

Site Characterization Site 731

United States Navy
Roosevelt Roads Naval Station
Ceiba, Puerto Rico

Contract Number: N62470-93-D-
4021

March 1998



BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

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Transmitted Via Federal Express

June 25, 1998

Mr. John G. Kresky
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Atlantic Divisions
Naval Facilities Engineering Command
6500 Hampton Boulevard
Norfolk, VA 23508-1297

Re: **Site Characterization Reports - Sites 731 and 734**
Roosevelt Roads Naval Station
Ceiba, Puerto Rico
Contract Number: N62470-93-D-4021
Project #: 399.33

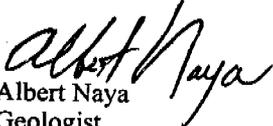
Dear Mr. Kresky:

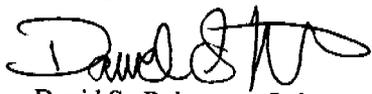
Blasland, Bouck, & Lee Inc. (BBL) is pleased to provide you with the final copies of the Site Characterization (SC) Reports for Sites 731 and 734 at the Roosevelt Roads Naval Station in Ceiba, Puerto Rico. Two copies of each report have been sent to Mr. Pedro Ruiz at the Roosevelt Roads Naval Station for his files and distribution to the Puerto Rico Environmental Quality Board. The comments provided by you and Mr. Ruiz have been incorporated into these final reports. No further action has been recommended at Sites 731 and 734 based on the results of the SC's.

BBL appreciates the opportunity to provide these services to the Navy. If you have any questions or comments regarding these reports, please do not hesitate to contact the undersigned.

Sincerely,

BLASLAND, BOUCK, & LEE, INC.


Albert Naya
Geologist


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AN/an

Enclosure

cc: Mr. Pedro Ruiz, Roosevelt Roads U.S. Naval Station w/ enclosure (2)
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0698284.WPD

Executive Summary

Blasland, Bouck & Lee, Inc. (BBL) conducted a site characterization (SC) for a former underground storage tank (UST) at the Roosevelt Roads U.S. Naval Station (NAVSTA Roosevelt Roads) located near the town of Ceiba, Puerto Rico. The SC evaluated the potential impact of the UST on the soils and groundwater in the area of Site 731, which is located on the western end of the U.S. Navy Station. Site 731 contained a 1,000-gallon UST previously used to store diesel fuel for heating purposes. The objective of this investigation was to define the areas of potentially impacted soil and groundwater by petroleum hydrocarbons.

The SC field investigation included collecting 48 soil samples from 4 soil borings, performing field screening on the soil samples, performing laboratory analysis of selected samples, performing two slug tests, measuring groundwater elevations, installing and sampling three groundwater monitoring wells, and collecting information to prepare a qualitative risk assessment.

Total Petroleum Hydrocarbons (TPH) above the Puerto Rico Environmental Quality Board (PREQB) target levels of 100 milligrams per kilogram (mg/Kg) were detected in only one sample collected at Site 731. The laboratory analytical results indicate that TPH concentrations in soil ranged from below detection limits to 1,300 mg/Kg

Dissolved petroleum hydrocarbons were not detected above the PREQB target levels in the groundwater samples obtained from the monitoring wells. The target levels are 5 microgram per liter (ug/L) for benzene, 50 ug/L for total benzene, toluene, ethylbenzene, and xylene (BTEX), and 50 milligrams per liter (mg/L) for TPH. Free product was not detected in any of the monitoring wells. Results of the qualitative risk assessment indicate that the human risks associated with Site 731 are extremely low.

Based on the assessment results, the petroleum hydrocarbon impacted soil will remain in place due to the low health hazards associated with it and the logistic difficulties associated with excavating around Building 731. Enhanced in-situ remediation methods are not recommended because the low permeability of the impacted soils. However, natural biodegradation processes (natural attenuation) are expected to reduce the TPH concentrations at site 731.

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-
- D-4 OVA Field Screening Methodology
 - D-5 Monitoring Well Construction
 - D-6 Monitoring Well Development
 - E TEG Laboratory Analytical Results
 - F Groundwater Sampling Procedures
 - G Savannah Laboratory Analytical Results

1. Introduction

The United States Naval Station, Roosevelt Roads (NAVSTA Roosevelt Roads) authorized Blasland, Bouck & Lee, Inc. (BBL) to perform a site SC under the contract number N62470-93-D-4021. The SC was performed for former a UST at Site 731 in NAVSTA Roosevelt Roads. The SC objective was to determine the degree and/or extent of petroleum product contamination to the groundwater and/or soil at Site 731. This report summarizes the work conducted, field investigation results, and remediation recommendations for Site 731.

1.1 Site Location

Site 731 is located in the NAVSTA Roosevelt Roads, in close proximity to the Ceiba Municipality on the eastern end of Puerto Rico (Figure 1-1). The approximate coordinates of NAVSTA Roosevelt Roads are 18° 15' 00" latitude and 65° 39' 30" longitude. A site map showing the location of Site 731 is provided as Figure 1-2, while Figure 1-3 shows the topography of Site 731 and surrounding area.

1.2 Site Background

Based on information provided by the NAVSTA Roosevelt Roads, Site 731 is the former location of a 1,000 - gallon, single-wall, fiberglass, reinforced plastic UST. The piping system consisted of single wall steel and copper piping. The UST contained diesel fuel used for heating purposes in Building 731. The tank remained operational from the time it was installed in 1985 to when it was removed in 1996.

TPH concentrations ranging from 750 to 4695 milligrams per kilogram (mg/kg) were detected at Site 731 during the UST removal. The NAVSTA Roosevelt Roads records indicate that accidental spills have not occurred at the site.

1.3 Previous Investigations

No previous SC investigations have been conducted at Site 731. The U.S. Navy removed the UST in 1996. NAVSTA Roosevelt Roads requested that a SC be performed after the detection of elevated levels of petroleum hydrocarbons in the soil.

1.4 Project Objectives

The main purpose of the project was to assess the extent of soil and groundwater contamination at the site. The SC investigation consisted of installing soil boring(s) and monitoring wells, and collecting and analyzing soil and groundwater samples.

A total of four (4) soil borings and three (3) monitoring wells were installed at the site. Soil and ground-water samples collected from the soil borings and monitoring wells installed during this investigation were sent to a laboratory for analysis. The final locations of the monitoring wells were based on the laboratory analytical results obtained from the soil and water samples collected from the soil borings. Monitoring well top-of-casing elevations and depth-to-water measurements were also collected. A water table elevation contour map was developed to show the ground-water flow direction. Slug tests were performed to determine the hydraulic conductivity of the surficial aquifer.



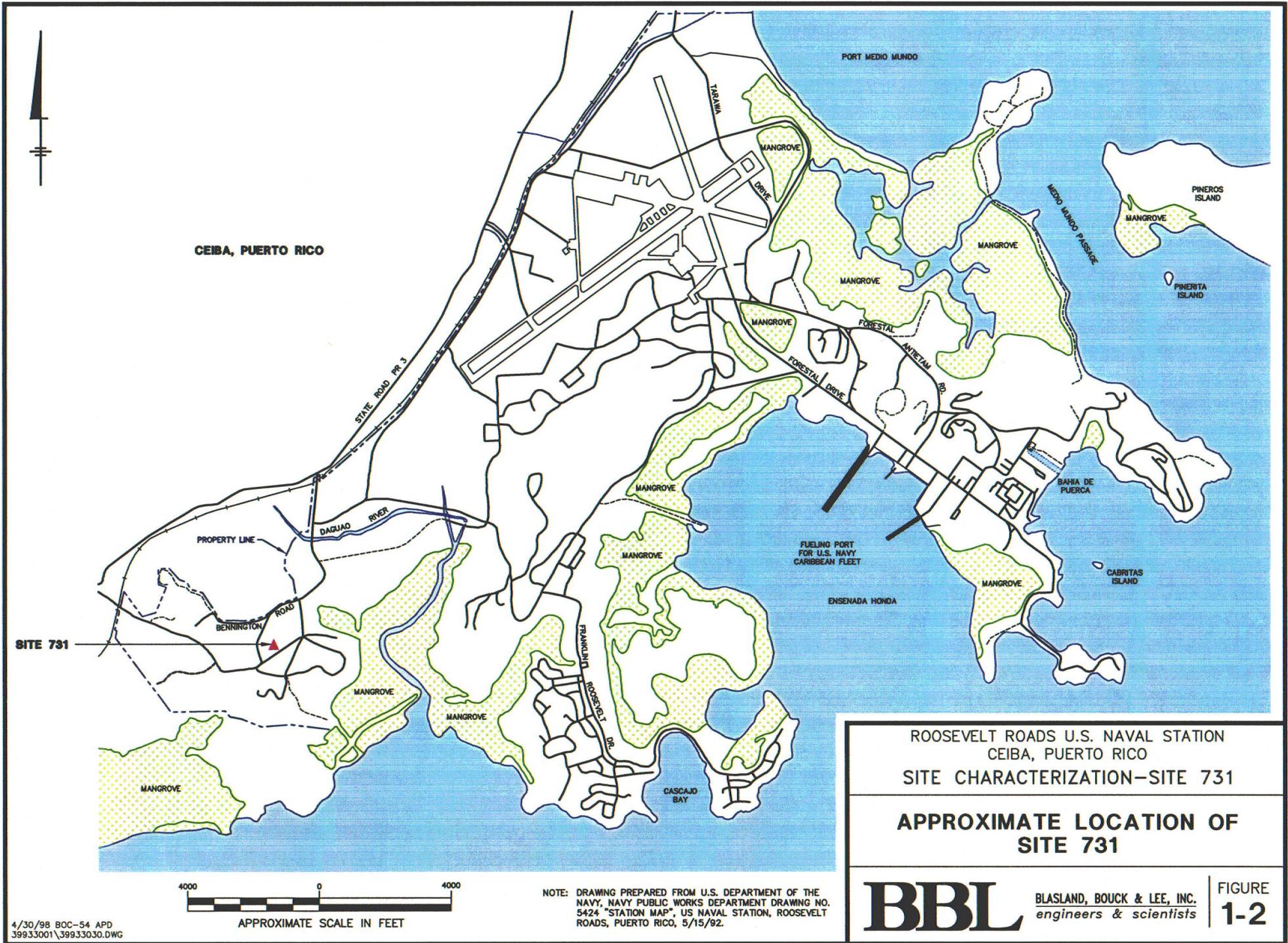
ROOSEVELT ROADS U.S. NAVAL STATION
 CEIBA, PUERTO RICO
 SITE CHARACTERIZATION- SITE 731

SITE LOCATION MAP

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**FIGURE
 1-1**



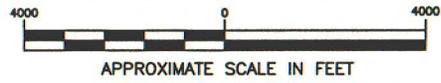
ROOSEVELT ROADS U.S. NAVAL STATION
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 SITE CHARACTERIZATION—SITE 731

APPROXIMATE LOCATION OF
 SITE 731

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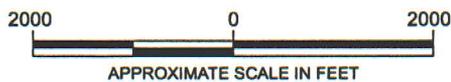
FIGURE
1-2

NOTE: DRAWING PREPARED FROM U.S. DEPARTMENT OF THE NAVY, NAVY PUBLIC WORKS DEPARTMENT DRAWING NO. 5424 "STATION MAP", US NAVAL STATION, ROOSEVELT ROADS, PUERTO RICO, 5/15/92.





