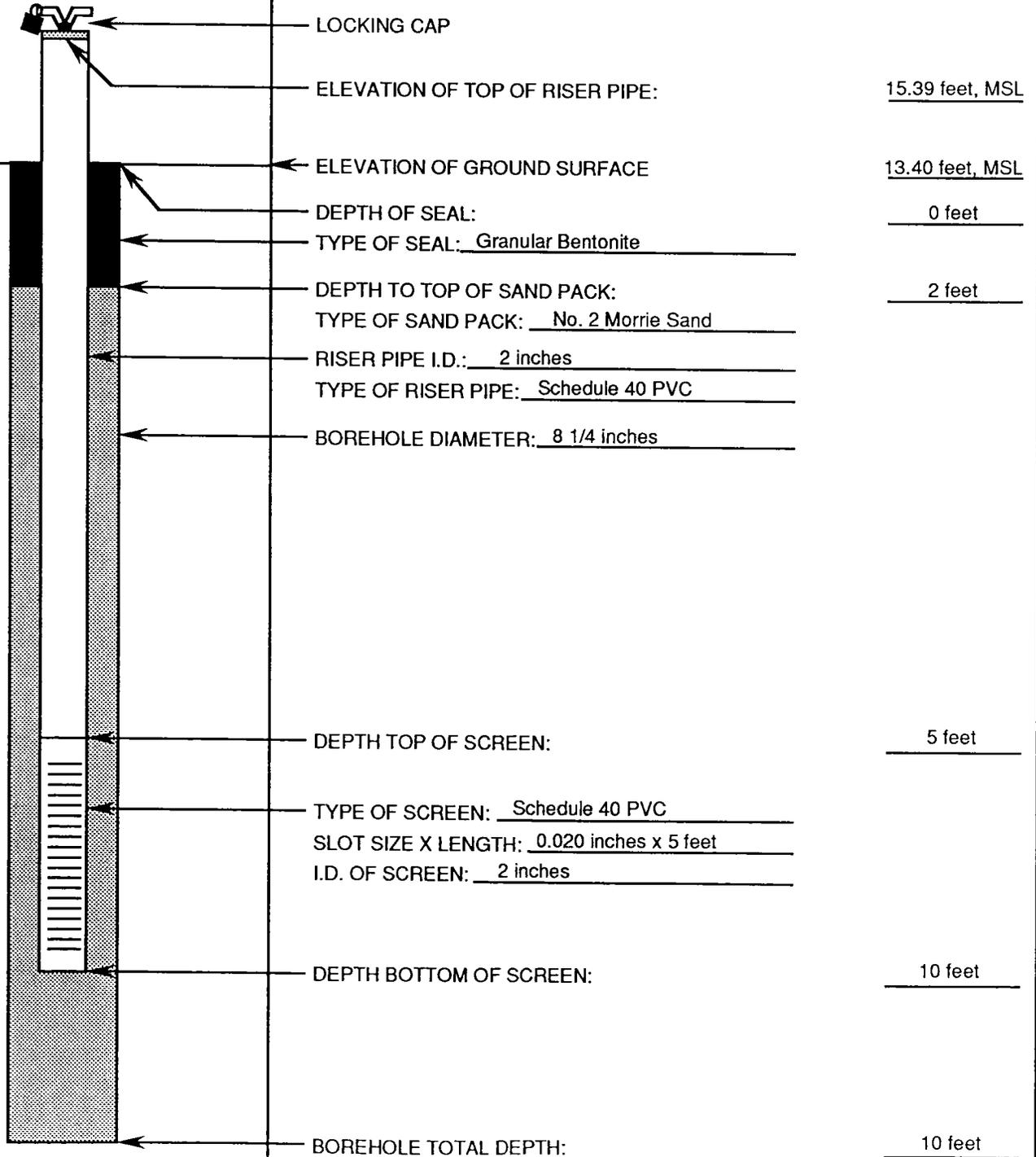
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 DATE INSTALLED: 3/23/90 PROJECT: FORT STORY IRP METHOD OF DRILLING: HOLLOW STEM AUGER  
 BORING NUMBER: WP-604 GEOLOGIST: GARY B. ENLOE METHOD OF DEVELOPMENT: N/A





### WELLPOINT CONSTRUCTION DIAGRAM

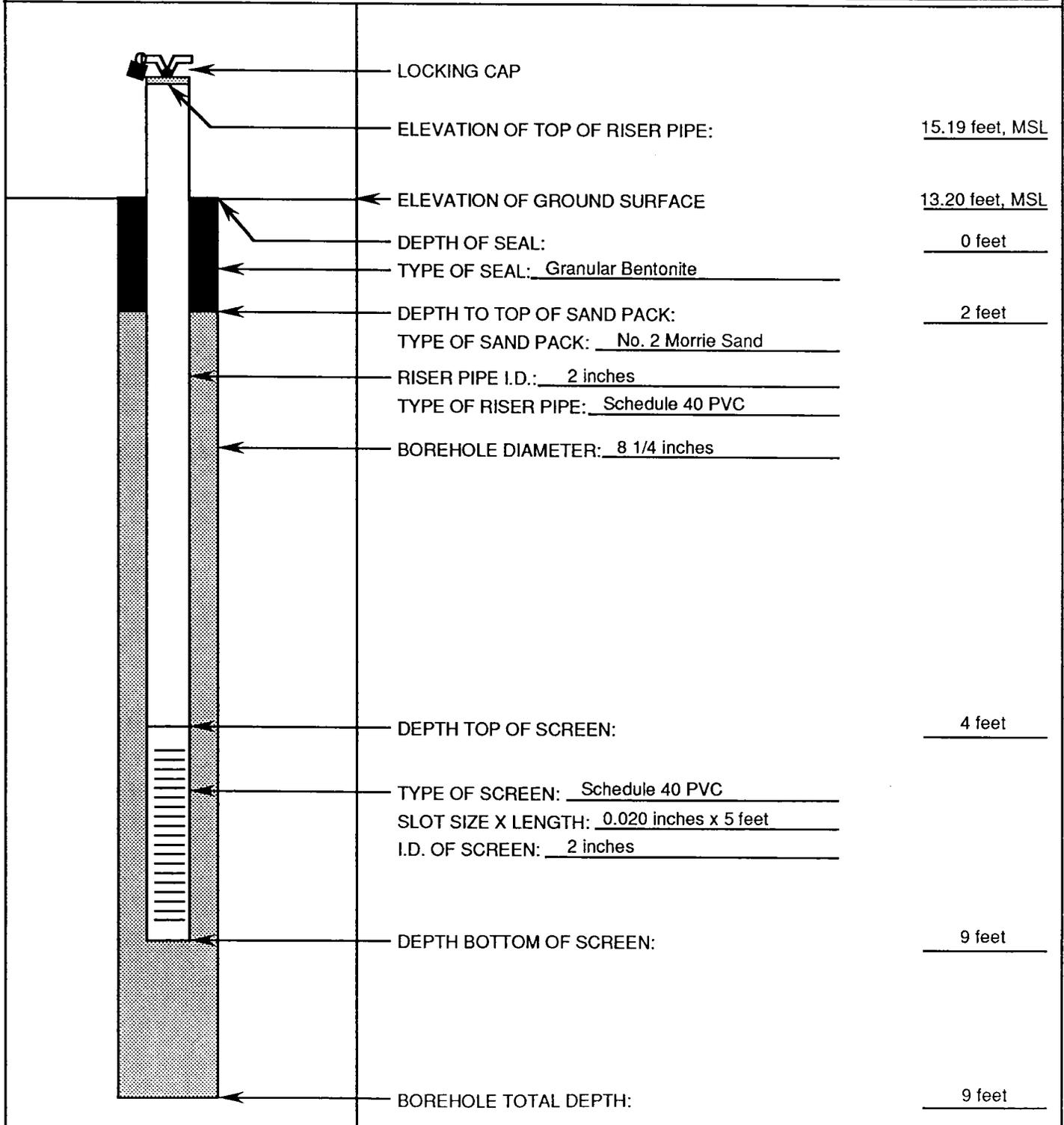
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 DATE INSTALLED: 3/23/90 PROJECT: FORT STORY IRP METHOD OF DRILLING: HOLLOW STEM AUGER  
 BORING NUMBER: WP-604 GEOLOGIST: GARY B. ENLOE METHOD OF DEVELOPMENT: N/A





### WELLPOINT CONSTRUCTION DIAGRAM

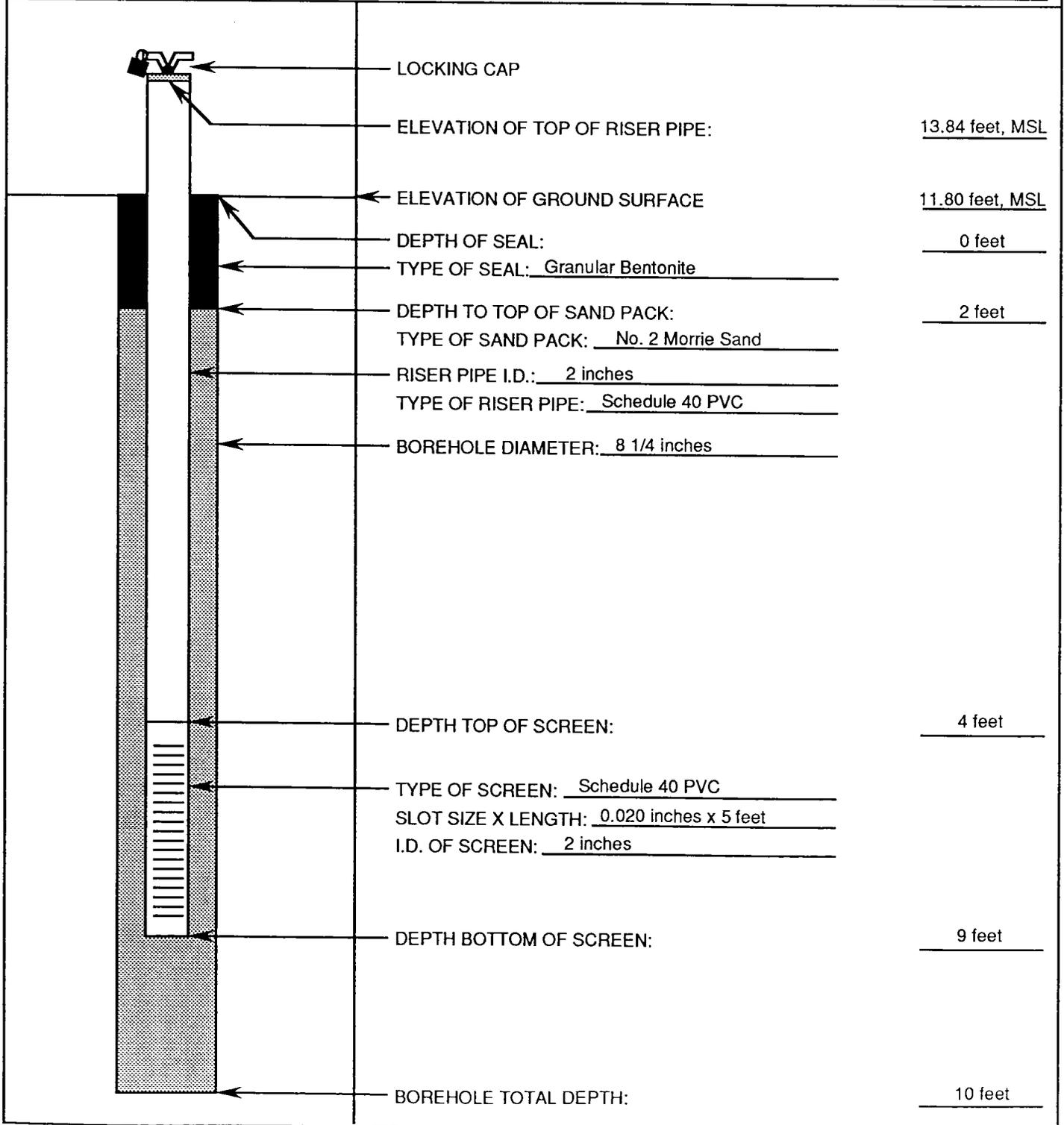
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 DATE INSTALLED: 3/23/90 PROJECT: FORT STORY IRP METHOD OF DRILLING: HOLLOW STEM AUGER  
 BORING NUMBER: WP-605 GEOLOGIST: GARY B. ENLOE METHOD OF DEVELOPMENT: N/A





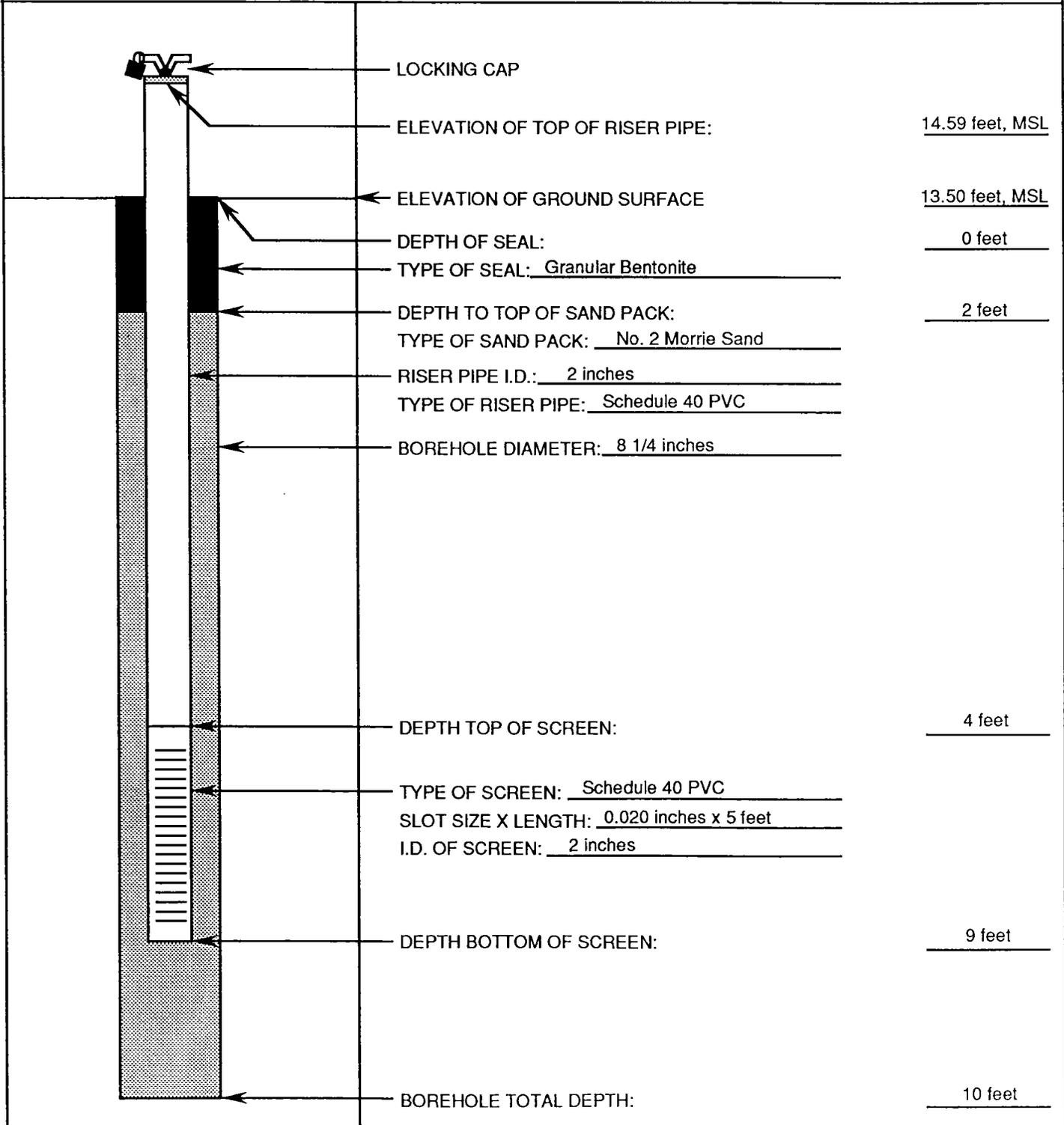
### WELLPOINT CONSTRUCTION DIAGRAM

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 DATE INSTALLED: 3/24/90 PROJECT: FORT STORY IRP METHOD OF DRILLING: HOLLOW STEM AUGER  
 BORING NUMBER: WP-606 GEOLOGIST: GARY B. ENLOE METHOD OF DEVELOPMENT: N/A