MAP SOURCE:
 UNITED STATES GEOLOGIC SURVEY
 TOPOGRAPHIC QUADRANGLE, 7.5 MIN.
 SERIES, NAGUABO, PUERTO RICO
 photo-revised 1982.



ATLANTIC OCEAN

CARRIBEAN SEA

ROOSEVELT ROADS U.S. NAVAL STATION
 CEIBA, PUERTO RICO
 SITE CHARACTERIZATION- SITE 731

TOPOGRAPHIC MAP

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FIGURE
1-3

2. Site Geology/Hydrogeology

2.1 Regional Geology

The geology of NAVSTA Roosevelt Roads consists of a sequence of intrusive and extrusive volcanic and volcanoclastic lithologies of lower Cretaceous age (M'Gonile, 1979). Much of the NAVSTA Roosevelt Roads is underlain by the Daguoa Formation, which is characterized by interbedded volcanic breccia, lava, subordinate volcanic sandstone, and crystal tuff (M'Gonile, 1979). The Daguoa Formation has an irregular surface and is encountered at various depths across the NAVSTA Roosevelt Roads (BBL, 1994). The Daguoa formation pinches out on the northern part of the NAVSTA Roosevelt Roads giving way to the Fajardo Formation. The Fajardo formation is made up of thin-bedded tuffaceous siltstone and sandstone of lower Cretaceous age (Briggs and Aguilar-Cortez, 1980). The largest hills [approximately 300 feet above mean sea level (MSL)] and ridges consist of the Daguoa Formation. The hills are flanked by Quaternary and Holocene fanglomerate and swamp deposits. Quaternary alluvium, slopewash, and fanglomerate deposits compose the broad low-lying areas of NAVSTA Roosevelt Roads (BBL, 1995).

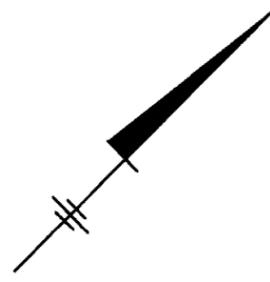
2.2 Site Geology

The soil samples collected during the installations of soil borings and monitoring wells were used to describe the site geology. Complete lithologic descriptions are included within the soil boring logs and monitoring well construction diagrams (Appendices A and B).

Site 731 lies on a small hill (approximately 40 feet above MSL) underlain by the Daguoa Formation that slopes downward to the south. Beneath Site 731, silt and clay, from highly weathered volcanic rock are encountered. The colors of the clays are primarily light to dark yellowish brown, light greenish gray/black, light olive brown, and pale green. The colors of the silt and clays were determined with the Munsell soil color system. The clay-rich material beneath this zone is saprolite, a thoroughly decomposed rock formed in place by chemical weathering of igneous and metamorphic rocks. The saprolite is encountered at approximately 6 to 8 feet below land surface (BLS). The formation of saprolite usually takes place in tropical or subtropical climates with high humidity. The brown coloring of the weathered volcanic rock is due to iron oxidation. These sediments possess high plasticity and are not easily crumbled under hand pressure. The locations of monitoring wells and soil borings are provided as figure 2-1. North-south and east-west geologic cross-sections are presented respectively in Figures 2-2 and 2-3. These cross-sections are based on the lithology observed during the installation of soil borings and monitoring wells for the SC.

2.3 Site Hydrogeology

Groundwater flow at the site is controlled by elevation differences between adjacent hills. Groundwater flow across the site is to the southeast. Site 731 is underlain by an unconfined surficial aquifer system, which is composed of plastic clays (saprolite). The high plasticity of the subsurface material indicates that water is present in the pore spaces, however, the specific yield (ratio of the volume of water that drains from a sample under gravity to the total volume of the sample) is very low. The high specific retention (ratio of the volume of water that a sample retains against the pull of gravity to the total volume of the sample) observed in the samples is due to the ionic attraction between positively charged hydrogen bonds in the water molecules and the net negative charges on clay particle surfaces. As a result, the subsurface material displays low hydraulic conductivity in all directions of the flow field. Additionally, results from the slug tests display evidence of a slow rate of return to static conditions in the monitoring well. A summary of the slug test results and hydraulic conductivity values are presented in Appendix C.



BLDG 731

STAIRS

FORMER UST

MW-1
SB-1

MH

A1 MW-2
SB-3

SIDEWALK

STAIRS

GRAVEL

BLDG 731

MH

SIDEWALK

A SB-4

B1 MW-3
SB-2

LIGHT POST

LEGEND

- △ SOIL BORING LOCATION
- MONITORING WELL INSTALLED BY BBL
- (MH) MANHOLE
- ☼ TREES
- ☼ (Large) TREES
- ▽ GRASS

SIDEWALK



APPROXIMATE SCALE IN FEET

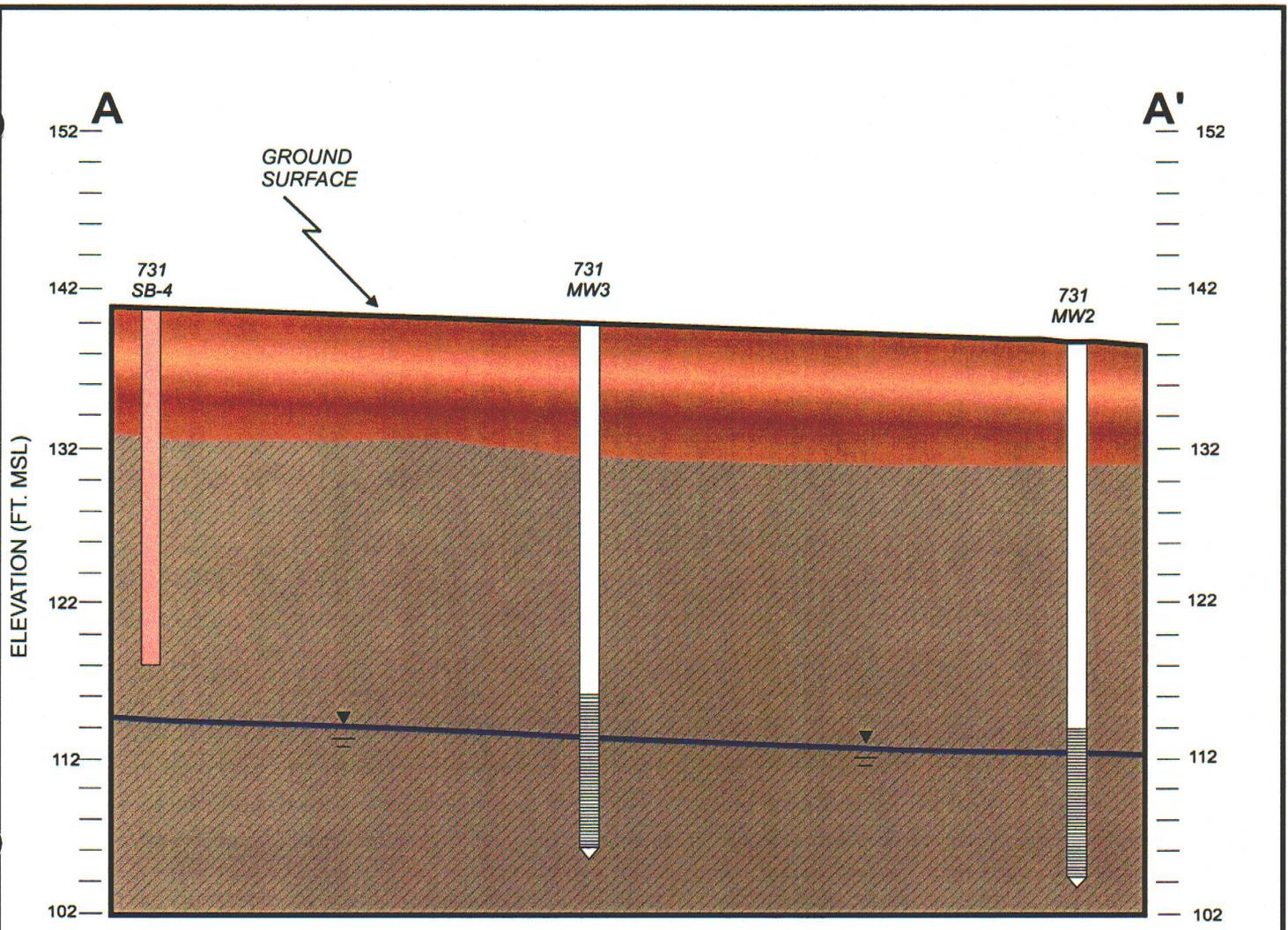
ROOSEVELT ROADS U.S. NAVAL STATION
CEIBA, PUERTO RICO
SITE CHARACTERIZATION-SITE 731

**MONITORING WELL AND
SOIL BORING LOCATIONS**

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FIGURE
2-1

ASPHALT PARKING AREA



VERTICAL EXAGGERATION - x4.0

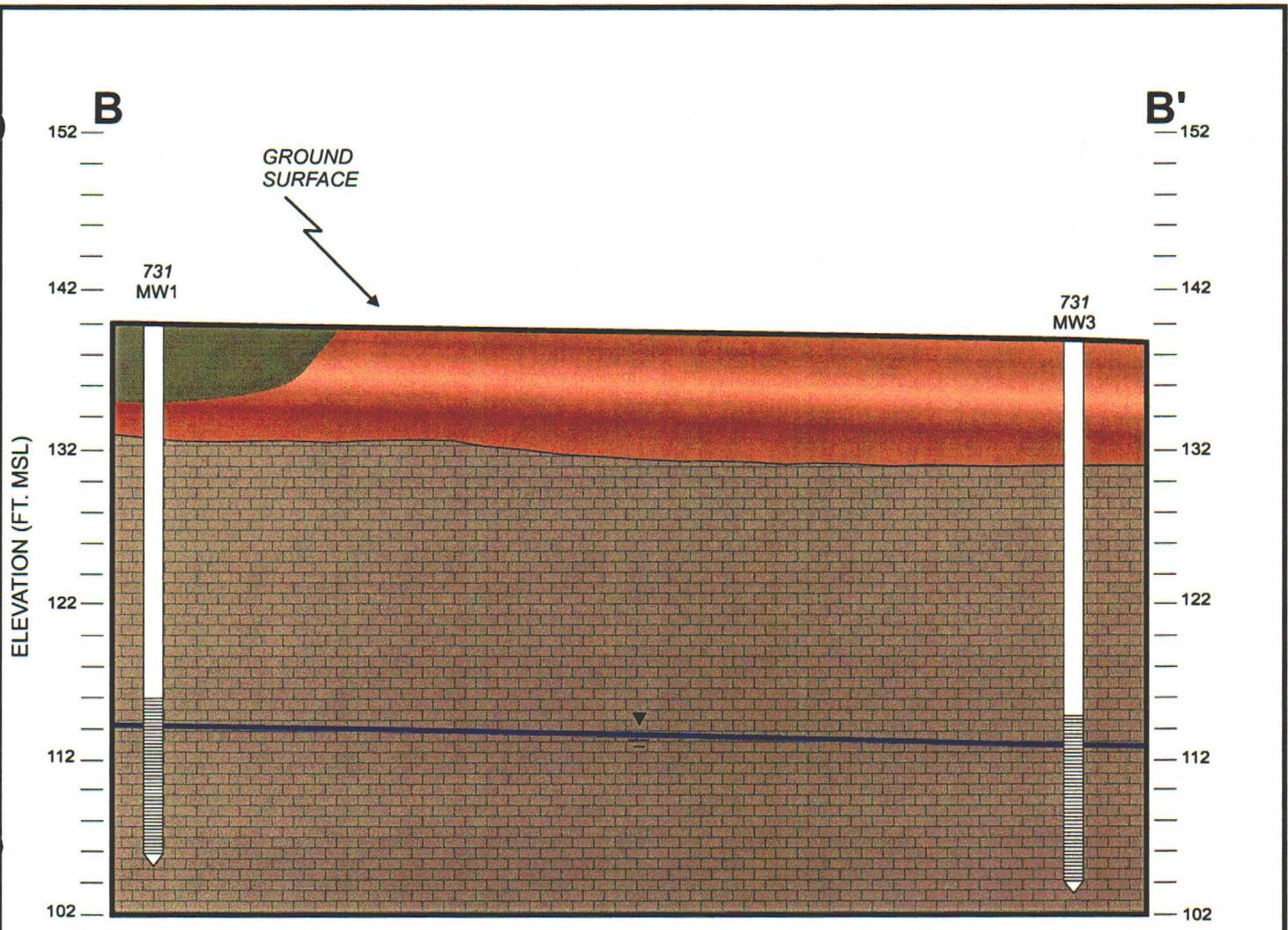
LEGEND

-  Silty Clay; varying dark colors
-  Saprolite (Weathered Rock)
-  WATER TABLE ELEVATION
-  SOIL BORING
-  MONITORING WELL RISER
-  MONITORING WELL SCREEN

NOTE: SEE FIGURE 2-1 FOR THE LOCATION OF GEOLOGIC CROSS SECTION A-A'.

NOTE: ELEVATIONS BASED ON U.S. NAVY DATUM.

ROOSEVELT ROADS U.S. NAVAL STATION CEIBA, PUERTO RICO SITE CHARACTERIZATION- SITE 731
GEOLOGIC CROSS SECTION A-A'
 BLASLAND, BOUCK & LEE, INC. engineers & scientists
FIGURE 2-2



LEGEND

-  Fill
-  Silty Clay
-  Saprolite (Weathered Volcanic Rock)
-  WATER TABLE ELEVATION
-  MONITORING WELL RISER
-  MONITORING WELL SCREEN

NOTE: SEE FIGURE 2-1 FOR THE LOCATION OF GEOLOGIC CROSS SECTION B-B'.

NOTE: ELEVATIONS BASED ON U.S. NAVY DATUM.

ROOSEVELT ROADS U.S. NAVAL STATION
CEIBA, PUERTO RICO
SITE CHARACTERIZATION- SITE 731

GEOLOGIC CROSS SECTION B-B'

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**FIGURE
2-3**

3. Field Investigations

The SC investigations took place continuously from February 9, 1998 through March 16, 1998. Assessment activities consisted of the installation of soil borings and monitoring wells and the collection of soil and groundwater samples. Soil samples were collected from each soil boring at two foot intervals and were screened in the field with an organic vapor analyzer (OVA). Groundwater and selected soil samples were sent for laboratory analyses. In addition, lithologic data were collected during the installation of monitoring wells and soil borings.

3.1 Drilling

A description of monitoring wells and soil borings installation is provided in this section. Geotechnical details pertaining drilling activities are included in Appendix D and summarized in Table 3-1.

TABLE 3-1
SUMMARY OF APPENDIX D

Appendix Section	Contents
D-1	Utility Location/Well Permit Application
D-2	Equipment Decontamination
D-3	Air Monitoring
D-4	OVA Field Screening Methodology
D-5	Monitoring Well Construction
D-6	Monitoring Well Development

On February 17, 1998, an application was submitted to the Puerto Rico Department of Natural Resources to obtain well construction permits (Appendix D-1). In addition, drilling activities at the site began after a utility clearance was performed. The equipment decontamination and air monitoring procedures that were used during drilling are discussed in Appendices D-2 and D-3.

3.1.1 Soil Boring Installation

To determine and delineate the extent of petroleum-impacted soils, four (4) soil borings (731-SB1 through 731-SB4) were installed (Figure 2-1). Soil borings were advanced to the water table using a 2-foot long, stainless-steel, split spoon sampler inside hollow stem augers (HSA). Soil samples were collected continuously in 2-foot intervals to a depth of 20 feet BLS and every 5 feet beyond 20 feet BLS until the termination of each boring. Standard penetration test procedures, in accordance with ASTM D-1586, were followed during the collection of soil samples. The surficial soils encountered at the site were described in accordance with the Unified Soil Classification System (USCS). In addition, soil boring lithologic logs are presented in Appendix A.

3.1.2 Soil Field Screening and Sampling

Soil samples were collected at 2-foot intervals using a split- spoon sampler until the water table was encountered. The samples were placed inside 16-ounce glass jars, covered by a sheet of aluminum foil, and securely capped. Approximately five minutes were allowed to elapse before the samples were analyzed with a Foxboro Model 128 Organic Vapor Analyzer (OVA). The methodology used to conduct OVA screening is described in detail in Appendix D-4. The OVA screening results, summarized in Table 3-2, indicate that 21 of the 48 samples screened produced detectable vapors. Thirteen of those 21 samples contained concentrations of total petroleum hydrocarbon vapor above 100 parts per million (PPM). The net hydrocarbon vapor concentrations ranged from non-detect to greater than 1,000 PPM. Methane vapor concentrations ranged from non-detect to 420 PPM.

Selected soil samples were collected for laboratory analyses, which included total petroleum hydrocarbons (TPH) by Environmental Protection Agency (EPA) Method 418.1 and benzene, toluene, ethylbenzene, and xylene (BTEX) by EPA Method 8020. At least two samples from each soil boring were selected for laboratory analyses. Two intervals were used for soil sample collection: from 2 to 6 feet BLS and at least 2 feet above the water table. Laboratory analytical data are presented in Section 4.1.

3.1.3 Groundwater Field Screening

At the time of the soil boring installations, the depth to water across Site 731 ranged from approximately 24 feet BLS to 27 feet BLS (Appendix A). The presence of the water table was determined by the BBL on-site geologist. Following the completion of a soil boring, the HSA was advanced an additional 4 feet into the water table. To allow groundwater recovery in the borehole, the HSA were raised 2 feet. Groundwater samples were then collected from the open borehole with a disposable Teflon bailer. To assist in determining the location of the permanent monitoring wells, a local laboratory [Transglobal Environmental Geochemistry (TEG)] was used to analyze groundwater samples within 24 hours. Based on the laboratory analytical data and field observations, three soil borings (SB-1, SB-2, and SB-3) were redrilled and converted to monitoring wells (MW-1, MW-2, and MW-3). The groundwater results analyzed by the local laboratory are included in Appendix E and summarized in Table 3-3.

3.1.4 Monitoring Well Construction

Three 2-inch monitoring wells were installed to define the horizontal extent of potentially impacted groundwater in and around the area of Site 731. The wells were installed under the observation of BBL personnel. The well construction materials and equipment were thoroughly decontaminated prior to installation of each well. The development of the wells was accomplished by using a 3-foot disposable Teflon bailer to remove fine-grained sediments in the groundwater (Table 3-4).

A detailed description of monitoring well construction and development is presented in Appendices D-5 and D-6, respectively. A monitoring well completion summary is included in Table 3-5. Monitoring well construction diagrams are presented in Appendix B.