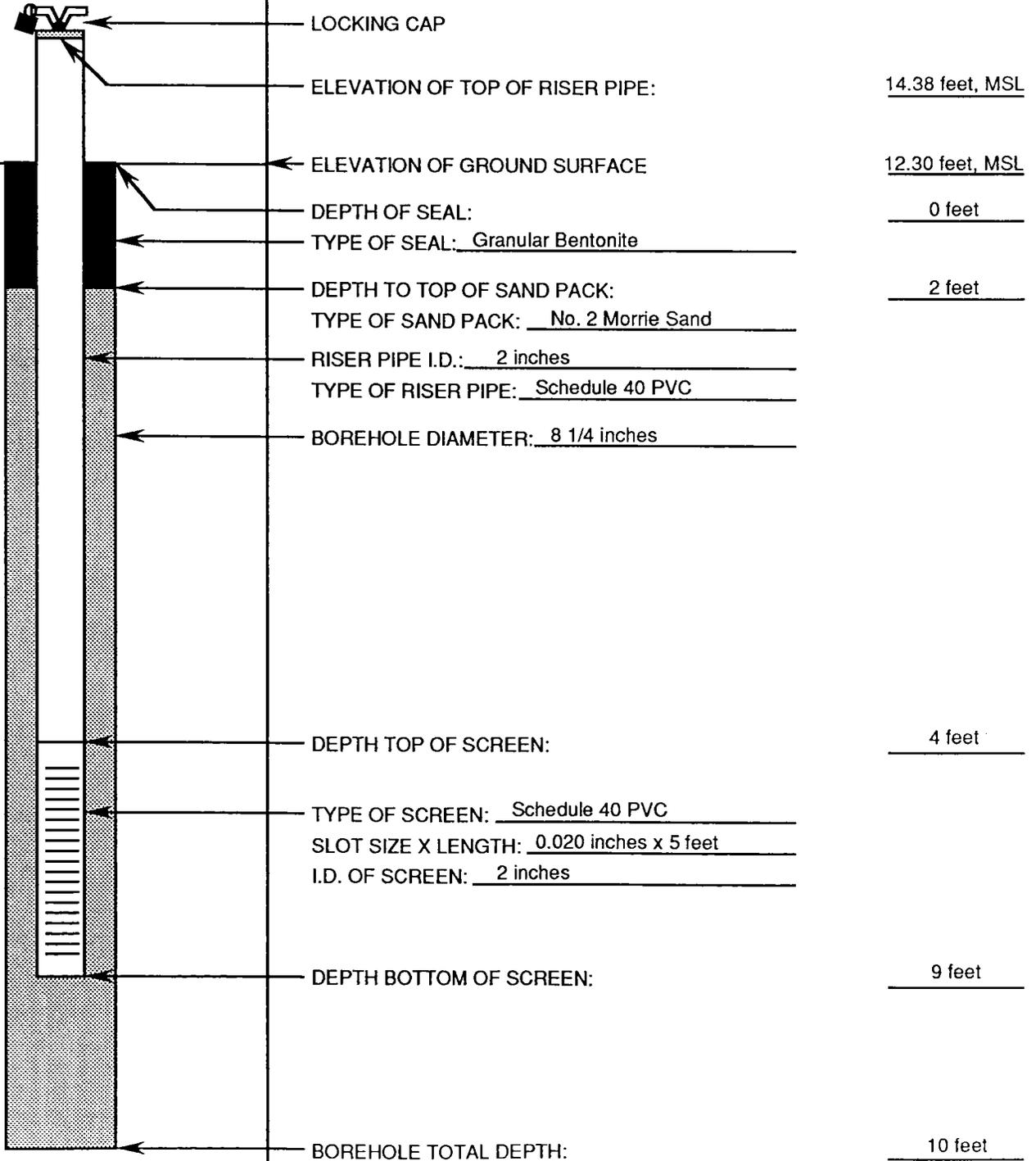
**WELLPOINT CONSTRUCTION DIAGRAM**

WELL POINT NUMBER: WP-607 CLIENT: U.S. ARMY CORPS OF ENGINEERS DRILLER: HARDIN AND HUBER, INC.  
 DATE INSTALLED: 3/24/90 PROJECT: FORT STORY IRP METHOD OF DRILLING: HOLLOW STEM AUGER  
 BORING NUMBER: WP-607 GEOLOGIST: GARY B. ENLOE METHOD OF DEVELOPMENT: N/A



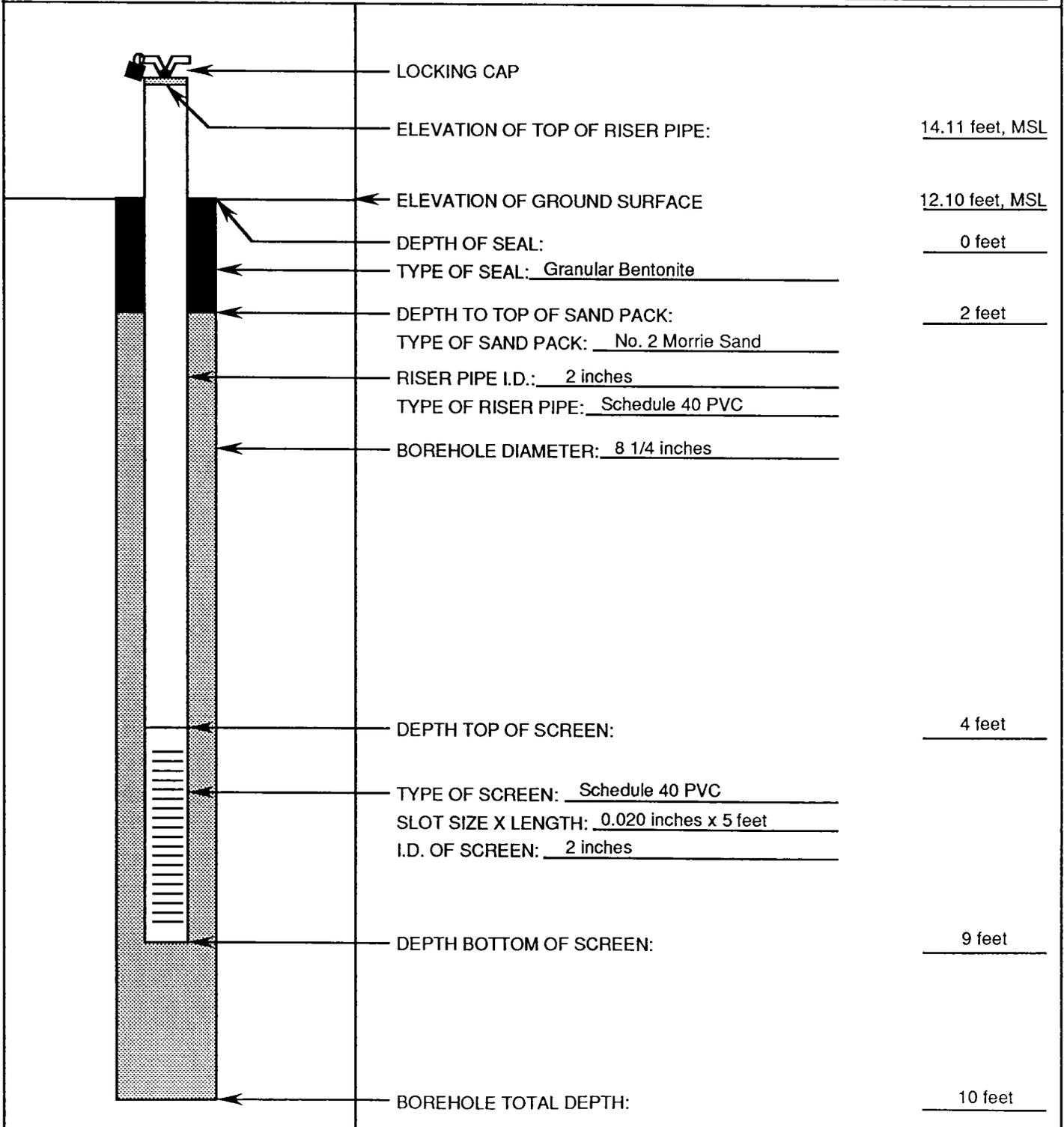
**WELLPOINT CONSTRUCTION DIAGRAM**

WELL POINT NUMBER: WP-608 CLIENT: U.S. ARMY CORPS OF ENGINEERS DRILLER: HARDIN AND HUBER, INC.  
 DATE INSTALLED: 3/23/90 PROJECT: FORT STORY IRP METHOD OF DRILLING: HOLLOW STEM AUGER  
 BORING NUMBER: WP-608 GEOLOGIST: GARY B. ENLOE METHOD OF DEVELOPMENT: N/A



**WELLPOINT CONSTRUCTION DIAGRAM**

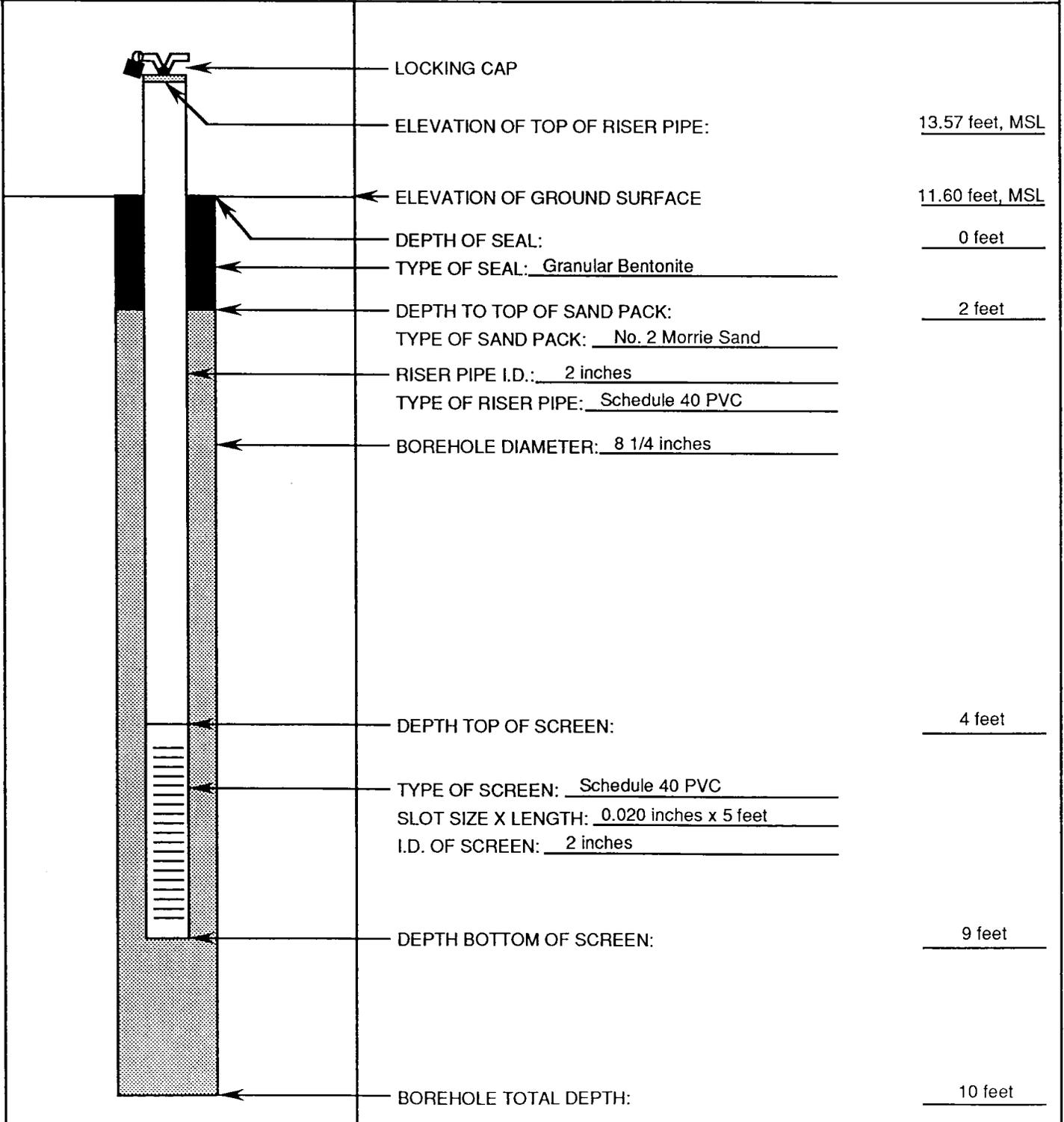
WELL POINT NUMBER: WP-609 CLIENT: U.S. ARMY CORPS OF ENGINEERS DRILLER: HARDIN AND HUBER, INC.  
 DATE INSTALLED: 3/24/90 PROJECT: FORT STORY IRP METHOD OF DRILLING: HOLLOW STEM AUGER  
 BORING NUMBER: WP-609 GEOLOGIST: GARY B. ENLOE METHOD OF DEVELOPMENT: N/A