TABLE 3-2 Continued
ORGANIC VAPOR ANALYSIS OF SOIL

Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

Sample Designation	Date sampled	Sample Depth (ft BLS)	Total Organic Vapors (ppm)	Total Methane Vapors* (ppm)	Total Petroleum Hydrocarbon Vapors (ppm)
731-SB4	2/11/98	0-2	<1	N/A	<1
	2/11/98	2-4	<1	N/A	<1
	2/11/98	4-6	240	120	120
	2/11/98	6-8	>1000	N/A	>1000
	2/11/98	8-10	N/C	N/C	N/C
	2/11/98	10-12	<1	N/A	<1
	2/11/98	12-14	<1	N/A	<1
	2/11/98	14-16	<1	N/A	<1
	2/11/98	16-18	30	12	18
	2/11/98	18-20	<1	N/A	<1
	2/11/98	23-25**	<1	N/A	<1

Note : See Figure 3-1 for sample locations

PPM = parts per million

BLS = below land surface

N/A = sample not screened because the total organic vapor concentration was less than 1 ppm or greater than 1,000 PPM and not quantifiable

N/C = not collected

* = Although methane is the primary organic vapor detected, other naturally occurring vapors may be included in this measurements

** = sample collected at or below the water table

**TABLE 3-3
SUMMARY OF TEG GROUNDWATER ANALYTICAL RESULTS**

**Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY	
Sample Number	Modified EPA Method 418.1 TPH (mg/L)
731 SB-1 (auger)	10
731 SB-2 (auger)	10
731 SB-3 (auger)	10
731 SB-4 (auger)	10
Puerto Rico EQB UST Target Levels	50
Notes: EQB = Environmental Quality Board TPH = Total Petroleum Hydrocarbon mg/L = Milligrams per Liter	

**TABLE 3-4
MONITORING WELL DEVELOPMENT SUMMARY**

**Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Well	Development Method	Development Completion Date	Approximate Gallons Developed	Number of Well Volumes Developed
731-MW1	BAILER	2/19/98	30	4.8
731-MW2	BAILER	2/20/98	40	6.4
731-MW3	BAILER	2/20/98	35	5.6

**TABLE 3-5
MONITORING WELL COMPLETION SUMMARY**

**Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Well Designation	731-MW1	731-MW2	731-MW3
Date installed	2/10/98	2/18/98	2/18/98
Total Well Depth (ft, BLS)	35	35	34
Top of Casing Elevation (ft)	140.16	138.48	139.56
Casing Type	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC
Casing Length(s)	25	25	24
Screen Type	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC
Screen Slot Size (in)	0.10	0.10	0.10
Screen Length	10	10	10
Screen Interval (ft, BLS)	25-35	25-35	24-34
<p>Note: All monitoring wells are 2 inches in diameter Top-of-casing elevations were referenced to the Roosevelt Roads datum</p> <p>in = inch ft = feet BLS = below land surface</p>			

3.2 Slug Tests

On March 20, 1998, slug tests were performed in monitoring wells 731-MW2 and 731-MW3. The aquifer hydraulic properties beneath the site were calculated from the data collected during these tests. The slug test procedure consisted of the following steps:

- A depth-to-water measurement was taken to determine static conditions in the well
- A pressure transducer was placed 6-inches off the bottom of the well. The transducer was secured in place with the manhole lid to prevent it from shifting during the test.
- The pressure transducer was connected to the data logger.
- The data logger was programmed for the test. This allowed the data logger to convert the pressure transducer readings to feet of head.
- The water level on the data logger was re-entered as zero to represent static conditions.
- The data logger started recording immediately after five gallons were of water were introduced into the well.
- Once the water level returned to static conditions, the data logger was stopped.

The slug test results were plotted on semi-logarithmic graphs and analyzed using the Bouwer and Rice method (Bouwer and Rice, 1976). The hydraulic conductivities (K) calculated from the slug test ranged from 8.9×10^{-1} feet per day (ft/day) to 7.8×10^{-1} ft/day. The slug tests indicated that the surficial clays at Site 734 have very low hydraulic conductivities. The raw data, graphs, and calculations pertaining the slug test are presented in Appendix C.

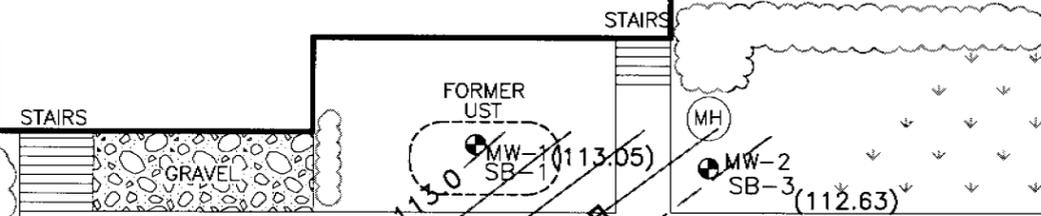
3.3 Water Table Elevation Measurements

The top-of-casing elevations of the three monitoring wells were surveyed by a licensed surveyor and referenced to the NAVSTA Roosevelt Roads datum. On February 25 and March 16, 1998, depth to water for the three monitoring wells was measured from the top of each well casing with an electronic interface probe, which is accurate to within 0.01 feet. Depth to water and monitoring well elevations are presented in Table 3-6. The water level measurements obtained on February 25 and March 16, 1998 were used to generate water table elevation maps (Figure 3-1 and Figure 3-2). As shown on the water table elevation maps (Figure 3-1 and Figure 3-2), the groundwater flow is toward the southeast.

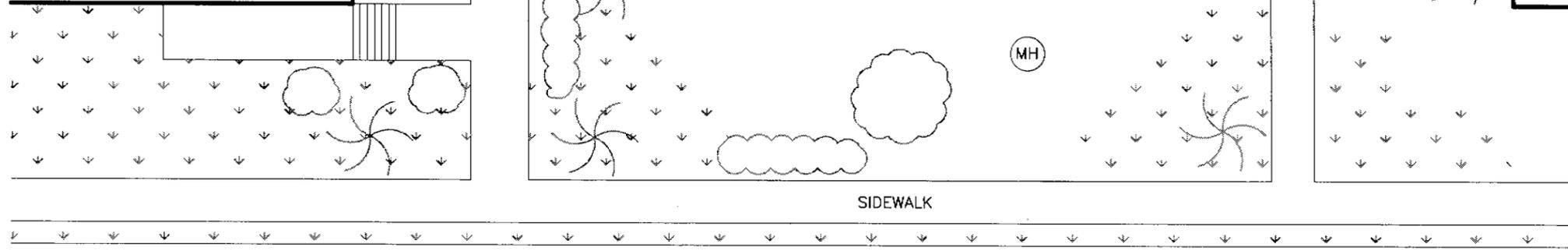
The ground-water gradient (I) and flow velocity (V) were calculated from the K obtained from the slug tests and water table elevation data. The groundwater gradient ranged from 0.23 feet/foot (ft/ft) to 0.26 ft/ft, while the flow velocity ranged from 0.049 ft/day to 0.055 ft/day. The calculations used to determine I and V are presented in Appendix C.



BLDG 731

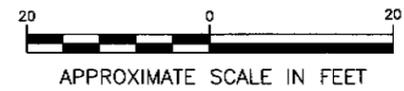


BLDG 731



LEGEND

- SOIL BORING LOCATION
- MONITORING WELL INSTALLED BY BBL
- MANHOLE
- 112.0- WATER TABLE ELEVATION CONTOUR (DASHED WHERE INFERRED)
- GROUNDWATER FLOW DIRECTION
- TREES
- TREES
- GRASS
- LIGHT POST