### WELLPOINT CONSTRUCTION DIAGRAM

WELL POINT NUMBER: WP-610 CLIENT: U.S. ARMY CORPS OF ENGINEERS DRILLER: HARDIN AND HUBER, INC.  
 DATE INSTALLED: 3/23/90 PROJECT: FORT STORY IRP METHOD OF DRILLING: HOLLOW STEM AUGER  
 BORING NUMBER: WP-610 GEOLOGIST: GARY B. ENLOE METHOD OF DEVELOPMENT: N/A



**APPENDIX D**  
**ANALYTICAL DATA — TANK CONTENTS**

MONTGOMERY LABORATORIES  
a division of James M. Montgomery, Consulting Engineers, Inc.  
555 East Walnut Street, Pasadena, California 91101  
(818) 796-9141 / (213) 681-4255 Telex 67-5420

Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34649
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	4/27/90	Date Analyzed:	5/8/90

Lab Number:	K43830
Sample I.D.:	S600TK609(0)

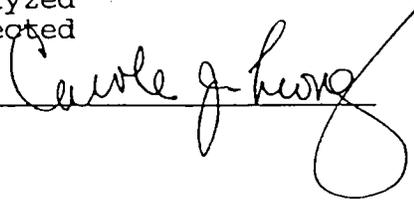
Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	24	0.50
----------------------	----	------

NA: Not analyzed  
ND: Not detected

Approved by



**APPROVED**

MAY 10 1990

QC OFFICER

MONTGOMERY LABORATORIES  
 a division of James M. Montgomery, Consulting Engineers, Inc.  
 555 East Walnut Street, Pasadena, California 91101  
 (818) 796-9141 / (213) 681-4255 Telex 67-5420

Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0451  
 Suite 300 Workorder#: W28291  
 Herndon, VA 22070 Report#: R34665  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 4/22/90 Date Received: 4/24/90  
 Date Extracted: 5/4/90,6/2/90 Date Analyzed: 5/30/90,6/12/90

Lab Number: K43846  
 Sample I.D.: S600TK610(0)

Compound	First Extraction Concentration (milligrams/liter)	Second Extraction Concentration (milligrams/liter)
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HBPH:

High BP Hydrocarbons	164	140000
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The set of samples which were initially extracted on 5/4/90 had low laboratory control sample (LCS) results. LCS1 was <1% (probably not spiked) and LCS2 was 65%. All samples were run but, because LCS1 was below the minimum acceptable limit, the data must be labeled as unreliable.

Most of the samples were re-extracted. The re-extraction analysis does not correlate well with the initial results. Sample heterogeneity and how the aliquots were taken out of the sample bottles probably were the main contributing factors. Initially, the oil floating on the samples was drained off before sampling the water. In subsequent extractions, the organic phase could not be separated from the aqueous phase due to low sample volume.

NA: Not analyzed  
 ND: Not detected

Approved by 

APPROVED

JUL 11 1990

QC OFFICER

MONTGOMERY LABORATORIES  
a division of James M. Montgomery, Consulting Engineers, Inc.  
555 East Walnut Street, Pasadena, California 91101  
(818) 796-9141 / (213) 681-4255 Telex 67-5420

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34664
Attn: Reid Dennis	Phone #: 703-478-3400

---

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	5/4/90,6/15/90	Date Analyzed:	5/30/90,6/22/90

---

Lab Number:	K43845
Sample I.D.:	S600TK611(0)

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Compound	First Extraction Concentration (milligrams/liter)	Second Extraction Concentration (milligrams/liter)
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HBPH:

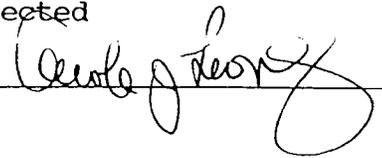
High BP Hydrocarbons	37	77
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The set of samples which were initially extracted on 5/4/90 had low laboratory control sample (LCS) results. LCS1 was <1% (probably not spiked) and LCS2 was 65%. All samples were run but, because LCS1 was below the minimum acceptable limit, the data must be labeled as unreliable.

Most of the samples were re-extracted. The re-extraction analysis does not correlate well with the initial results. Sample heterogeneity and how the aliquots were taken out of the sample bottles probably were the main contributing factors. Initially, the oil floating on the samples was drained off before sampling the water. In subsequent extractions, the organic phase could not be separated from the aqueous phase due to low sample volume.

---

NA: Not analyzed  
ND: Not detected

Approved by 

APPROVED  
JUL 11 1990  
QC OFFICER

MONTGOMERY LABORATORIES  
 a division of James M. Montgomery, Consulting Engineers, Inc.  
 555 East Walnut Street, Pasadena, California 91101  
 (818) 796-9141 / (213) 681-4255 Telex 67-5420

Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34651
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	5/1/90	Date Analyzed:	5/17/90

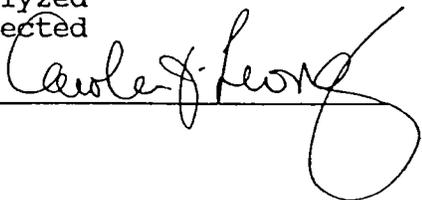
Lab Number:	K43832
Sample I.D.:	S600TK612(0)

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	2.2	0.25
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NA: Not analyzed  
 ND: Not detected

Approved by 

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**MAY 21 1990**  
**QC OFFICER**

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

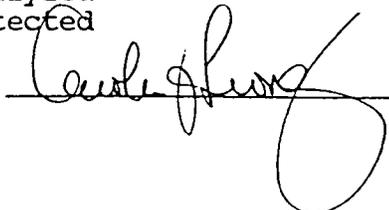
Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34652
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	5/1/90	Date Analyzed:	5/17/90

Lab Number:	K43833
Sample I.D.:	S600TK612(0)D

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
HBPH:		
High BP Hydrocarbons	3.0	0.25

NA: Not analyzed  
ND: Not detected

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MAY 21 1990  
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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34650
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	5/1/90	Date Analyzed:	5/17/90

Lab Number:	K43831
Sample I.D.:	S600TK613(0)

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
HBPH:		
High BP Hydrocarbons	74000	1250

NA: Not analyzed  
ND: Not detected

Approved by 

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**MAY 21 1990**  
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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0451  
 Suite 300 Workorder#: W28291  
 Herndon, VA 22070 Report#: R34658  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 4/22/90 Date Received: 4/24/90  
 Date Extracted: 5/4/90,6/15/90 Date Analyzed: 5/30/90,6/21/90

Lab Number: K43839  
 Sample I.D.: S600TK615(0)

Compound	First Extraction Concentration (milligrams/liter)	Second Extraction Concentration (milligrams/liter)
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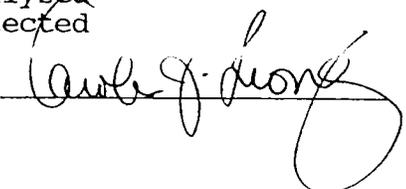
HBPH:

High BP Hydrocarbons	24	32
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The set of samples which were initially extracted on 5/4/90 had low laboratory control sample (LCS) results. LCS1 was <1% (probably not spiked) and LCS2 was 65%. All samples were run but, because LCS1 was below the minimum acceptable limit, the data must be labeled as unreliable.

Most of the samples were re-extracted. The re-extraction analysis does not correlate well with the initial results. Sample heterogeneity and how the aliquots were taken out of the sample bottles probably were the main contributing factors. Initially, the oil floating on the samples was drained off before sampling the water. In subsequent extractions, the organic phase could not be separated from the aqueous phase due to low sample volume.

NA: Not analyzed  
 ND: Not detected

Approved by 

APPROVED  
 JUL 11 1990  
 QC OFFICER

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34659
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	5/4/90,6/2/90	Date Analyzed:	5/30/90,6/8/90

Lab Number:	K43840
Sample I.D.:	S600TK616(0)

Compound	First Extraction Concentration (milligrams/liter)	Second Extration Concentration (milligrams/liter)
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HBPH:

High BP Hydrocarbons	7.4	27
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The set of samples which were initially extracted on 5/4/90 had low laboratory control sample (LCS) results. LCS1 was <1% (probably not spiked) and LCS2 was 65%. All samples were run but, because LCS1 was below the minimum acceptable limit, the data must be labeled as unreliable.

Most of the samples were re-extracted. The re-extraction analysis does not correlate well with the initial results. Sample heterogeneity and how the aliquots were taken out of the sample bottles probably were the main contributing factors. Initially, the oil floating on the samples was drained off before sampling the water. In subsequent extractions, the organic phase could not be separated from the aqueous phase due to low sample volume.

NA: Not analyzed

ND: Not detected

Approved by



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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps (Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34645
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	4/27/90	Date Analyzed:	5/8/90

Lab Number:	K43826
Sample I.D.:	S600TK617(0)

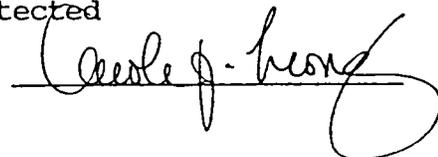
Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	24	0.50
----------------------	----	------

NA: Not analyzed  
ND: Not detected

Approved by



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MAY 10 1990

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#: 1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34646
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	Date Received: 4/24/90
Date Extracted: 4/27/90	Date Analyzed: 5/8/90

Lab Number:	K43827
Sample I.D.:	S600TK620(0)

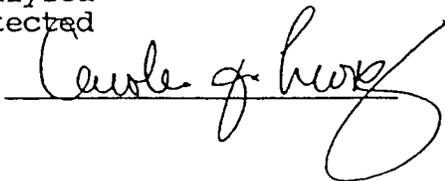
Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	44000	625
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NA: Not analyzed  
 ND: Not detected

Approved by



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**MAY 10 1990**

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34654
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	5/1/90	Date Analyzed:	5/17/90

Lab Number:	<b>K43835</b>
Sample I.D.:	S600TK621(0)

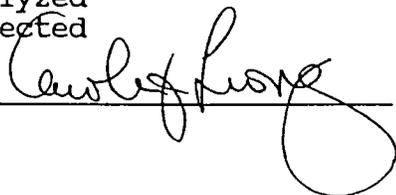
Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	140	5.0
----------------------	-----	-----

NA: Not analyzed  
 ND: Not detected

Approved by



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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34647
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	Date Received: 4/24/90
Date Extracted: 5/1/90	Date Analyzed: 5/17/90

Lab Number:	K43828
Sample I.D.:	S600TK622(0)

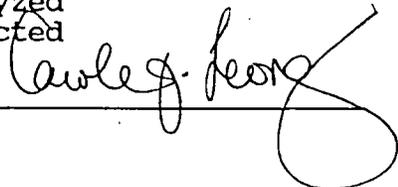
Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	17000	250
----------------------	-------	-----

NA: Not analyzed  
ND: Not detected

Approved by \_\_\_\_\_



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**MAY 21 1990**  
**QC OFFICER**

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#: 1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34648
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	Date Received: 4/24/90
Date Extracted: 4/27/90	Date Analyzed: 5/8/90

Lab Number:	K43829
Sample I.D.:	S600TK622(0)D

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	1400	10
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NA: Not analyzed  
 ND: Not detected

Approved by

*C. G. King*

**APPROVED**  
 MAY 10 1990  
 QC OFFICER

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34655
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	5/1/90	Date Analyzed:	5/17/90

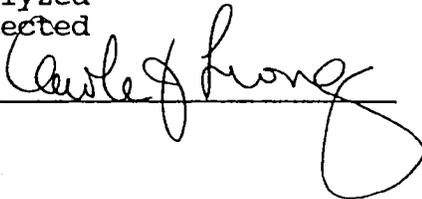
Lab Number:	K43836
Sample I.D.:	S600TK625(0)

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
----------	-------------------------------------	---------------------------------------

HBPH:

High BP Hydrocarbons	32	1.0
----------------------	----	-----

NA: Not analyzed  
 ND: Not detected

Approved by 

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**MAY 21 1990**  
**QC OFFICER**

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps (Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34667
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	5/4/90	Date Analyzed:	5/31/90

Lab Number:	K43848
Sample I.D.:	S600TK629 (0)

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	1.2	0.05
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NA: Not analyzed  
 ND: Not detected

Approved by

*Charles J. Leong*

**APPROVED**

JUN - 4 1990

**QC OFFICER**

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34657
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	5/4/90,6/2/90	Date Analyzed:	5/30/90,6/8/90

Lab Number:	K43838
Sample I.D.:	S600TK632(0)

Compound	First Extraction Concentration (milligrams/liter)	Second Extraction Concentration (milligrams/liter)
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HBPH:

High BP Hydrocarbons	100	81
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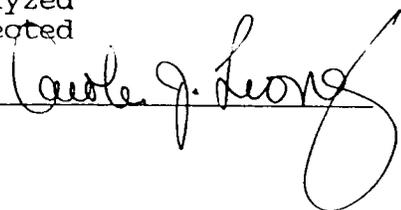
The set of samples which were initially extracted on 5/4/90 had low laboratory control sample (LCS) results. LCS1 was <1% (probably not spiked) and LCS2 was 65%. All samples were run but, because LCS1 was below the minimum acceptable limit, the data must be labeled as unreliable.

Most of the samples were re-extracted. The re-extraction analysis does not correlate well with the initial results. Sample heterogeneity and how the aliquots were taken out of the sample bottles probably were the main contributing factors. Initially, the oil floating on the samples was drained off before sampling the water. In subsequent extractions, the organic phase could not be separated from the aqueous phase due to low sample volume.