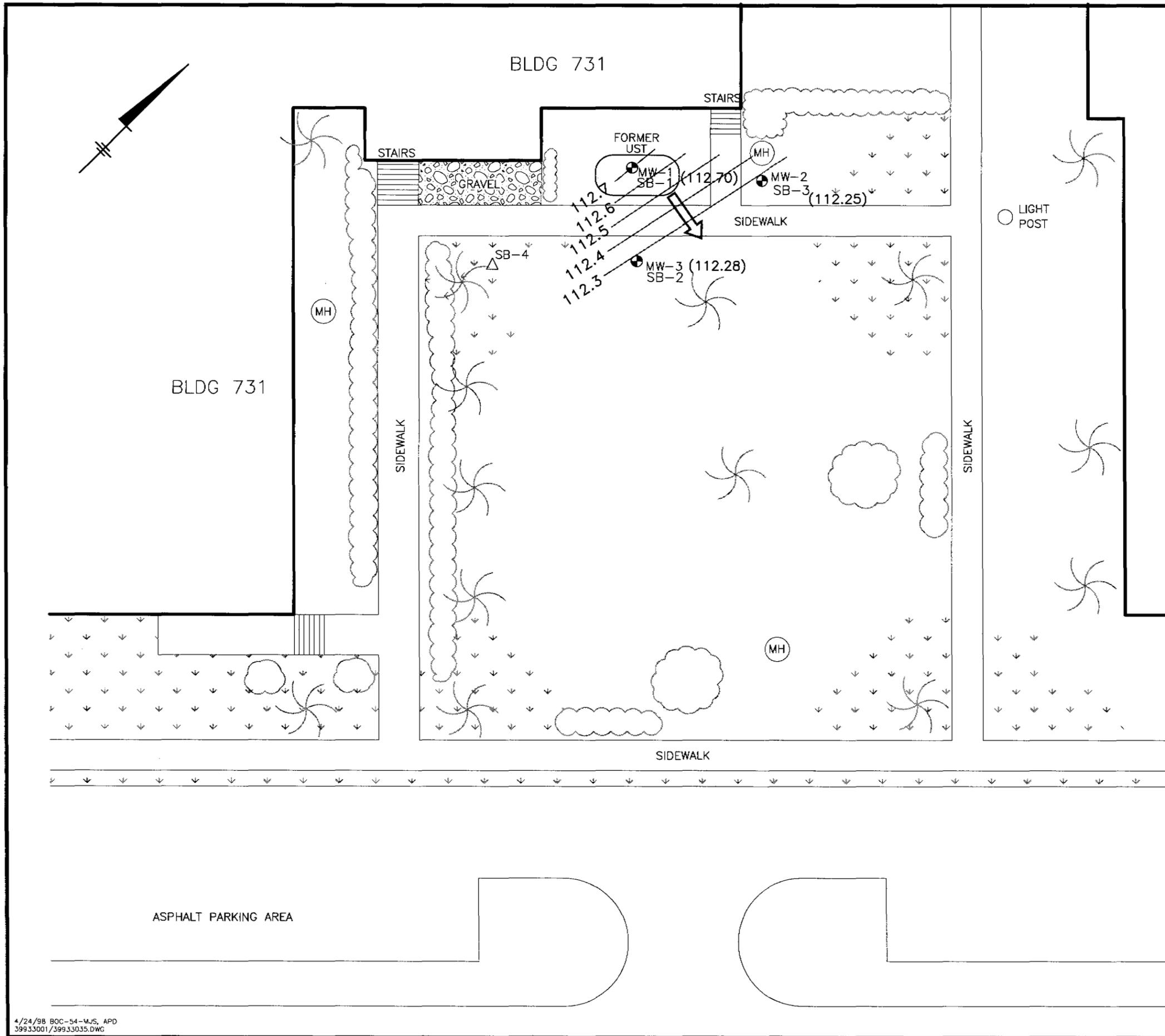


ROOSEVELT ROADS U.S. NAVAL STATION
BUILDING 731
CEIBA, PUERTO RICO

**WATER-TABLE ELEVATION
CONTOURS- FEBRUARY 25, 1998**

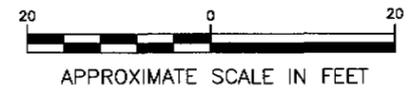
BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
3-1



LEGEND

- △ SOIL BORING LOCATION
- ⊕ MONITORING WELL INSTALLED BY BBL
- ⊙ (MH) MANHOLE
- 112.7 WATER TABLE ELEVATION CONTOUR
- ➔ GROUNDWATER FLOW DIRECTION
- 🌳 TREES
- 🌳 TREES
- 🌿 GRASS



ROOSEVELT ROADS U.S. NAVAL STATION
CEIBA, PUERTO RICO

SITE CHARACTERIZATION- SITE 731

**WATER-TABLE ELEVATION
CONTOURS- MARCH 16, 1998**

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists **FIGURE 3-2**

4/24/98 BOC-54-MJS, APD
399.33001/399.33035.DWG

**TABLE 3-6
WATER LEVEL DATA**

**Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Well Designation	Elevation of Top of Casing (ft, RRD)	February 25, 1998		March 16, 1998	
		Depth to Water (ft)	Water Level Elevation (ft, RRD)	Depth to Water (ft)	Water Level Elevation (ft, RRD)
731-MW1	140.16	27.11	113.05	27.46	112.70
731-MW2	138.48	25.85	112.63	26.23	112.25
731-MW3	139.56	26.88	112.68	27.28	112.28

NOTE: Top-of-Casing elevations were referenced to RRD
ft = feet
RRD = NAVSTA Roosevelt Roads Datum

3.4 Groundwater Sampling

On February 26, 1998, groundwater samples were collected from the three monitoring wells. The groundwater samples were transported, on ice, to a certified laboratory via an overnight courier. The samples were analyzed by the following EPA methods: 418.1 (TPH), 8020 (BTEX), 239 (total lead), and 610 (polynuclear aromatic hydrocarbon (PAH))

Field blanks, equipment blanks, and trip blanks were collected to ensure that contaminants were not introduced to the water samples before, during, or after sample collection. Groundwater sampling procedures and Quality Assurance/Quality Control (QA/QC) guidelines are detailed in Appendix F.

4. Laboratory Analytical Results

4.1 Soil Analytical Results

The laboratory analytical data for the soil samples collected during this investigation are summarized in Table 4-1. Complete laboratory analytical data of samples collected by BBL personnel are presented in Appendix G. The TPH data collected by BBL were used to approximate the maximum horizontal and vertical extent of soil potentially impacted by hydrocarbons. Concentrations of hydrocarbons in the soil samples collected is provided as Figure 4-1. Concentrations of TPH above the PREQB target levels appear to be restricted to the immediate location of the former UST and are not present immediately above the measured water table.

As shown in Table 4-1 and Figure 4-1, only one sample is above the PREQB target level for TPH. The sample, collected from 2 feet to 6 feet BLS at soil boring 731 SB-1, had a petroleum hydrocarbon concentration of 1,300 milligram per kilogram (mg/kg). Additional laboratory analysis by modified EPA method 8015 for the diesel range organic compounds indicated that the elevated TPH concentration in the soil sample from 731 SB-1 (2-6) was a result of concentrations of hydrocarbons compounds and not due to interference effects. The presence of elevated levels of TPH is attributed to the former UST at Site 731. Although PREQB does not have any standards for BTEX in soils, the samples were analyzed to characterize individual constituents. The laboratory analytical data indicate that the samples were below the method detection limits for BTEX constituents.

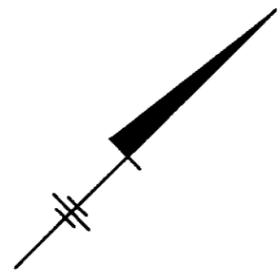
Soil quality assurance/quality (QA/QC) control analytical data are summarized in Table 4-2.

The soil analytical data were used to determine the status of the drill cuttings. Based on the laboratory analytical data, drill cuttings from soil borings SB-2 and SB-3 were classified as nonhazardous and spread. The rest of the drill cuttings were containerized in 55-gallon drums for disposal at a Puerto Rico certified landfill.

4.2 Groundwater Analytical Results

The groundwater laboratory analytical data, summarized in Table 4-3, showed that BTEX, TPH, and total lead are not present within the wells at the site. PREQB defines groundwater to be contaminated if it contains benzene concentrations above 5 micrograms per liter (ug/L), total BTEX concentrations above 50 ug/L, or TPH concentrations above 50 milligrams per liter (mg/L). As summarized in Table 4-3 and depicted in Figure 4-2, the groundwater samples analyzed do not exceed any of the PREQB target levels.

A summary of the QA/QC laboratory analytical data is presented in Table 4-4. The soil, groundwater, and QA/QC laboratory analytical reports are provided in Appendix G.



BLDG 731

2/10/98		
100	1,300	
<20	<10	

FORMER UST
MW-1
SB-1

2/10/98		
<20	69	
<20	<10	

MW-2
SB-3

2/12/98		
<20	<10	
<20	<10	

2/10/98		
<20	<10	
<20	<10	

MW-3
SB-2

LEGEND

- △ SOIL BORING LOCATION
- ⊕ MONITORING WELL INSTALLED BY BBL
- ⊙ (MH) MANHOLE

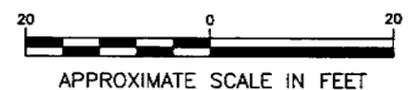
BTEX (mg/Kg) TPH (μg/Kg)

2/10/98	

- DATE COLLECTED
- INTERVAL COLLECTED ON SURFICIAL SOIL
- INTERVAL COLLECTED ABOVE WATER-TABLE

- BTEX BENZENE, TOLUENE, ETHYLBENZENE, XYLENE
- TPH TOTAL PETROLEUM HYDROCARBONS
- (μg/Kg) MICROGRAMS PER LITER
- (mg/Kg) MILLIGRAMS PER LITER

- TREES
- TREES
- GRASS



Roosevelt Roads U.S. Naval Station
Ceiba, Puerto Rico
SITE CHARACTERIZATION- SITE 731
SOIL-BTEX AND TPH
CONCENTRATIONS-FEBRUARY-1998

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists **FIGURE 4-1**

BLDG 731

STAIRS

STAIRS

GRAVEL

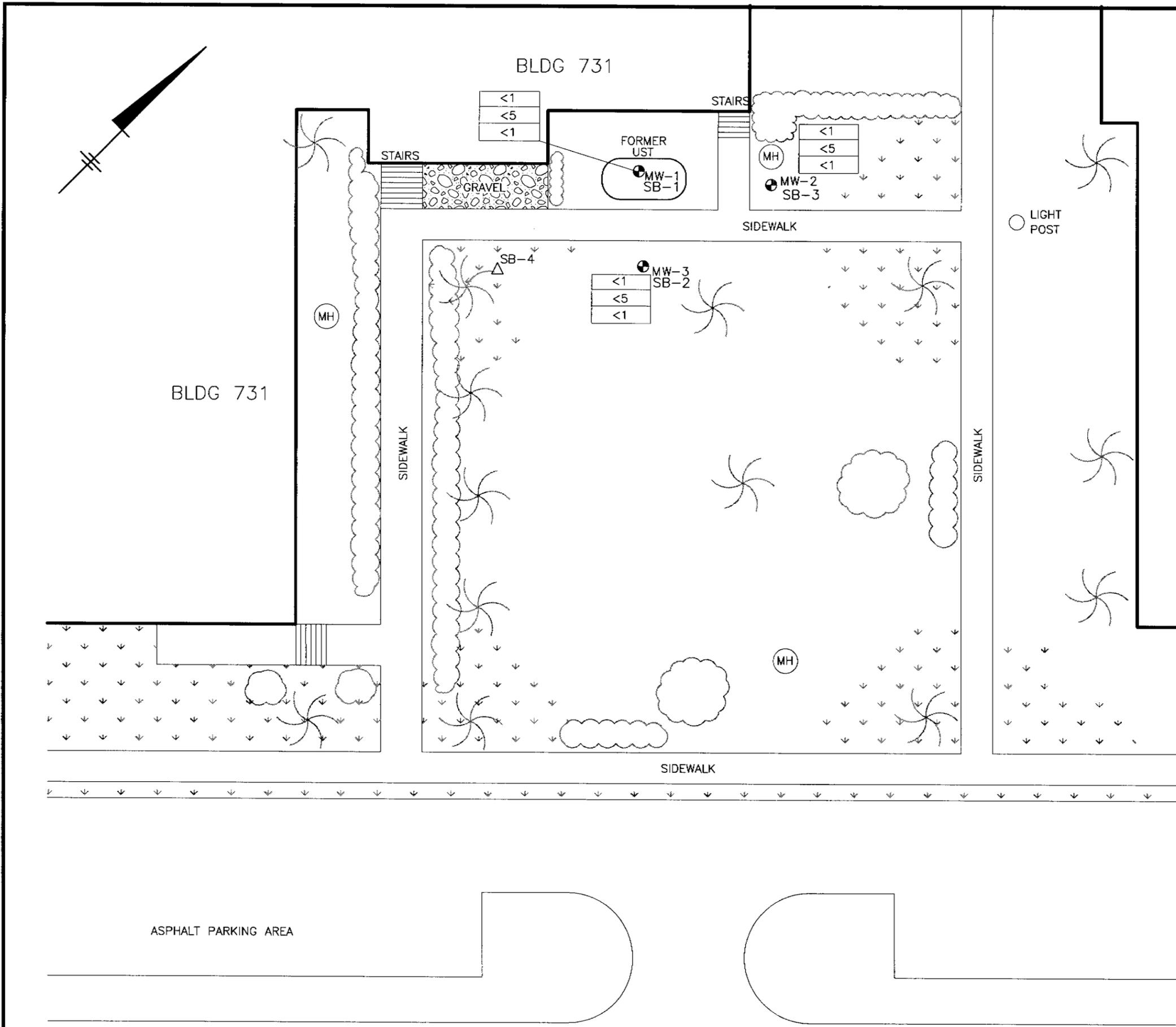
SIDEWALK

SIDEWALK

SIDEWALK

SIDEWALK

ASPHALT PARKING AREA



LEGEND

- Δ SOIL BORING LOCATION
- \oplus MONITORING WELL INSTALLED BY BBL
- $\textcircled{\text{MH}}$ MANHOLE

<1	BENZENE CONCENTRATIONS($\mu\text{g/L}$)
<5	BTEX CONCENTRATIONS($\mu\text{g/L}$)
<1	TPH CONCENTRATIONS(mg/L)

BTEX BENZENE, TOLUENE, ETHYLBENZENE, XYLENE
 TPH TOTAL PETROLEUM HYDROCARBONS
 ($\mu\text{g/Kg}$) MICROGRAMS PER LITER
 (mg/Kg) MILLIGRAMS PER LITER

- TREES
- TREES
- GRASS



APPROXIMATE SCALE IN FEET

Roosevelt Roads U.S. Naval Station
 Ceiba, Puerto Rico

SITE CHARACTERIZATION- SITE 731

GROUNDWATER BENZENE, BTEX AND TPH CONCENTRATIONS

FEBRUARY 29, 1998

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE **4-2**

4/24/98 BOC-54-MJS, APD
 39933001\39933037.DWG

**TABLE 4-1
SUMMARY OF SOIL ANALYTICAL RESULTS**

**Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Soil Boring	Date Sampled	Savannah Laboratories	
		Modified EPA Method 418.1 TPH (mg/kg)	Modified EPA Method 8020 Total BTEX (ug/kg)
731-SB-1 (2-6)	2/10/98	1300	<100
731-SB-1 (33-35)	2/10/98	<10	<20
731-SB-2 (2-6)	2/10/98	<10	<20
731-SB-2 (23-25)	2/10/98	<10	<20
731-SB-3 (2-6)	2/10/98	69	<20
731-SB-3 (23-25)	2/10/98	<10	<20
731-SB-4 (2-6)	2/12/98	<10	<20
731-SB-4 (23-25)	2/12/98	<10	<20
Puerto Rico EQB UST Target Levels		100	NS
Notes: EQB = Environmental Quality Board TPH = Total Petroleum Hydrocarbons Total BTEX = Sum of Benzene, Toluene, Ethylbenzene, and Xylenes ug/Kg = Micrograms per Kilogram mg/Kg = Milligrams per Kilogram NS = No Standards in Puerto Rico UST = Underground Storage Tank			

**TABLE 4-2
SUMMARY OF SOIL QA/QC ANALYTICAL RESULTS**

**Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Sample Name	Date Sampled	Sample Matrix	Savannah Laboratories	
			TPH mg/kg	Total BTEX ug/kg
731 DUP 1 [731-SB3 (23-25) 731-SB3 (23-25)	02/11/98	Soil	<10	<20
	02/11/98	Soil	<10	<20
				<20
			mg/L	ug/L
Rinsate Blank	02/09/98	Water	<10	<5
Rinsate Blank	02/10/98	Water	<1	<5
Rinsate Blank	02/11/98	Water	<1	<5
Trip Blank	02/12/98	Water	NA	
<p>Notes:</p> <p>EQB = Environmental Quality Board TPH = Total Petroleum Hydrocarbon Total BTEX = Sum of Benzene, Toluene, Ethylbenzene, and Xylenes Concentrations ug/Kg = Micrograms per Kilogram mg/Kg = Milligrams per Kilogram UST = Underground Storage Tank</p>				

**TABLE 4-3
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS**

**Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Parameter	EQB Levels	U.S. EPA MCL	731-MW1	731-MW2	731-MW3
Date Sampled			2/28/98	2/28/98	2/28/98
Benzene (ug/L)	5	1.0	<1	<1	<1
Toluene (ug/L)	1,000	1,000	<1	<1	<1
Ethylbenzene (ug/L)	700	700	<1	<1	<1
Xylene (ug/l)	10,000	10,000	<2	<2	<2
Total BTEX (ug/L)	50	NS	<5	<5	<5
MTBE (ug/L)	NS	NS	<10	<10	<10
PAH (ug/L)	NS	NS	BDL*	BDL*	BDL*
Total Naphthalene (ug/L)	NS	NS	<25	<25	<25
TPH (mg/L)	50	NS	<1	<1	<1
Lead (mg/L)	0.015	0.015	<0.005	<0.005	<0.005
<p>Notes:</p> <ul style="list-style-type: none"> ug/L = Micrograms per Liter mg/L = Milligrams per Liter MTBE = Methyl-tert-butyl-ether Total BTEX = Sum of Benzene, Toluene, Ethylbenzene, and Xylenes Concentrations PAH = Polynuclear Aromatic Hydrocarbon (excluding naphthalenes) TPH = Total Petroleum Hydrocarbon by EPA Method 418.1 NS = No Standard MCL = Maximum Contaminant Level Total Naphthalenes = Sum of Naphthalenes and Methyl-naphthalenes BDL = Below Detection Limits * = All PAH compounds excluding naphthalenes were below their respective detection limits 					

**TABLE 4-4
SUMMARY OF GROUNDWATER QA/QC ANALYTICAL RESULTS**

**Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Parameter	EQB Levels	U.S. EPA MCL	Rinsate Blank	Field Blank	Trip Blank
Date Sampled			2/27/98	2/27/98	3/2/98
Benzene (ug/L)	5	1.0	N/A	<1	<1
Toluene (ug/L)	1,000	1,000	N/A	<1	<1
Ethylbenzene (ug/L)	700	700	N/A	<1	<1
Xylene (ug/l)	10,000	10,000	N/A	<2	<2
Total BTEX (ug/L)	50	NS	N/A	<5	<5
MTBE (ug/L)	NS	NS	N/A	<10	<10
PAH (ug/L)	NS	NS	BDL *	BDL *	N/A
Total Naphthalenes (ug/L)	NS	NS	<25	<25	N/A
TPH (mg/L)	50	NS	<1	<1	N/A
Lead (mg/L)	0.015	0.015	<0.005	<0.005	N/A
<p>Notes:</p> <ul style="list-style-type: none"> ug/L = Micrograms per Liter mg/L = Milligrams per Liter MTBE = Methyl-tert-butyl-ether Total BTEX = Sum of Benzene, Toluene, Ethylbenzene, and Xylenes PAH = Polynuclear Aromatic Hydrocarbon (excluding naphthalenes) TPH = Total Petroleum Hydrocarbon by EPA Method 418.1 N/A = Not Available NS = No Standard MCL = Maximum Contaminant Level Total Naphthalenes = Sum of Naphthalenes and Methyl-naphthalenes BDL = Below Detection Limit * = All PAH compounds, excluding naphthalenes were below their respective detection limits 					

5. Qualitative Risk Assessment

The objective of the Qualitative Risk Assessment (QRA) is to identify the population that is potentially at risk of exposure to chemicals present in, or released from, soil and groundwater at Site 731. A discussion of exposures pathways and a qualitative evaluation of the magnitude of the risk are presented within this QRA. An exposure pathway is described as the route by which a chemical migrates from the contamination source to a potential receptor. To determine the exposure pathway, the chemical of concern, possible transport media, exposure routes (means by which a chemical comes in contact with a biological receptor), and an analysis of the potential receptors are taken into account. The results of the QRA are used to qualitatively determine the health risk to environmental receptors from the contaminants found at Site 731.

5.1 Nature and Extent of Release

Based on field and laboratory data obtained during groundwater sampling, BBL concluded that dissolved petroleum hydrocarbons are not present at concentrations above PREQB target levels. Laboratory analytical data indicated that soils exceeding PREQB TPH target levels of 100 mg/Kg are limited to an approximately area of 25 square feet or less in the former UST location.

5.2 Chemicals of Concern

Petroleum contains a large number of compounds, however, the petroleum-based compounds potentially present in groundwater that represent a potential risk to human health and the environment are volatile organic aromatics (consisting of benzene, toluene, ethylbenzene, and xylene), naphthalene, and lead. Toluene, ethylbenzene, xylenes, and naphthalene are non-carcinogenic compounds; benzene and lead are known human carcinogens. Thus, the qualitative risk assessment will focus on the human health impacts of benzene and lead in the groundwater.

5.3 Exposure Assessment

The exposure assessment examines the potential migratory pathways and the biological receptors affected by the compounds of concern. An exposure assessment also estimates both short and long term assessment in terms of doses by exposure routes.