NA: Not analyzed

ND: Not detected

Approved by



APPROVED

JUL 11 1990

QC OFFICER

Account: 1868.STORY Name: Army Corps(Ft Story & Eustis)/JMM-VIR-1  
 Workorder: W28291 Rept: R34644  
 Labno: K43843 SID: S600TK635(0)  
 Sample Date: 4/22/90

635

Sample: K43843 S600TK635(0)

Test#	Test Name	Type	Determ.	Result	Det.Limits	Units	Dt Anl
6	AS	1	As	<0.10	0.005	mg/l	900426
15	CD	1	Cd	<0.005	0.005	mg/l	900426
29	CR	1	Cr	<0.010	0.010	mg/l	900426
54	PB	1	Pb	0.06	0.002	mg/l	900601
2623	HIGHBPHC	1	HBP HC	54	0.50	mg/l	900530
2527	PCB	1	1016	ND	2.0	ug/l	900514
			1221	ND	4.0	ug/l	900514
			1232	ND	2.0	ug/l	900514
			1242	ND	2.0	ug/l	900514
			1248	ND	2.0	ug/l	900514
			1254	ND	2.0	ug/l	900514
			1260	ND	2.0	ug/l	900514
			DEcldt	80	24-150	ug/l	900514
2540	TOX	1	TOX	27	10	ug/l	900502

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway PO#:	1868.0451
Suite 300 Workorder#:	W28291
Herndon, VA 22070 Report#:	R34663
Attn: Reid Dennis Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	5/4/90, 6/2/90	Date Analyzed:	5/30/90, 6/12/90

Lab Number:	K43844
Sample I.D.:	S600TK636(0)

Compound	First Extraction Concentration (milligrams/liter)	Second Extraction Concentration (milligrams/liter)
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HBPH:

High BP Hydrocarbons	46	7.8
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The set of samples which were initially extracted on 5/4/90 had low laboratory control sample (LCS) results. LCS1 was <1% (probably not spiked) and LCS2 was 65%. All samples were run but, because LCS1 was below the minimum acceptable limit, the data must be labeled as unreliable.

Most of the samples were re-extracted. The re-extraction analysis does not correlate well with the initial results. Sample heterogeneity and how the aliquots were taken out of the sample bottles probably were the main contributing factors. Initially, the oil floating on the samples was drained off before sampling the water. In subsequent extractions, the organic phase could not be separated from the aqueous phase due to low sample volume.

NA: Not analyzed  
ND: Not detected

Approved by *Carl George*

APPROVED  
JUL 11 1990  
QC OFFICER

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
560 Herndon Parkway PO#: 1868.0451  
Suite 300 Workorder#: W28291  
Herndon, VA 22070 Report#: R34653  
Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 4/22/90 Date Received: 4/24/90  
Date Extracted: 5/1/90 Date Analyzed: 5/17/90

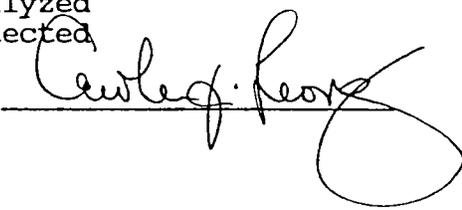
Lab Number: K43834  
Sample I.D.: S600TK643(0)

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	460	5.0
----------------------	-----	-----

NA: Not analyzed  
ND: Not detected

Approved by 

APPROVED  
MAY 21 1990  
QC OFFICER

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps (Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34660
Attn: Reid Dennis	Phone #:	703-478-3400

---

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	5/4/90, 6/15/90	Date Analyzed:	5/30/90-6/21/90

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Lab Number:	K43841
Sample I.D.:	S600TK644(0)

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Compound	First Extraction Concentration (milligrams/liter)	Second Extraction Concentration (milligrams/liter)
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HBPH:

High BP Hydrocarbons	3.2	<0.05
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The set of samples which were initially extracted on 5/4/90 had low laboratory control sample (LCS) results. LCS1 was <1% (probably not spiked) and LCS2 was 65%. All samples were run but, because LCS1 was below the minimum acceptable limit, the data must be labeled as unreliable.

Most of the samples were re-extracted. The re-extraction analysis does not correlate well with the initial results. Sample heterogeneity and how the aliquots were taken out of the sample bottles probably were the main contributing factors. Initially, the oil floating on the samples was drained off before sampling the water. In subsequent extractions, the organic phase could not be separated from the aqueous phase due to low sample volume.

---

NA: Not analyzed  
ND: Not detected

Approved by



APPROVED  
JUL 11 1990  
QC OFFICER

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(818) 796-9141 / (213) 681-4255 Telex 67-5420

Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY	
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34661
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	5/4/90,6/2/90	Date Analyzed:	5/30/90,6/8/90

Lab Number:	K43842
Sample I.D.:	S600TK646(0)

Compound	First Extraction Concentration (milligrams/liter)	Second Extraction Concentration (milligrams/liter)
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HBPH:

High BP Hydrocarbons	26	4.5
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The set of samples which were initially extracted on 5/4/90 had low laboratory control sample (LCS) results. LCS1 was <1% (probably not spiked) and LCS2 was 65%. All samples were run but, because LCS1 was below the minimum acceptable limit, the data must be labeled as unreliable.

Most of the samples were re-extracted. The re-extraction analysis does not correlate well with the initial results. Sample heterogeneity and how the aliquots were taken out of the sample bottles probably were the main contributing factors. Initially, the oil floating on the samples was drained off before sampling the water. In subsequent extractions, the organic phase could not be separated from the aqueous phase due to low sample volume.

NA: Not analyzed  
ND: Not detected

Approved by

*Carole J. Leong*

APPROVED  
JUL 11 1990  
QC OFFICER

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555 East Walnut Street, Pasadena, California 91101  
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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

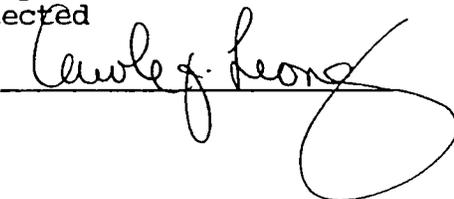
Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34656
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	Date Received: 4/24/90
Date Extracted: 5/1/90	Date Analyzed: 5/17/90

Lab Number:	K43837
Sample I.D.:	S600TK647(0)

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
HBPH:		
High BP Hydrocarbons	520	5.0

NA: Not analyzed  
ND: Not detected

Approved by 

**APPROVED**  
**MAY 21 1990**  
**QC OFFICER**

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34666
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	Date Received: 4/24/90	
Date Extracted: 5/4/90,6/2/90	Date Analyzed: 5/30/90,6/12/90	

Lab Number:	K43847
Sample I.D.:	S600TK648(0)

Compound	First Extraction Concentration (milligrams/liter)	Second Extraction Concentration (milligrams/liter)
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HBPH:

High BP Hydrocarbons	11	7.1
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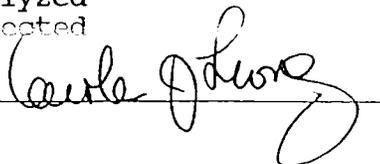
The set of samples which were initially extracted on 5/4/90 had low laboratory control sample (LCS) results. LCS1 was <1% (probably not spiked) and LCS2 was 65%. All samples were run but, because LCS1 was below the minimum acceptable limit, the data must be labeled as unreliable.

Most of the samples were re-extracted. The re-extraction analysis does not correlate well with the initial results. Sample heterogeneity and how the aliquots were taken out of the sample bottles probably were the main contributing factors. Initially, the oil floating on the samples was drained off before sampling the water. In subsequent extractions, the organic phase could not be separated from the aqueous phase due to low sample volume.

NA: Not analyzed

ND: Not detected

Approved by



APPROVED

JUL 11 1990

QC OFFICER

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Report of Analysis for  
 TOTAL ORGANIC HALOGEN

Army Corps (Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34691
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Analyzed:	4/27/90		

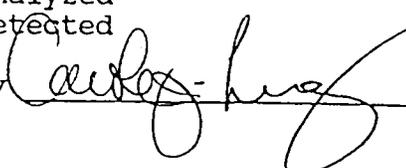
Lab#	Sample Description	Total Organic Halogen (micrograms/liter)	Detection Limit (micrograms/liter)
K43826	S600TK617(0)	160✓	100
K43827	S600TK620(0)	100✓	100
K43828	S600TK622(0)	240✓	100*
K43829	S600TK622(0) D	290✓	200#
K43830	S600TK609(0)	25✓	20**
K43831	S600TK613(0)	170✓	100
K43832	S600TK612(0)	22✓	20**
K43833	S600TK612(0) D	31✓	20***
K43834	S600TK643(0)	160✓	100**
K43835	S600TK621(0)	98✓	40**
K43836	S600TK625(0)	49✓	40**
K43837	S600TK647(0)	66✓	40++
K43838	S600TK632(0)	150✓	100***
K43839	S600TK615(0)	89✓	40***
K43840	S600TK616(0)	84✓	40***
K43841	S600TK644(0)	20✓	17***
K43842	S600TK646(0)	130✓	40+
K43843	S600TK635(0)	27✓	20+
K43844	S600TK636(0)	280✓	80++
K43845	S600TK611(0)	150✓	100+
K43846	S600TK610(0)	170✓	80++
K43847	S600TK648(0)	61✓	40++
K43848	S600TK629(0)	40✓	20++

# replicates have poor precision due to sample matrix.

\*analyzed on 4/26/90, \*\*analyzed on 4/30/90, \*\*\*analyzed on 5/1/90  
 +analyzed on 5/2/90, ++analyzed on 5/3/90

NA: Not Analyzed

ND: Not Detected

Approved by 

**APPROVED**

**MAY - 9 1990**

**QC OFFICER**

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Report of Inorganic Analyses

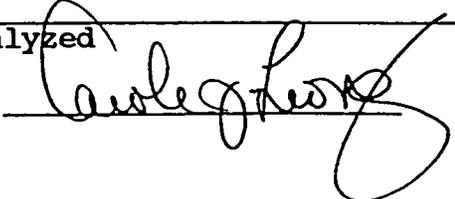
Army Corps (Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0431
Suite 300	Workorder#:	W29223
Herndon, VA 22070	Report#:	R40203
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled: 6/10/90  
Date Completed: 6/19/90

Date Received: 6/12/90

Lab#	Sample I.D.	HalOil mg/kg	Ig deg F
K69402	S10TK631(0)	490	NEG

NA: Not Analyzed

Approved by 

**APPROVED**  
**JUN 25 1990**  
**QC OFFICER**

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Report of Inorganic Analyses

Army Corps (Ft Story & Eustis)/JMM-VIR-1	Job#: 1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34644
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	Date Received: 4/24/90
Date Completed: 6/11/90	

Lab#	Sample I.D.	As mg/l	Cd mg/l	Cr mg/l	Pb mg/l
K43826	S600TK617(0)	<0.10	<0.005	<0.010	0.022
K43827	S600TK620(0)	<0.10	<0.005	<0.010	0.03
K43828	S600TK622(0)	<0.10	<0.005	0.010	0.39
K43829	S600TK622(0)D	<0.10	<0.005	<0.010	0.28
K43830	S600TK609(0) *	<0.025	<0.005	<0.010	0.031
K43831	S600TK613(0)	<0.10	<0.005	<0.010	0.37
K43832	S600TK612(0) *	<0.025	<0.005	<0.010	0.01
K43833	S600TK612(0)D*	<0.025	<0.005	<0.010	0.03
K43834	S600TK643(0)	<0.10	<0.005	0.013	0.57
K43835	S600TK621(0)	<0.10	<0.005	<0.010	0.14
K43836	S600TK625(0)	<0.10	<0.005	<0.010	0.80
K43837	S600TK647(0)	<0.10	<0.005	0.012	0.28
K43838	S600TK632(0)	<0.10	<0.005	<0.010	0.46
K43839	S600TK615(0)	<0.10	<0.005	<0.010	0.39
K43840	S600TK616(0) *	<0.025	<0.005	<0.010	0.06
K43841	S600TK644(0)	<0.10	<0.005	<0.010	<0.01
K43842	S600TK646(0)	<0.10	0.005	<0.010	0.05
K43843	S600TK635(0)	<0.10	<0.005	<0.010	0.06
K43844	S600TK636(0)	<0.10	<0.005	<0.010	0.18
K43845	S600TK611(0)	<0.10	0.019	0.013	4.9
K43846	S600TK610(0)	<0.10	<0.005	0.010	0.15
K43847	S600TK648(0)	<0.10	<0.005	<0.010	0.12
K43848	S600TK629(0)	<0.10	<0.005	0.010	0.15

Samples contain greater than 50% "free product", except for samples denoted with \*.

NA: Not Analyzed

Approved by

*Cheuk C. Wong*

APPROVED

JUN 13 1990

QC OFFICER

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Report of Inorganic Analyses

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Army Corps (Ft Story & Eustis)/JMM-VIR-1	Job#: 1868.STORY
560 Herndon Parkway	PO#: 1868.0431
Suite 300	Workorder#: W29223
Herndon, VA 22070	Report#: R40204
Attn: Reid Dennis	Phone #: 703-478-3400

---

Date Sampled: 6/10/90	Date Received: 6/12/90
Date Completed: 6/22/90	

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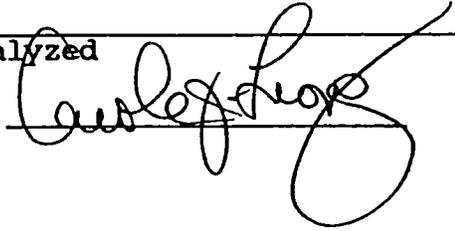
Lab#	Sample I.D.	As mg/kg	Cd mg/kg	Cr mg/kg	Pb mg/kg
K69403	S10TK631(0)	<1.0	<0.05	<0.10	1.0

---



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NA: Not Analyzed

Approved by 

**APPROVED**  
JUN 25 1990  
QC OFFICER

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34672
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	Date Received: 4/24/90
Date Extracted: 4/25/90	Date Analyzed: 5/14/90

Lab Number:	<b>K43830</b>
Sample I.D.:	<b>S600TK609(0)</b>

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by *Charles George*

**APPROVED**  
**MAY 25 1990**  
**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number: K43830  
Sample I.D.: S600TK609(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	74	24-150

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34688
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	4/25/90	Date Analyzed:	5/14/90

Lab Number:	K43846
Sample I.D.:	S600TK610(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	5.0
Arochlor 1221	ND	10
Arochlor 1232	ND	5.0
Arochlor 1242	ND	5.0
Arochlor 1248	ND	5.0
Arochlor 1254	ND	5.0
Arochlor 1260	ND	5.0

Sample required dilution, affecting surrogate recoveries.

ND: Not Detected  
NA: Not Analyzed

Approved by 

**APPROVED**

**MAY 25 1990**

**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number:	K43846
Sample I.D.:	S600TK610(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	<1	24-150

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34687
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	4/25/90	Date Analyzed:	5/14/90

Lab Number:	K43845
Sample I.D.:	S600TK611(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
NA: Not Analyzed

Approved by *Carole J. Long*

**APPROVED**  
**MAY 25 1990**  
**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number:  
Sample I.D.:

K43845  
S600TK611(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	35	24-150

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34674
Attn: Reid Dennis	Phone #: 703-478-3400

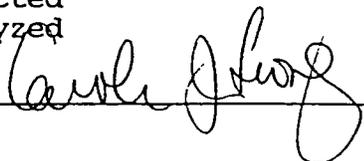
Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	4/25/90	Date Analyzed:	5/14/90

Lab Number:	K43832
Sample I.D.:	S600TK612(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	1.0
Arochlor 1221	ND	2.0
Arochlor 1232	ND	1.0
Arochlor 1242	ND	1.0
Arochlor 1248	ND	1.0
Arochlor 1254	ND	1.0
Arochlor 1260	ND	1.0

ND: Not Detected  
NA: Not Analyzed

Approved by



**APPROVED**

**MAY 25 1990**

**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number:	K43832
Sample I.D.:	S600TK612(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	114	24-150

---

ND: Not Detected  
NA: Not Analyzed

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---

Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway PO#:	1868.0451
Suite 300 Workorder#:	W28291
Herndon, VA 22070 Report#:	R34675
Attn: Reid Dennis Phone #:	703-478-3400

---

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	4/25/90	Date Analyzed:	5/14/90

---

Lab Number:	K43833
Sample I.D.:	S600TK612(0)D

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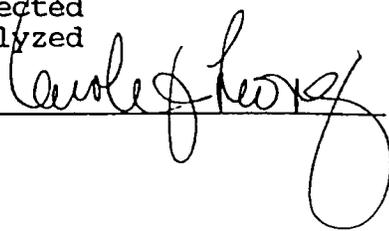
Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	0.20
Arochlor 1221	ND	0.40
Arochlor 1232	ND	0.20
Arochlor 1242	ND	0.20
Arochlor 1248	ND	0.20
Arochlor 1254	ND	0.20
Arochlor 1260	ND	0.20

---

ND: Not Detected

NA: Not Analyzed

Approved by



**APPROVED**  
**MAY 25 1990**  
**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)Lab Number:  
Sample I.D.:K43833  
S600TK612(0)D

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:	.	
Dibutyl Chlorendate	85	24-150

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34673
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	4/25/90	Date Analyzed:	5/14/90

Lab Number:	K43831
Sample I.D.:	S600TK613(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by 

**APPROVED**  
**MAY 25 1990**  
 QC OFFICER

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

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Lab Number: K43831  
Sample I.D.: S600TK613(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	80	24-150

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34681
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	4/25/90	Date Analyzed:	5/14/90

Lab Number:	K43839
Sample I.D.:	S600TK615(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
NA: Not Analyzed

Approved by *Carolyn King*

**APPROVED**  
MAY 25 1990  
QC OFFICER

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

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Lab Number: K43839  
Sample I.D.: S600TK615(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	64	24-150

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34682
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	Date Received: 4/24/90
Date Extracted: 4/25/90	Date Analyzed: 5/14/90

Lab Number:	K43840
Sample I.D.:	S600TK616(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
NA: Not Analyzed

Approved by *Cowley King*

**APPROVED**  
**MAY 25 1990**  
**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

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Lab Number: K43840  
Sample I.D.: S600TK616(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	57	24-150

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

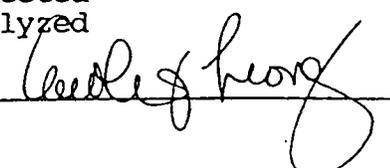
Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34668
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	Date Received: 4/24/90
Date Extracted: 4/25/90	Date Analyzed: 5/14/90

Lab Number:	K43826
Sample I.D.:	S600TK617(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	0.20
Arochlor 1221	ND	0.40
Arochlor 1232	ND	0.20
Arochlor 1242	ND	0.20
Arochlor 1248	ND	0.20
Arochlor 1254	ND	0.20
Arochlor 1260	ND	0.20

ND: Not Detected  
 NA: Not Analyzed

Approved by 

**APPROVED**  
**MAY 25 1990**  
**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number: K43826  
Sample I.D.: S600TK617(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	64	24-150

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34669
Attn: Reid Dennis	Phone #:	703-478-3400

---

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	4/25/90	Date Analyzed:	5/15/90

---

Lab Number:	K43827
Sample I.D.:	S600TK620(0)

---

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	5.0
Arochlor 1221	ND	10
Arochlor 1232	ND	5.0
Arochlor 1242	ND	5.0
Arochlor 1248	ND	5.0
Arochlor 1254	ND	5.0
Arochlor 1260	ND	5.0

---

ND: Not Detected  
NA: Not Analyzed

Approved by *Reid Dennis*

**APPROVED**

**MAY 25 1990**

**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number: K43827  
Sample I.D.: S600TK620(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	<1	24-150

Sample required dilution, affecting surrogate recoveries.

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#:
Suite 300	Workorder#:
Herndon, VA 22070	Report#:
Attn: Reid Dennis	Phone #:
	1868.0451
	W28291
	R34677
	703-478-3400

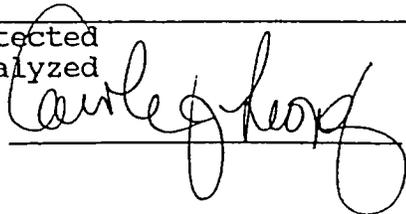
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Date Extracted:	4/25/90	Date Analyzed:	5/14/90

Lab Number:	K43835
Sample I.D.:	S600TK621(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by



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**MAY 25 1990**  
**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number: K43835  
Sample I.D.: S600TK621(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	111	24-150

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

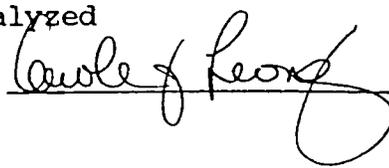
Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#: 1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34670
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	•	Date Received: 4/24/90
Date Extracted: 4/25/90		Date Analyzed: 5/14/90

Lab Number:	K43828
Sample I.D.:	S600TK622(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by 

**APPROVED**  
**MAY 25 1990**  
**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number: K43828  
Sample I.D.: S600TK622(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	134	24-150

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

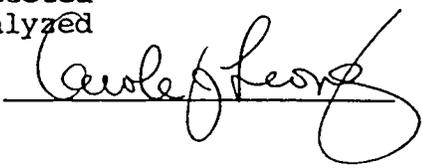
Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34671
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	Date Received: 4/24/90
Date Extracted: 4/25/90	Date Analyzed: 5/14/90

Lab Number:	K43829
Sample I.D.:	S600TK622(0)D

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	10
Arochlor 1221	ND	20
Arochlor 1232	ND	10
Arochlor 1242	ND	10
Arochlor 1248	ND	10
Arochlor 1254	ND	10
Arochlor 1260	ND	10

ND: Not Detected  
 NA: Not Analyzed

Approved by 

**APPROVED**

**MAY 25 1990**

**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

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Lab Number: K43829  
Sample I.D.: S600TK622(0)D

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Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	<1	24-150

Sample required dilution, affecting surrogate recoveries.

---

ND: Not Detected  
NA: Not Analyzed

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POLYCHLORINATED BIPHENYLS (PCBs)

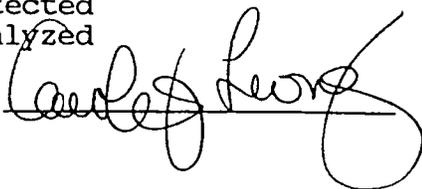
Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28291
Herndon, VA 22070	Report#:	R34678
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	4/25/90	Date Analyzed:	5/14/90

Lab Number:	K43836
Sample I.D.:	S600TK625(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
NA: Not Analyzed

Approved by 

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**MAY 25 1990**  
**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number: K43836  
Sample I.D.: S600TK625(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:	.	
Dibutyl Chlorendate	43	24-150

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

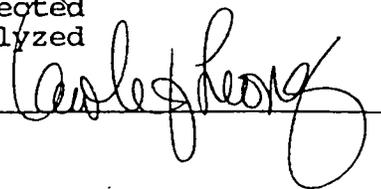
Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34690
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	Date Received: 4/24/90
Date Extracted: 4/25/90	Date Analyzed: 5/14/90

Lab Number:	K43848
Sample I.D.:	S600TK629(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by 

**APPROVED**

MAY 25 1990

LAB OFFICER

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number:	K43848
Sample I.D.:	S600TK629(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	49	24-150

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#:
Suite 300	Workorder#:
Herndon, VA 22070	Report#:
Attn: Reid Dennis	Phone #:
	1868.0451
	W28291
	R34680
	703-478-3400

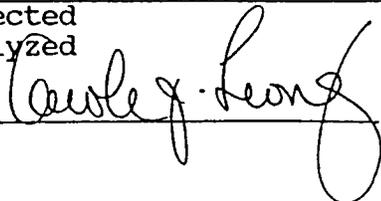
Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	4/25/90	Date Analyzed:	5/14/90

Lab Number:	K43838
Sample I.D.:	S600TK632(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
NA: Not Analyzed

Approved by



**APPROVED**  
**MAY 25 1990**  
**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number:	K43838
Sample I.D.:	S600TK632(0)

---

Compound	Recovery ( % )	QC Limits ( % )
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## SURROGATE:

Dibutyl Chlorendate	122	24-150
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ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

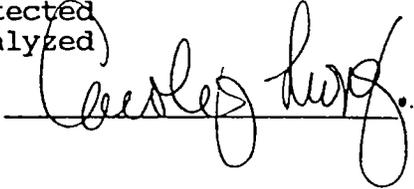
Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0451  
 Suite 300 Workorder#: W28291  
 Herndon, VA 22070 Report#: R34685  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 4/22/90 Date Received: 4/24/90  
 Date Extracted: 4/25/90 Date Analyzed: 5/14/90

Lab Number: K43843  
 Sample I.D.: S600TK635(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by 

APPROVED  
 MAY 25 1990  
 QC OFFICER

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number: K43843  
Sample I.D.: S600TK635(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	80	24-150

---

ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#:
Suite 300	Workorder#:
Herndon, VA 22070	Report#:
Attn: Reid Dennis	Phone #:
	1868.0451
	W28291
	R34686
	703-478-3400

Date Sampled:	4/22/90	Date Received:	4/24/90
Date Extracted:	4/25/90	Date Analyzed:	5/14/90

Lab Number:	K43844
Sample I.D.:	S600TK636(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
NA: Not Analyzed

Approved by *Charles Long*

**APPROVED**  
**MAY 25 1990**  
**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number: K43844  
Sample I.D.: S600TK636(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	54	24-150

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ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

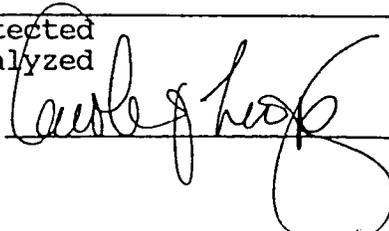
Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0451  
 Suite 300 Workorder#: W28291  
 Herndon, VA 22070 Report#: R34676  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 4/22/90 Date Received: 4/24/90  
 Date Extracted: 4/25/90 Date Analyzed: 5/14/90

Lab Number: K43834  
 Sample I.D.: S600TK643 (0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by 

**APPROVED**  
 MAY 25 1990  
 OFFICER

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

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Lab Number:  
Sample I.D.:

K43834  
S600TK643(0)

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Compound	Recovery ( % )	QC Limits ( % )
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SURROGATE:

Dibutyl Chlorendate

59

24-150

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ND: Not Detected  
NA: Not Analyzed

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28291
Herndon, VA 22070	Report#: R34683
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 4/22/90	Date Received: 4/24/90
Date Extracted: 4/25/90	Date Analyzed: 5/14/90

Lab Number:	K43841
Sample I.D.:	S600TK644(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by 

**APPROVED**

**MAY 25 1990**

**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)Lab Number:  
Sample I.D.:K43841  
S600TK644(0)

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	129	24-150

ND: Not Detected  
NA: Not AnalyzedAPPROVED  
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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0451  
 Suite 300 Workorder#: W28291  
 Herndon, VA 22070 Report#: R34684  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 4/22/90 Date Received: 4/24/90  
 Date Extracted: 4/25/90 Date Analyzed: 5/14/90

Lab Number: K43842  
 Sample I.D.: S600TK646(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by 

APPROVED

MAY 25 1990

CC OFFICER

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number: K43842  
Sample I.D.: S600TK646(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	111	24-150

---

ND: Not Detected  
NA: Not Analyzed

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MAY 25 1990  
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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0451  
 Suite 300 Workorder#: W28291  
 Herndon, VA 22070 Report#: R34679  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 4/22/90 Date Received: 4/24/90  
 Date Extracted: 4/25/90 Date Analyzed: 5/14/90

Lab Number: K43837  
 Sample I.D.: S600TK647(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	1.0
Arochlor 1221	ND	2.0
Arochlor 1232	ND	1.0
Arochlor 1242	ND	1.0
Arochlor 1248	ND	1.0
Arochlor 1254	ND	1.0
Arochlor 1260	ND	1.0

ND: Not Detected  
 NA: Not Analyzed

Approved by 

**APPROVED**  
**MAY 25 1990**  
**QC OFFICER**

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

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Lab Number: K43837  
Sample I.D.: S600TK647(0)

---

Compound	Recovery ( % )	QC Limits ( % )
SURROGATE:		
Dibutyl Chlorendate	55	24-150

---

ND: Not Detected  
NA: Not Analyzed

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 555 East Walnut Street, Pasadena, California 91101  
 (818) 796-9141 / (213) 681-4255 Telex 67-5420

Report of Analysis for  
 POLYCHLORINATED BIPHENYLS (PCBs)

Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0451  
 Suite 300 Workorder#: W28291  
 Herndon, VA 22070 Report#: R34689  
 Attn: Reid Dennis Phone #: 703-478-3400

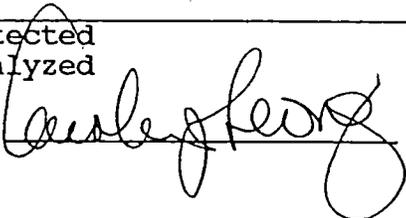
Date Sampled: 4/22/90 Date Received: 4/24/90  
 Date Extracted: 4/25/90 Date Analyzed: 5/14/90

Lab Number: K43847  
 Sample I.D.: S600TK648(0)

Compound	Concentration (micrograms/liter)	Detection Limit (micrograms/liter)
Arochlor 1016	ND	0.10
Arochlor 1221	ND	0.20
Arochlor 1232	ND	0.10
Arochlor 1242	ND	0.10
Arochlor 1248	ND	0.10
Arochlor 1254	ND	0.10
Arochlor 1260	ND	0.10