5.3.1 Human Receptors

Site 731 is a former UST located in the front of Building 731. The building, assigned as enlisted men living quarters, is inhabited by U.S. Navy Personnel. The potential of human contact with the compounds is considered minimal because of the following:

- The contamination is found in subsurface soils below 2 feet.
- The soils consist of silt and clay minimizing the ability of the soils to spread by wind action.
- The area is covered by vegetation.
- The area has restricted access (i.e., authorized personnel only)
- A concrete sidewalk is used by personnel when walking past the former UST location preventing contact with soil.

5.3.2 Environmental Receptors

The potential for migration of the compounds of concern to environmental receptors is considered minimal. The main exposure pathway is movement of groundwater off the site. The potential for compounds in the soil to leach

to the groundwater appears minimal because no ground water contamination was discovered during the SC investigation. The impacted soils are overlain by clays, which exhibit high plasticity resulting in low hydraulic conductivity. These clays act as a cap, which limits the ability of soil to spread by wind action. Topography at Site 731 is characterized by a gentle slope toward the east and a measured groundwater flow to the southeast. The southeast direction of the groundwater flow indicates a possible route toward Bahia de Algodones. Thus, Bahia de Algodones is the only potential environmental receptor of the compounds of concern. However, no impacts to the groundwater have been documented at Site 731, eliminating Bahia de Algodones as a potential environmental receptor.

5.3.3 Exposure Pathways

Exposure pathways are defined as the routes compounds follow from an original source to potential receptors. The mechanism by which the human population can come into contact with the compound is also evaluated and taken into consideration by the exposure pathways. The following four elements are required to complete an exposure pathway:

- a source and mechanism of release for a compound of concern (e.g., a storage tank leak);
- a feasible environmental transport route (e.g., dissolved groundwater constituents);
- an exposure point of potential contact with receptors (e.g., a potable well);
- an exposure route allowing receptors to come in contact with the compound(s) (e.g., inhalation of vapors and ingestion of groundwater).

If one of these elements is not present, the exposure pathway is considered incomplete. In Site 731, the first element (a source/mechanism) has been shown to exist. However, the concentrations of benzene and lead in the groundwater are below method detection limits and PREQB target levels. Thus, the source is limited to a small volume of soil located within the immediate vicinity of the former UST area. A discussion of the potential exposure pathways is presented in the following sections.

5.3.4 Groundwater Consumption Pathway

The tropical rain forest (El Yunque) provides the primary source of potable water in eastern Puerto Rico. El Yunque is located approximately 5 miles west of NAVSTA Roosevelt Roads. Based on conversations with U.S. Navy personnel, Puerto Rico Department of Natural Resources personnel, and water supply personnel in the nearby town of Fajardo (Fajardo is located 7 miles northwest of the Naval Station), it was determined that potable water supply for the Naval Station and the towns of Ceiba and Fajardo originates from El Yunque. The Naval Station has a gravity feed distribution system from the rain forest to the water treatment plant on NAVSTA Roosevelt Roads. Due to the availability of surface water in eastern Puerto Rico, groundwater is not exploited as a source of potable water; therefore, this pathway is incomplete.

5.3.5 Ingestion Pathway

The only potential ingestion pathway of the compounds of concern is if excavation or drilling activities were conducted at the site. Workers may be exposed, through contact, with the soils during these activities. Thus, a minor possibility of an ingestion pathway exists at the site. However, proposed construction activities require the approval of the NAVSTA Roosevelt Roads command prior to conducting any site work. Therefore, this exposure pathway is considered incomplete under current site conditions.

5.3.6 Inhalation Pathway

Vaporization of compounds from soil and groundwater into the air could lead to the inhalation of the compounds of concern. In addition, contaminated soil particles could be transported by wind if exposed to the land surface. The potential for either of these pathways is minimal, because the contaminated soils are typically encountered at least 2 feet BLS and are covered at the surface by either grass or a concrete sidewalk. Therefore, this exposure pathway is incomplete under current site conditions.

5.4 Risk Evaluation

The QRA results indicate that due to the presence of incomplete exposure pathways, the potential for human contact with the compounds of concern is minimum. As described in this section, each viable exposure pathway is incomplete. The missing elements are a viable exposure point and/or a viable exposure route. In addition, the groundwater present at the site is free of contaminants. Thus, the compounds of concern do not present a hazard to personnel who visit, work, or live at the NAVSTA Roosevelt Roads, or the surrounding area.

6. Remediation Assessment

This section presents the corrective action options that could be implemented to remediate the soil. The advantages and disadvantages of using a specific method at the site are evaluated.

6.1 Soil Remediation

Three common methods of soil remediation include: soil excavation and disposal, soil vapor extraction (SVE), and bioremediation. The advantages and limitations of each method are discussed in the following sections.

6.1.1 Soil Excavation and Disposal

Excavated soils would be disposed of, off site, in a landfill. Landfilling is the only disposal method for contaminated soil because Puerto Rico lacks incineration facilities. Hydrocarbon impacted soils can be disposed at a certified landfill as long as the soils do not exhibit the Resource Conservation and Recovery Act (RCRA) waste characteristics as defined in 40 CFR 261. However, excavation of contaminated soils is not a viable option at the site due to the close proximity to living quarters. Excavation activities could complete the exposure pathways of petroleum hydrocarbons. Additionally, the structure/foundation of the building could be damaged as a result of excavation activities.

6.1.2 Soil Vapor Extraction

SVE is an effective means of in-situ soil treatment designed to extract volatile organic compounds (VOCs) from the soil. A typical SVE system consists of one or several extraction wells that are under vacuum. VOCs are removed from the soils by these wells and treated at the land surface by thermal oxidation, catalytic incineration, or carbon adsorption. SVE would be ineffective at the site due to the low permeability soils encountered at the site.

6.1.3 Bioremediation

Bioremediation is a method of stimulating indigenous subsurface microorganisms by increasing nutrients and adding electron acceptors to biodegrade the compounds of concern. In-situ bioremediation presents an attractive economical option because the need for excavation, transportation, and disposal of soil is not required. Although bioremediation is an appealing alternative, it is also site-specific and requires a number of parameters to be adequate. The subsurface geology at the site lacks an adequate hydraulic conductivity to allow the effective transport of electron acceptors and nutrients throughout the surficial aquifer. This is due to the existence of silts and clays at the site that induce nutrient sorption on the surficial soil. Therefore, the amount of nutrients available for growth is limited. Thus, enhanced bioremediation will not be an effective method of soil remediation.

6.1.4 No Further Action

Due to the limited area of soil exceeding PREQB target levels for TPH at the site, no further action is recommended. If excavation activities were conducted, the exposure of soils to the air increases the probabilities of contact between the compounds of concern and human receptors. Additionally, the building's structure/foundation could be damaged as a result of excavation activities. The effectiveness of both SVE and bioremediation is limited by the low permeability of the subsurface soils. Low permeability soils prevent effective air migration toward the SVE extraction wells and limit the ability of organisms to remediate the contamination.

7. Conclusions and Recommendations

7.1 Conclusions

The presence of petroleum hydrocarbons in the soil and groundwater was assessed during this site characterization. The elevated concentrations of petroleum hydrocarbons in soils are attributed to the UST system formerly located at Site 731.

Laboratory analytical data indicated that concentrations of TPH in the soils were above PREQB target levels. The elevated soil TPH concentrations were detected in soils collected from a depth of 2 to 6 feet BLS in soil boring 731- SB-1 at the former UST location. No free-product was encountered in any of the monitoring wells. Additionally, no dissolved petroleum hydrocarbons were found above method detection limits in groundwater samples collected during this investigation.

A qualitative risk assessment was conducted to assess various exposure pathways. Based on the lack of complete exposure pathways, it was determined that the amount of soil exceeding the PREQB TPH target levels of 100 mg/Kg present at the site is not a threat to human health.

7.2 Recommendations

Based on the information obtained from the field investigation and laboratory analytical data, it is recommended that no corrective measures (no further action) be implemented at the site. Soil excavation is not recommended because the structure/foundation of building 731 may be damaged. Excavation could increase the probabilities of human exposure to petroleum hydrocarbons because building 731 is assigned as living quarters. Due to the low permeability of the clays underlying the site, enhanced in-situ remediation methods are not recommended. However, natural biodegradation processes (natural attenuation) are expected to reduce hydrocarbon concentrations in the soils at Site 731.

8. References

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M'Gongile, J.W., *Geologic Map of Naguabo and Part of the Punta Puerca Quadrangle, Puerto Rico, United States Geological Survey Miscellaneous Investigations Series, Map I-1099, 1979.*

Briggs, Reginald P. & Aguilar-Cortez, Eduardo., *Geologic Map of the Fajardo and Cayo Icacos Quadrangles, Puerto Rico, United States Geological Survey Investigation Series, Map I-1153, 1980.*

APPENDIX A
SOIL BORING LITHOLOGIC LOGS

A. Soil Boring Log

Exploration for: <u>Site Characterization</u>			Location	
Date: <u>Feb 9, 1998</u>			Site 731 Roosevelt Roads U.S. Naval Station Ceiba, Puerto Rico Water Table 27 ft BLS	
Boring No.: <u>731-SB1</u>				
Recorded By: <u>Albert Nava</u>				
Drill Type: <u>B-61</u>				
Weather: <u>Sunny, 80's</u>				
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Silty Sand, very pale orange, (10 YR 8/2); dry
2	HA	2	4	Peat Gravel, dark yellowish brown, (10 YR 4/2); dry
3	HA	4	6	Inorganic clay of low plasticity, greenish black (5GY 2/1); wet
4	SPT	6	8	Clayey Gravel, greenish black (5GY 2/1); dry
5	SPT	8	10	Inorganic clay of low plasticity, dark greenish gray (5GY 2/1); dry
6	SPT	10	12	Inorganic clay of high plasticity, pale green (10G 6/2); dry
7	SPT	12	14	Inorganic clay of high plasticity, pale green (10G 6/2); dry
8	SPT	14	16	Inorganic clay of high plasticity, light olive brown (5Y 5/6); dry
9	SPT	16	18	Silty clay, light olive brown, (5Y 5/6); dry
10	SPT	18	20	Sandy clay, light olive brown (5Y 5/6); dry
11	SPT	23	25	Silty clay, moderate yellow (5Y 8/4); dry
12	SPT	28	30	Silty clay, moderate yellow (5Y 8/4); slightly wet
13	SPT	33	35	Silty clay, light olive (10Y 5/4); slightly wet
14	SPT	38	40	Inorganic clay of high plasticity, pale green (10G 6/2); wet
Notes: N/C = Not collected because a hard volcanic rock was encountered PH = post hole HA = hand auger SPT = standard penetration test BLS = below land surface				