ND: Not Detected  
 NA: Not Analyzed

Approved by



APPROVED

MAY 25 1990

QC OFFICER

Report of Analysis for  
POLYCHLORINATED BIPHENYLS (PCBs)

---

Lab Number: K43847  
Sample I.D.: S600TK648(0)

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Compound	Recovery ( % )	QC Limits ( % )
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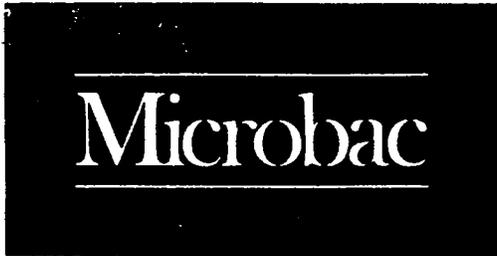
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SURROGATE:

Dibutyl Chlorendate	113	24-150
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ND: Not Detected  
NA: Not Analyzed



DATE RECEIVED: 03-26-90  
DATE REPORTED: 04-09-90  
CUSTOMER PO#:  
LABORATORY #: 039079  
INVOICE #: 1144

JAMES M. MONTGOMERY & ASSOC.  
560 HERNDON PARKWAY SUITE 300  
HERNDON, VA 22070  
ATTN: DAMIAN SANDOVAL

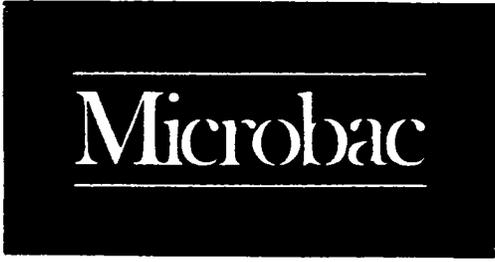
CERTIFICATE OF ANALYSIS

SAMPLE ID	TEST/METHOD	RESULT	UNIT
CHAIN OF CUSTODY # 281			
A. S10TK615 ✓	FK MOISTURE BTU	94 NO IGNITION	% ****
B. S10TK614	FK MOISTURE BTU	78 380	% BTU/LB
C. S10TK612 ✓	FK MOISTURE BTU	96 NO IGNITION	% ****

RESPECTFULLY SUBMITTED,  
*Michelle MinsheW-Wagner (atw)*

MICHELLE MINSHEW-WAGNER  
LABORATORY DIRECTOR

ATW



DATE RECEIVED: 03-24-90  
DATE REPORTED: 06-12-90  
CUSTOMER PO#:  
LABORATORY #: 049013  
INVOICE #: 1145

JAMES M. MONTGOMERY & ASSOC.  
560 HERNDON PARKWAY SUITE 300  
HERNDON, VA 22070  
ATTN: DAMIAN SANDOVAL

CERTIFICATE OF ANALYSIS

SAMPLE ID	TEST/METHOD	RESULT	UNIT
CHAIN OF CUSTODY # 290			
A. S10TK611 ✓	FK MOISTURE BTU	97 NO IGNITION	% ****
B. S10TK610 ✓	FK MOISTURE BTU	95 NO IGNITION	% ****
C. S10TK607 ✓	FK MOISTURE BTU	<0.5 19,468	% BTU/LB
D. S10TK609 ✓	FK MOISTURE BTU	83 NO IGNITION	% ****
E. S10TK10FP ✓ (S10TK610FP)	FK MOISTURE BTU	<0.5 17,003	% BTU/LB

RESPECTFULLY SUBMITTED,  
*Michelle MinsheW - Wagner (atw)*  
MICHELLE MINSHEW-WAGNER  
LABORATORY DIRECTOR

ATW



DATE RECEIVED: 03-21-90  
DATE REPORTED: 05-07-90  
CUSTOMER PO#:  
LABORATORY #: C39063 A-F  
INVOICE #: 0998

JAMES M. MONTGOMERY & ASSOC.  
560 HERNDON PARKWAY SUITE 300  
HERNDON, VA 22070  
ATTN: REID DENNIS

CERTIFICATE OF ANALYSIS

SAMPLE ID	TEST/METHOD	RESULT	UNIT
CHAIN OF CUSTODY # 312			
A. S10TK644000320 ✓	FK MOISTURE BTU	71.0 NO IGNITION	% *****
B. S10TK646000320 /	FK MOISTURE BTU	96.5 NO IGNITION	% *****
C. S10TK647000320 ✓	FK MOISTURE BTU	79.0 NO IGNITION	% *****
D. S10TK636000320 ✓	FK MOISTURE BTU	94.0 NO IGNITION	% *****
E. S10TK636000320FP ✓	FK MOISTURE BTU	27.2 14,235	% BTU/LB
F. S10TK635000320 ✓	FK MOISTURE BTU	86.0 NO IGNITION	% *****

RESPECTFULLY SUBMITTED,

*Michelle Minshe-Wagner*

MICHELLE MINSHEW-WAGNER  
LABORATORY DIRECTOR

ATW



DATE RECEIVED: 03-22-90  
DATE REPORTED: 05-07-90  
CUSTOMER PO#:  
LABORATORY #: 039064 A-G  
INVOICE #: 0997

JAMES M. MONTGOMERY & ASSOC.  
560 HERNDON PARKWAY SUITE 300  
HERNDON, VA 22070  
ATTN: REID DENNIS

CERTIFICATE OF ANALYSIS

SAMPLE ID	TEST/METHOD	RESULT	UNIT
CHAIN OF CUSTODY # 310			
A. S10TK629000321 ✓	FK MOISTURE BTU	91.0 NO IGNITION	% *****
B. S10TK628000321FP ✓	FK MOISTURE BTU	<0.5 19,471	% BTU/LB
C. S10TK630000321FP ✓	FK MOISTURE BTU	<0.5 19,560	% BTU/LB
D. S10TK63100321 ✓	FK MOISTURE BTU	9.4 6,065	% BTU/LB
E. S10TK63200321 ✓	FK MOISTURE BTU	66.0 NO IGNITION	% *****
F. S10TK643000321 ✓	FK MOISTURE BTU	66.5 747.8	% BTU/LB
G. S10TK648000321 ✓	FK MOISTURE BTU	96.5 NO IGNITION	% *****

RESPECTFULLY SUBMITTED,

*Michelle Minschew-Wagner*  
MICHELLE MINSHEW-WAGNER  
LABORATORY DIRECTOR

ATW



DATE RECEIVED: 03-26-90  
DATE REPORTED: 05-07-90  
CUSTOMER PO#:  
LABORATORY #: 039076 A-I  
INVOICE #: 0999

JAMES M. MONTGOMERY & ASSOC.  
560 HERNDON PARKWAY SUITE 300  
HERNDON, VA 22070  
ATTN: REID DENNIS

CERTIFICATE OF ANALYSIS

SAMPLE ID	TEST/METHOD	RESULT	UNIT
CHAIN OF CUSTODY # 279			
X A. S10TK623	FK MOISTURE BTU	96.0 NO IGNITION	% *****
B. S10TK623FP ✓	FK MOISTURE BTU	1.3 1,654	% BTU/LB
C. S10TK624FP ✓	FK MOISTURE BTU	<0.5 19,560	% BTU/LB
D. S10TK622 ✓	FK MOISTURE BTU	75.2 NO IGNITION	% *****
E. S10TK618FP ✓	FK MOISTURE BTU	<0.5 19,520	% BTU/LB
F. S10TK620 ✓	FK MOISTURE BTU	39.0 NO IGNITION	% *****
G. S10TK620FP ✓	FK MOISTURE BTU	1.0 19,480	% BTU/LB
H. S10TK621 ✓	FK MOISTURE BTU	98.7 NO IGNITION	% *****
I. S10TK616 ✓	FK MOIATURE BTU	97.5 NO IGNITION	% *****

RESPECTFULLY SUBMITTED,

*Michelle Minshe Wagner*  
MICHELLE MINSHEW-WAGNER  
LABORATORY DIRECTOR

ATW



Microbac

DATE RECEIVED: 05-08-90  
DATE REPORTED: 05-15-90  
CUSTOMER PO#:  
LABORATORY #: 039077  
INVOICE #: 1032

JAMES M. MONTGOMERY & ASSOC.  
560 HERNDON PARKWAY SUITE 300  
HERNDON, VA 22070  
ATTN: DAMIAN SANDOVAL

CERTIFICATE OF ANALYSIS

SAMPLE ID	TEST/METHOD	RESULT	UNIT
CHAIN OF CUSTODY # 266			
A. S10TK625 ✓	FK MOISTURE BTU	88.5 893	% BTU/LB
B. S10TK626FP ✓	FK MOISTURE BTU	<0.5 19,557	% BTU/LB
C. S10TK613 ✓	FK MOISTURE BTU	62.5 1612	% BTU/LB
D. S10TK617 ✓	FK MOISTURE BTU	85.0 463	% BTU/LB

RESPECTFULLY SUBMITTED,

MICHELLE MINSHEW-WAGNER  
LABORATORY DIRECTOR

MAY 21 1990

ATW



RECEIVED  
MAY 23 1990  
LABORATORY CONSULTING  
LABORATORY

DATE RECEIVED: 05-08-90  
DATE REPORTED: 05-15-90  
CUSTOMER PO#:  
LABORATORY #: 039078  
INVOICE #: 1033

JAMES M. MONTGOMERY & ASSOC.  
560 HERNDON PARKWAY SUITE 300  
HERNDON, VA 22070  
ATTN: DAMIAN SANDOVAL

CERTIFICATE OF ANALYSIS

SAMPLE ID	TEST/METHOD	RESULT	UNIT
CHAIN OF CUSTODY # 263			
A. S10TK607FP ✓	FK MOISTURE BTU	<0.5 19,387	% BTU/LB
B. S10TK612 ✓	FK MOISTURE BTU	96.5 No INGNITION	% *****
C. S10TK626FP ✓	FK MOISTURE BTU	<0.5 19,611	% BTU/LB
D. S10TK622FP ✓	FK MOISTURE BTU	<0.5 19,443	% BTU/LB
E. S10TK609 ✓	FK MOISTURE BTU	<0.5 19,457	% BTU/LB
F. S10TK614 ✓	FK BTU	<0.5 19,545	% BTU/LB

RESPECTFULLY SUMITTED,

*Michelle Minshew-Wagner (akw)*

MICHELLE MINSHEW-WAGNER  
LABORATORY DIRECTOR

D.A.F

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Soil

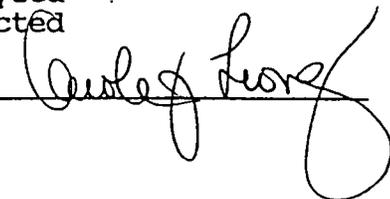
Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
560 Herndon Parkway PO#: 1868.0451  
Suite 300 Workorder#: W28040  
Herndon, VA 22070 Report#: R31396  
Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 3/21/90 Date Received: 4/10/90  
Date Extracted: 4/17/90 Date Analyzed: 4/30/90

Lab Number: K41970  
Sample I.D.: S10TR607FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
HBPH:		
High BP Hydrocarbons	1050000	50000

NA: Not analyzed  
ND: Not detected

Approved by 

APPROVED  
MAY - 7 1990  
QC OFFICER

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0401
Suite 300	Workorder#:	W28031
Herndon, VA 22070	Report#:	R31323
Attn: Reid Dennis	Phone #:	703-478-3400

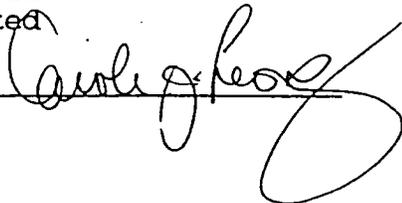
Date Sampled:	3/24/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	5/2/90

Lab Number:	K41934
Sample I.D.:	S10TK607FPDUP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
HBPH:		
High BP Hydrocarbons	1180000	50000

NA: Not analyzed  
 ND: Not detected

Approved by



**APPROVED**  
**MAY - 7 1990**  
**QC OFFICER**

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
560 Herndon Parkway PO#: 1868.0401  
Suite 300 Workorder#: W28031  
Herndon, VA 22070 Report#: R31326  
Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 3/24/90 Date Received: 4/10/90  
Date Extracted: 4/17/90 Date Analyzed: 4/30/90

Lab Number: K41937  
Sample I.D.: S10TK609FP

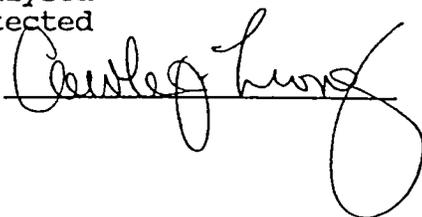
Compound Concentration (milligrams/kilogram) Detection Limit (milligrams/kilogram)

HBPH:

High BP Hydrocarbons 1060000 50000

NA: Not analyzed  
ND: Not detected

Approved by



**APPROVED**  
**MAY - 2 1990**  
**QC OFFICER**

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28040
Herndon, VA 22070	Report#:	R31397
Attn: Reid Dennis	Phone #:	703-478-3400

---

Date Sampled:	3/21/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/30/90

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Lab Number:	K41971
Sample I.D.:	S10TK610FP

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Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
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HBPH:

High BP Hydrocarbons	1020000	50000
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NA: Not analyzed  
ND: Not detected

Approved by 

**APPROVED**  
MAY - 2 1990  
QC OFFICER

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0401
Suite 300	Workorder#: W28031
Herndon, VA 22070	Report#: R31327
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled:	3/24/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/30/90

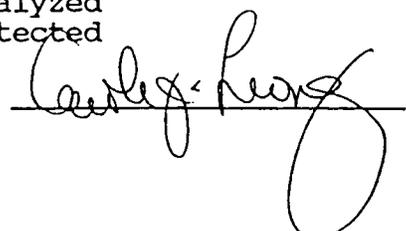
Lab Number:	K41938
Sample I.D.:	S10TK614FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
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HBPH:

High BP Hydrocarbons	940000	50000
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NA: Not analyzed  
 ND: Not detected

Approved by 

**APPROVED**  
**MAY - 2 1990**

**QC OFFICER**

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 a division of James M. Montgomery, Consulting Engineers, Inc.  
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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway PO#:	1868.0451
Suite 300 Workorder#:	W28038
Herndon, VA 22070 Report#:	R31374
Attn: Reid Dennis Phone #:	703-478-3400

Date Sampled:	3/23/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/30/90

Lab Number:	K41960
Sample I.D.:	S10TK618FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
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HBPH:

High BP Hydrocarbons	960000	50000
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NA: Not analyzed  
 ND: Not detected

Approved by Carol Perry

**APPROVED**  
**MAY - 2 1990**  
**QC OFFICER**

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---

Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28038
Herndon, VA 22070	Report#: R31375
Attn: Reid Dennis	Phone #: 703-478-3400

---

Date Sampled: 3/23/90	Date Received: 4/10/90
Date Extracted: 4/17/90	Date Analyzed: 4/30/90

---

Lab Number:	K41961
Sample I.D.:	S10TK620FP

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Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
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HBPH:

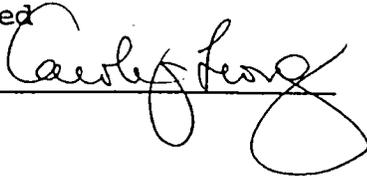
High BP Hydrocarbons	1150000	50000
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---

NA: Not analyzed

ND: Not detected

Approved by \_\_\_\_\_



**APPROVED**  
**MAY - 2 1990**  
**QC OFFICER**

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0401
Suite 300	Workorder#:	W28031
Herndon, VA 22070	Report#:	R31325
Attn: Reid Dennis	Phone #:	703-478-3400

---

Date Sampled:	3/24/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/30/90

---

Lab Number:	<b>K41936</b>
Sample I.D.:	S10TK622FP

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Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
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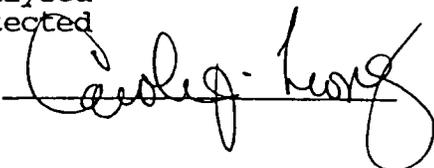
HBPH:

High BP Hydrocarbons	1000000	50000
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---

NA: Not analyzed  
 ND: Not detected

Approved by



**APPROVED**  
**MAY 15 1990**  
**QC OFFICER**

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555 East Walnut Street, Pasadena, California 91101  
(818) 796-9141 / (213) 681-4255 Telex 67-5420

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28038
Herndon, VA 22070	Report#:	R31372
Attn: Reid Dennis	Phone #:	703-478-3400

---

Date Sampled:	3/23/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/30/90

---

Lab Number:	K41958
Sample I.D.:	S10TK623FP

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Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
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HBPH:

High BP Hydrocarbons	1100000	50000
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NA: Not analyzed  
ND: Not detected

Approved by *Carley Long*

**APPROVED**  
**MAY - 2 1990**  
**QC OFFICER**

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 (818) 796-9141 / (213) 681-4255 Telex 67-5420

Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28038
Herndon, VA 22070	Report#:	R31373
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	3/23/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/30/90

Lab Number:	K41959
Sample I.D.:	S10TK624FP

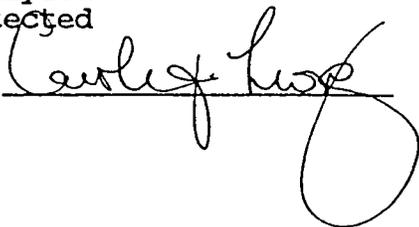
Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
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HBPH:

High BP Hydrocarbons	1030000	50000
----------------------	---------	-------

NA: Not analyzed  
 ND: Not detected

Approved by



**APPROVED**

**MAY - 2 1990**

**QC OFFICER**

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 a division of James M. Montgomery, Consulting Engineers, Inc.  
 555 East Walnut Street, Pasadena, California 91101  
 (818) 796-9141 / (213) 681-4255 Telex 67-5420

Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway PO#:	1868.0451
Suite 300 Workorder#:	W28039
Herndon, VA 22070 Report#:	R31383
Attn: Reid Dennis Phone #:	703-478-3400

Date Sampled:	3/23/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/30/90

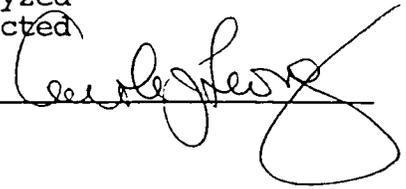
Lab Number:	K41963
Sample I.D.:	S10TK626FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
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HBPH:

High BP Hydrocarbons	1130000	50000
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NA: Not analyzed  
 ND: Not detected

Approved by 

**APPROVED**

**MAY 2 1990**

**QC OFFICER**

MONTGOMERY LABORATORIES  
 a division of James M. Montgomery, Consulting Engineers, Inc.  
 555 East Walnut Street, Pasadena, California 91101  
 (818) 796-9141 / (213) 681-4255 Telex 67-5420

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway PO#:	1868.0401
Suite 300 Workorder#:	W28031
Herndon, VA 22070 Report#:	R31324
Attn: Reid Dennis Phone #:	703-478-3400

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Date Sampled:	3/24/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/30/90

---

Lab Number:	K41935
Sample I.D.:	S10TK626FPDUP

---

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
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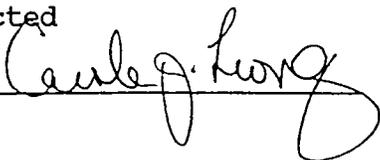
HBPH:

High BP Hydrocarbons	1100000	50000
----------------------	---------	-------

---

NA: Not analyzed  
 ND: Not detected

Approved by



**APPROVED**  
**MAY - 2 1990**  
**QC OFFICER**

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---

Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28040
Herndon, VA 22070	Report#:	R31394
Attn: Reid Dennis	Phone #:	703-478-3400

---

Date Sampled:	3/21/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/30/90

---

Lab Number:	K41968
Sample I.D.:	S10TK628000321FP

---

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
----------	--	--

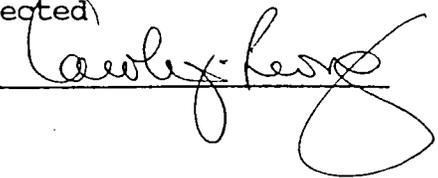
---

HBPH:

High BP Hydrocarbons	1030000	50000
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---

NA: Not analyzed  
 ND: Not detected

Approved by 

**APPROVED**  
**MAY 2 1990**  
**QC OFFICER**

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---

Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28040
Herndon, VA 22070	Report#: R31395
Attn: Reid Dennis	Phone #: 703-478-3400

---

Date Sampled:	3/21/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/30/90

---

Lab Number:	K41969
Sample I.D.:	S10TK63000321FP

---

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
----------	--	--

HBPH:

High BP Hydrocarbons	1090000	50000
----------------------	---------	-------

---

NA: Not analyzed

ND: Not detected

Approved by



**APPROVED**

**MAY - 2 1990**

**QC OFFICER**

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---

Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Soil

Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway PO#:	1868.0451
Suite 300 Workorder#:	W28035
Herndon, VA 22070 Report#:	R31349
Attn: Reid Dennis Phone #:	703-478-3400

---

Date Sampled:	3/20/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/30/90

---

Lab Number:	K41946
Sample I.D.:	S10TK636000320FP

---

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
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HBPH:

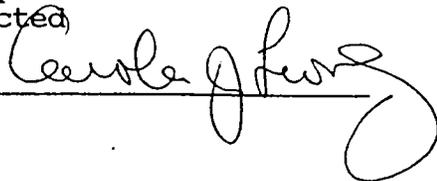
High BP Hydrocarbons	1100000*	5000
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\*Revised to correct data entry error.

---

NA: Not analyzed  
 ND: Not detected

Approved by



APPROVED

MAY 28 1990

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Revised Report of Inorganic Analyses

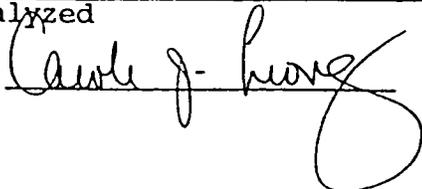
Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0401
Suite 300	Workorder#:	W28031
Herndon, VA 22070	Report#:	R31322
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	3/24/90	Date Received:	4/10/90
Date Completed:	5/23/90		

Lab#	Sample I.D.	HalOil mg/kg	As mg/kg	Cd * mg/kg	Cr * mg/kg	Pb mg/kg	Ig deg F
K41934	S10TK607FPDUP	<100	<0.25	<0.05	<0.10	<0.1	134
K41935	S10TK626FPDUP	<100	<0.25	<0.05	<0.10	<0.1	137
K41936	S10TK622FP	<100	<0.25	<0.05	<0.10	<0.1	135
K41937	S10TK609FP	<100	<0.25	<0.05	<0.10	<0.1	127
K41938	S10TK614FP	<100	<0.5	<0.05	<0.10	0.1	>140

\* This report was revised to change reporting units to mg/kg for Cd and Cr.

NA: Not Analyzed

Approved by 

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**MAY 23 1990**  
**QC OFFICER**

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---

Report of Inorganic Analyses

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28038
Herndon, VA 22070	Report#: R31371
Attn: Reid Dennis	Phone #: 703-478-3400

---

Date Sampled:	3/23/90	Date Received:	4/10/90
Date Completed:	5/10/90		

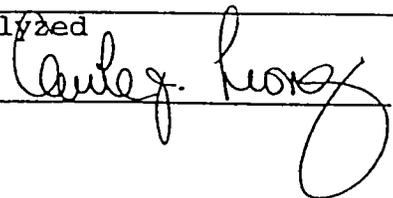
---

Lab#	Sample I.D.	HalOil mg/kg	As mg/kg	Cd mg/kg	Cr mg/kg	Pb mg/kg	Ig deg F
K41958	S10TK623FP	<100	0.25	0.10	0.18	43	>140
K41959	S10TK624FP	<100	<0.25	<0.05	<0.1	<0.10	>140
K41960	S10TK618FP	<100	<0.25	<0.05	<0.1	0.10	137
K41961	S10TK620FP	<100	<0.25	<0.05	<0.1	1.0	>140

---

NA: Not Analyzed

Approved by



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**MAY 11 1990**  
**QC OFFICER**

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Report of Inorganic Analyses

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Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28040
Herndon, VA 22070	Report#:	R31393
Attn: Reid Dennis	Phone #:	703-478-3400

---

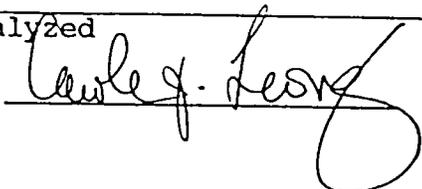
Date Sampled:	3/21/90	Date Received:	4/10/90
Date Completed:	5/10/90		

---

Lab#	Sample I.D.	HalOil mg/kg	As mg/kg	Cd mg/kg	Cr mg/kg	Pb mg/kg	Ig deg F
K41968	S10TK628000321FP	<100	<0.25	<0.05	<0.1	13	130
K41969	S10TK63000321FP	<100	<1.0	<0.05	<0.1	<1.0	>140
K41970	S10TK607FP	<100	<0.25	<0.05	<0.1	<0.10	138
K41971	S10TK610FP	<100	<1.0	<0.05	<0.1	<1.0	>140

---

NA: Not Analyzed

Approved by 

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**MAY 11 1990**  
**QC OFFICER**

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Report of Inorganic Analyses

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28039
Herndon, VA 22070	Report#:	R31382
Attn: Reid Dennis	Phone #:	703-478-3400

---

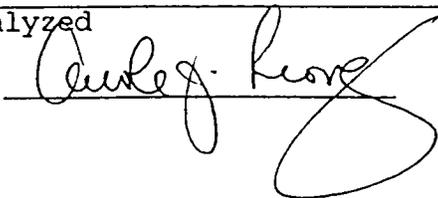
Date Sampled:	3/23/90	Date Received:	4/10/90
Date Completed:	5/10/90		

---

Lab#	Sample I.D.	HalOil mg/kg	As mg/kg	Cd mg/kg	Cr mg/kg	Pb mg/kg	Ig deg F
K41963	S10TK626FP	<100	<0.25	<0.05	<0.1	<0.10	>140

---

NA: Not Analyzed

Approved by 

APPROVED

MAY 11 1990

QC OFFICER

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Report of Inorganic Analyses

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28035
Herndon, VA 22070	Report#:	R31348
Attn: Reid Dennis	Phone #:	703-478-3400

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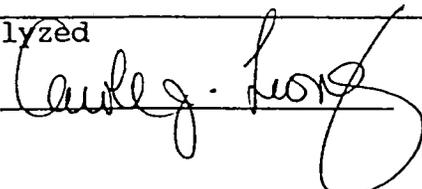
Date Sampled:	3/20/90	Date Received:	4/10/90
Date Completed:	5/10/90		

---

Lab#	Sample I.D.	HalOil mg/kg	Ig deg F	As mg/kg	Cd mg/kg	Cr mg/kg	Pb mg/kg
K41946	S10TK636000320FP	<100	>140	<0.25	<0.05	<0.1	58

---

NA: Not Analyzed

Approved by 

**APPROVED**  
**MAY 11 1990**  
**QC OFFICER**

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Report of Analysis for  
POLYCHLORINATED BIPHENYLS

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway PO#:	1868.0451
Suite 300 Workorder#:	W28040
Herndon, VA 22070 Report#:	R31387
Attn: Reid Dennis Phone #:	703-478-3400

Date Sampled:	3/21/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/18/90

Lab Number:	K41966
Sample I.D.:	S10TK607FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
NA: Not Analyzed

Approved by Awley. Luong

**APPROVED**  
**APR 24 1990**  
**QC OFFICER**

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0401  
 Suite 300 Workorder#: W28031  
 Herndon, VA 22070 Report#: R31312  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 3/24/90 Date Received: 4/10/90  
 Date Extracted: 4/17/90 Date Analyzed: 4/18/90

Lab Number: K41929 /  
 Sample I.D.: S10TK607FPDUP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by *Carle J. Hong*

**APPROVED**  
**APR 23 1990**

**QC OFFICER**

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---

Report of Analysis for  
 POLYCHLORINATED BIPHENYLS

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway PO#:	1868.0401
Suite 300 Workorder#:	W28031
Herndon, VA 22070 Report#:	R31315
Attn: Reid Dennis Phone #:	703-478-3400

---

Date Sampled:	3/24/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/18/90

---

Lab Number:	K41932
Sample I.D.:	S10TK609FP

---

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

---

ND: Not Detected  
 NA: Not Analyzed

Approved by



**APPROVED**  
**APR 23 1990**

**QC OFFICER**

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0451  
 Suite 300 Workorder#: W28040  
 Herndon, VA 22070 Report#: R31388  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 3/21/90 Date Received: 4/10/90  
 Date Extracted: 4/17/90 Date Analyzed: 4/18/90

Lab Number: K41967  
 Sample I.D.: S10TK610FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by *Carole G. Long*

**APPROVED**

**APR 24 1990**

**QC OFFICER**

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Report of Analysis for  
POLYCHLORINATED BIPHENYLS

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
560 Herndon Parkway PO#: 1868.0401  
Suite 300 Workorder#: W28031  
Herndon, VA 22070 Report#: R31316  
Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 3/24/90 Date Received: 4/10/90  
Date Extracted: 4/17/90 Date Analyzed: 4/18/90

Lab Number: K41933  
Sample I.D.: S10TK614FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
NA: Not Analyzed

Approved by *Carole J. Herzog*

**APPROVED**  
**APR 23 1990**  
**QC OFFICER**

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28038
Herndon, VA 22070	Report#: R31365
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 3/23/90	Date Received: 4/10/90
Date Extracted: 4/17/90	Date Analyzed: 4/18/90

Lab Number:	K41956
Sample I.D.:	S10TK618FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by *Cowley J. Loney*

**APPROVED**  
**APR 23 1990**  
**QC OFFICER**

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 Report of Analysis for  
 POLYCHLORINATED BIPHENYLS
 

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Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0451
Suite 300	Workorder#: W28038
Herndon, VA 22070	Report#: R31366
Attn: Reid Dennis	Phone #: 703-478-3400

---

Date Sampled: 3/23/90	Date Received: 4/10/90
Date Extracted: 4/17/90	Date Analyzed: 4/18/90

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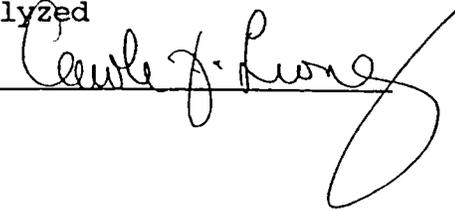
Lab Number:	K41957
Sample I.D.:	S10TK620FP

---

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

---

ND: Not Detected  
 NA: Not Analyzed

Approved by 

**APPROVED**  
**APR 23 1990**  
**QC OFFICER**

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(818) 796-9141 / (213) 681-4255 Telex 67-5420

---

Report of Analysis for  
POLYCHLORINATED BIPHENYLS

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0401
Suite 300	Workorder#:	W28031
Herndon, VA 22070	Report#:	R31314
Attn: Reid Dennis	Phone #:	703-478-3400

---

Date Sampled:	3/24/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/18/90

---

Lab Number:	K41931
Sample I.D.:	S10TK622FP

---

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

---

ND: Not Detected  
NA: Not Analyzed

Approved by *Charles G. Long*

**APPROVED**  
**APR 23 1990**

**QC OFFICER**

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(818) 796-9141 / (213) 681-4255 Telex 67-5420

Report of Analysis for  
POLYCHLORINATED BIPHENYLS

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
560 Herndon Parkway PO#: 1868.0451  
Suite 300 Workorder#: W28038  
Herndon, VA 22070 Report#: R31363  
Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 3/23/90 Date Received: 4/10/90  
Date Extracted: 4/17/90 Date Analyzed: 4/18/90

Lab Number: K41954  
Sample I.D.: S10TK623FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
NA: Not Analyzed

Approved by Carole J. Montgomery

**APPROVED**  
**APR 23 1990**  
**QC OFFICER**

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0451  
 Suite 300 Workorder#: W28038  
 Herndon, VA 22070 Report#: R31364  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 3/23/90 Date Received: 4/10/90  
 Date Extracted: 4/17/90 Date Analyzed: 4/18/90

Lab Number: K41955  
 Sample I.D.: S10TK624FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by Carole J. Long

**APPROVED**  
**APR 23 1990**

**QC OFFICER**

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS

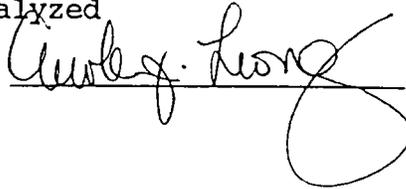
Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0451  
 Suite 300 Workorder#: W28039  
 Herndon, VA 22070 Report#: R31380  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 3/23/90 Date Received: 4/10/90  
 Date Extracted: 4/17/90 Date Analyzed: 4/18/90

Lab Number: K41962  
 Sample I.D.: S10TK626FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by 

**APPROVED**  
**APR 24 1990**  
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Report of Analysis for  
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Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0401  
 Suite 300 Workorder#: W28031  
 Herndon, VA 22070 Report#: R31313  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 3/24/90 Date Received: 4/10/90  
 Date Extracted: 4/17/90 Date Analyzed: 4/18/90

Lab Number: K41930  
 Sample I.D.: S10TK626FPDUP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by *Carole Henry*

**APPROVED**  
**APR 23 1990**  
**QC OFFICER**

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 a division of James M. Montgomery, Consulting Engineers, Inc.  
 555 East Walnut Street, Pasadena, California 91101  
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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS

Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0451  
 Suite 300 Workorder#: W28040  
 Herndon, VA 22070 Report#: R31385  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 3/21/90 Date Received: 4/10/90  
 Date Extracted: 4/17/90 Date Analyzed: 4/18/90

Lab Number: K41964  
 Sample I.D.: S10TK628000321FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by 

**APPROVED**  
**APR 23 1990**  
**QC OFFICER**

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 555 East Walnut Street, Pasadena, California 91101  
 (818) 796-9141 / (213) 681-4255 Telex 67-5420

Report of Analysis for  
 POLYCHLORINATED BIPHENYLS

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0451
Suite 300	Workorder#:	W28040
Herndon, VA 22070	Report#:	R31386
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	3/21/90	Date Received:	4/10/90
Date Extracted:	4/17/90	Date Analyzed:	4/18/90

Lab Number:	K41965
Sample I.D.:	S10TK63000321FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected  
 NA: Not Analyzed

Approved by Charles J. Luong

**APPROVED**  
**APR 24 1990**  
**QC OFFICER**

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Report of Analysis for  
 POLYCHLORINATED BIPHENYLS

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
 560 Herndon Parkway PO#: 1868.0451  
 Suite 300 Workorder#: W28035  
 Herndon, VA 22070 Report#: R31351  
 Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 3/20/90 Date Received: 4/10/90  
 Date Extracted: 4/17/90 Date Analyzed: 4/18/90

Lab Number: K41947  
 Sample I.D.: S10TK636000320FP

Compound	Concentration (milligrams/kilogram)	Detection Limit (milligrams/kilogram)
Arochlor 1016	ND	2.0
Arochlor 1221	ND	4.0
Arochlor 1232	ND	2.0
Arochlor 1242	ND	2.0
Arochlor 1248	ND	2.0
Arochlor 1254	ND	2.0
Arochlor 1260	ND	2.0

ND: Not Detected

NA: Not Analyzed

Approved by Charles J. Long

**APPROVED**

**APR 23 1990**

**QC OFFICER**

**APPENDIX E**  
**ANALYTICAL DATA — GROUNDWATER**

MONTGOMERY LABORATORIES  
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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0411
Suite 300	Workorder#: W27981
Herndon, VA 22070	Report#: R30802
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 3/25/90	Date Received: 3/26/90	
Date Extracted: 3/28/90	Date Analyzed: 4/4/90	

Lab Number:	K41519
Sample I.D.:	SIOWP601

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	ND	0.05
----------------------	----	------

NA: Not analyzed  
ND: Not detected

Approved by

*Carole J. Long*

APPROVED

APR 10 1990

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 (818) 796-9141 / (213) 681-4255 Telex 67-5420

Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0411
Suite 300	Workorder#: W27981
Herndon, VA 22070	Report#: R30803
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled:	3/25/90	Date Received:	3/26/90
Date Extracted:	3/28/90	Date Analyzed:	4/4/90

Lab Number:	K41520
Sample I.D.:	SIOWP601DUP

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	ND	0.05
----------------------	----	------

NA: Not analyzed  
 ND: Not detected

Approved by

*Carole J. King*

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps (Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway PO#:	1868.0411
Suite 300 Workorder#:	W27981
Herndon, VA 22070 Report#:	R30801
Attn: Reid Dennis Phone #:	703-478-3400

Date Sampled:	3/25/90	Date Received:	3/26/90
Date Extracted:	3/38/90	Date Analyzed:	4/4/90

Lab Number:	K41518
Sample I.D.:	SIOWP602

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	ND	0.05
----------------------	----	------

NA: Not analyzed

ND: Not detected

Approved by

*Carole J. Long*

**APPROVED**  
**APR 10 1990**  
**QC OFFICER**

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0411
Suite 300	Workorder#: W27981
Herndon, VA 22070	Report#: R30800
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled:	3/25/90	Date Received:	3/26/90
Date Extracted:	3/28/90	Date Analyzed:	4/4/90

Lab Number:	K41517
Sample I.D.:	SIOWP603

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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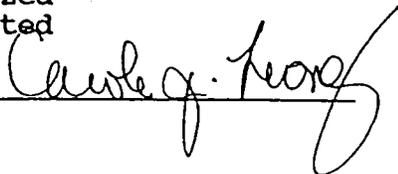
HBPH:

High BP Hydrocarbons	ND	0.05
----------------------	----	------

NA: Not analyzed

ND: Not detected

Approved by



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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#:
Suite 300	1868.0411
Herndon, VA 22070	Workorder#:
Attn: Reid Dennis	W27981
	Report#:
	R30804
	Phone #:
	703-478-3400

---

Date Sampled:	3/25/90	Date Received:	3/26/90
Date Extracted:	3/28/90	Date Analyzed:	4/4/90

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Lab Number:	K41521
Sample I.D.:	SIOWP604

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Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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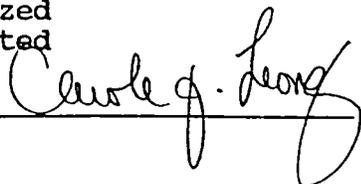
HBPH:

High BP Hydrocarbons	0.3	0.05
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---

NA: Not analyzed  
 ND: Not detected

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Report of GC/FID Analysis for  
 HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0411
Suite 300	Workorder#: W27981
Herndon, VA 22070	Report#: R30808
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled:	3/25/90	Date Received:	3/26/90
Date Extracted:	3/28/90	Date Analyzed:	4/4/90

Lab Number:	K41525
Sample I.D.:	SIOWP605

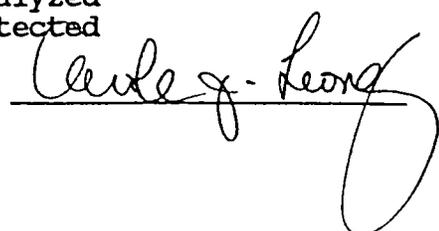
Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	ND	0.05
----------------------	----	------

NA: Not analyzed

ND: Not detected

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0411
Suite 300	Workorder#:	W27981
Herndon, VA 22070	Report#:	R30806
Attn: Reid Dennis	Phone #:	703-478-3400

Date Sampled:	3/25/90	Date Received:	3/26/90
Date Extracted:	3/28/90	Date Analyzed:	4/4/90

Lab Number:	K41523
Sample I.D.:	SIOWP606

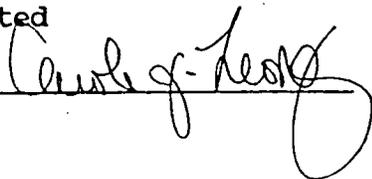
Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
----------	-------------------------------------	---------------------------------------

HBPH:

High BP Hydrocarbons	ND	0.05
----------------------	----	------

NA: Not analyzed  
ND: Not detected

Approved by \_\_\_\_\_



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APR 10 1990  
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555 East Walnut Street, Pasadena, California 91101  
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---

Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps (Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0411
Suite 300	Workorder#:	W27981
Herndon, VA 22070	Report#:	R30805
Attn: Reid Dennis	Phone #:	703-478-3400

---

Date Sampled:	3/25/90	Date Received:	3/26/90
Date Extracted:	3/28/90	Date Analyzed:	4/4/90

---

Lab Number:	K41522
Sample I.D.:	SIOWP607

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Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	ND	0.05
----------------------	----	------

---

NA: Not analyzed  
ND: Not detected

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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1	Job#:	1868.STORY
560 Herndon Parkway	PO#:	1868.0411
Suite 300	Workorder#:	W27981
Herndon, VA 22070	Report#:	R30807
Attn: Reid Dennis	Phone #:	703-478-3400

---

Date Sampled:	3/25/90	Date Received:	3/26/90
Date Extracted:	3/28/90	Date Analyzed:	4/4/90

---

Lab Number:	K41524
Sample I.D.:	SIOWP608

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Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
----------	-------------------------------------	---------------------------------------

HBPH:

High BP Hydrocarbons	0.1	0.05
----------------------	-----	------

---

NA: Not analyzed

ND: Not detected

Approved by



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Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#:	1868.STORY
560 Herndon Parkway	PO#: 1868.0411
Suite 300	Workorder#: W27981
Herndon, VA 22070	Report#: R30810
Attn: Reid Dennis	Phone #: 703-478-3400

Date Sampled: 3/25/90	Date Received: 3/26/90
Date Extracted: 3/28/90	Date Analyzed: 4/4/90

Lab Number:	K41527
Sample I.D.:	SIOWP609

Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	0.1	0.05
----------------------	-----	------

NA: Not analyzed  
ND: Not detected

Approved by

*Charles J. Long*

APPROVED

APR 10 1990

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a division of James M. Montgomery, Consulting Engineers, Inc.  
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(818) 796-9141 / (213) 681-4255 Telex 67-5420

Report of GC/FID Analysis for  
HIGH BOILING POINT HYDROCARBONS in Water

Army Corps(Ft Story & Eustis)/JMM-VIR-1 Job#: 1868.STORY  
560 Herndon Parkway PO#: 1868.0411  
Suite 300 Workorder#: W27981  
Herndon, VA 22070 Report#: R30809  
Attn: Reid Dennis Phone #: 703-478-3400

Date Sampled: 3/25/90 Date Received: 3/26/90  
Date Extracted: 3/28/90 Date Analyzed: 4/4/90

Lab Number: K41526  
Sample I.D.: SIOWP610

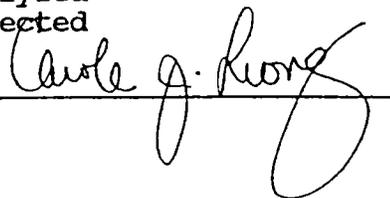
Compound	Concentration (milligrams/liter)	Detection Limit (milligrams/liter)
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HBPH:

High BP Hydrocarbons	ND	0.05
----------------------	----	------

NA: Not analyzed  
ND: Not detected

Approved by



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APR 10 1990  
QC OFFICER