A. Soil Boring Log

Exploration for: <u>Site Characterization</u>		Location		
Date: <u>Feb 10, 1998</u>		Site 731		
Boring No.: <u>731-SB2</u>		Roosevelt Roads U.S. Naval Station		
Recorded By: <u>Albert Naya</u>		Ceiba, Puerto Rico		
Drill Type: <u>B-61</u>		Water Table		
Weather: <u>Sunny, 80's</u>		27 ft BLS		
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Silty clay, dark yellowish orange (10 YR 6/6); dry
2	HA	2	4	Silty clay, dark yellowish orange (10 YR 6/6); dry
3	HA	4	6	Silty clay, dark yellowish orange (10 YR 6/6); dry
4	SPT	6	8	Inorganic clay of low to medium plasticity, dark yellowish orange (10 YR 4/2); dry
5	SPT	8	10	N/C
6	SPT	10	12	Inorganic clay of high plasticity, dark yellowish brown (10YR 4/2); dry
7	SPT	12	14	Inorganic clay of high plasticity, dark yellowish brown (10 YR 4/2); dry
8	SPT	14	16	Inorganic clay of high plasticity, light olive brown (5Y 5/6); dry
9	SPT	16	18	Silty clay, dark yellowish orange (10 YR 6/6); dry
10	SPT	18	20	Silty clay, dark yellowish orange (10 YR 6/6); dry
11	SPT	23	25	Silty clay; moderate olive brown (5Y 4/4); dry
12	SPT	28	30	Silty clay, moderate olive brown (5Y 4/4); slightly wet
Notes:				
N/C = Not collected because a hard volcanic rock was encountered				
PH = post hole				
HA = hand auger				
SPT = standard penetration test				
BLS = below land surface				

A. Soil Boring Log

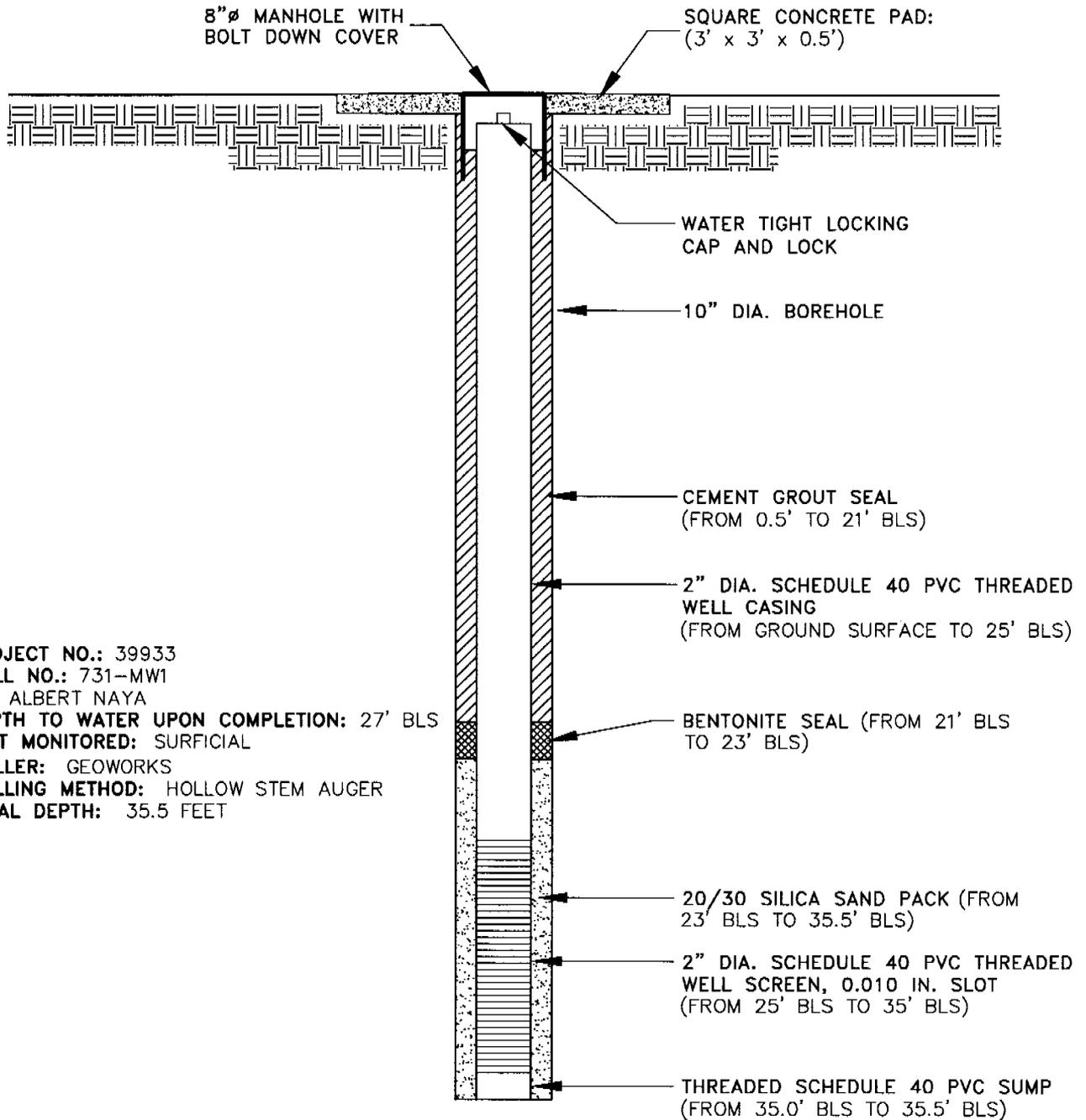
Exploration for: <u>Site Characterization</u>			Location	
Date: <u>Feb 11, 1998</u>			Site 731	
Boring No.: <u>731-SB3</u>			Roosevelt Roads U.S. Naval Station	
Recorded By: <u>Albert Naya</u>			Ceiba, Puerto Rico	
Drill Type: <u>B-61</u>			Water Table	
Weather: <u>Sunny, 80's</u>			26 ft BLS	
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Silty clay, moderate yellowish brown (10YR 6/2); dry
2	HA	2	4	Silty clay, moderate yellowish brown (10YR 6/2); dry
3	HA	4	6	Inorganic clay of medium plasticity, dusky yellowish brown (10YR 2/2); dry
4	SPT	6	8	Inorganic clay of high plasticity, grayish brown (5YR 3/2); dry
5	SPT	8	10	Inorganic clay of high plasticity, grayish brown (5YR 3/2); dry
6	SPT	10	12	Inorganic clay of high plasticity, grayish brown (5YR 3/2) and dark yellowish orange (10YR 6/6); dry
7	SPT	12	14	Inorganic clay of high plasticity, dark yellowish orange (10YR 6/6); dry
8	SPT	14	16	Inorganic clay of high plasticity, dark yellowish orange (10YR 6/6); dry
9	SPT	16	18	Silty clay, dark yellowish orange (10YR 6/6); dry
10	SPT	18	20	Silty clay, dark yellowish orange (10YR 6/6); dry
11	SPT	23	25	Silty clay, light olive brown (5Y 5/6); dry
Notes:				
N/C = not collected because a hard volcanic rock was encountered				
PH = post hole				
HA = hand auger				
SPT = standard penetration test				
BLS = below land surface				

A. Soil Boring Log

Exploration for: <u>Site Characterization</u>			Location	
Date: <u>Feb 11, 1998</u>			Site 731 Roosevelt Roads U.S. Naval Station Ceiba, Puerto Rico Water Table 27 ft BLS	
Boring No.: <u>731-SB4</u>				
Recorded By: <u>Albert Nava</u>				
Drill Type: <u>B-61</u>				
Weather: <u>Sunny, 80's</u>				
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Silty clay, moderate yellowish brown (10YR 5/4); dry
2	HA	2	4	Silty clay, moderate yellowish brown (10YR 5/4); dry
3	HA	4	6	Inorganic clay of low plasticity, dark yellowish orange (10YR 6/6); dry
4	SPT	6	8	Inorganic clay of high plasticity, dark yellowish orange (10YR 6/6); dry
5	SPT	8	10	N/C
6	SPT	10	12	Inorganic clay of high plasticity, grayish green (10G 9/2); dry
7	SPT	12	14	Inorganic clay of high plasticity, moderate yellowish orange (10YR 6/6); dry
8	SPT	14	16	Inorganic clay of high plasticity, moderate yellowish orange (10YR 6/6); dry
9	SPT	16	18	Silty clay, dark yellowish orange (10YR 6/6); dry
10	SPT	18	20	Silty clay, dusky yellowish orange (10Y 5/4); dry
11	SPT	23	25	Silty clay, light olive brown (5Y 5/6); dry
Notes: N/C = Not collected because a hard volcanic rock was encountered PH = post hole HA = hand augers SPT = standard penetration test BLS = below land surface				

APPENDIX B
MONITORING WELL CONSTRUCTION DIAGRAMS

731 - MW1



PROJECT NO.: 39933
 WELL NO.: 731-MW1
 BY: ALBERT NAYA
 DEPTH TO WATER UPON COMPLETION: 27' BLS
 UNIT MONITORED: SURFICIAL
 DRILLER: GEOWORKS
 DRILLING METHOD: HOLLOW STEM AUGER
 TOTAL DEPTH: 35.5 FEET

(DRAWING NOT TO SCALE)

MSL = MEAN SEA LEVEL
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION
 CEIBA, PUERTO RICO
 SITE 731

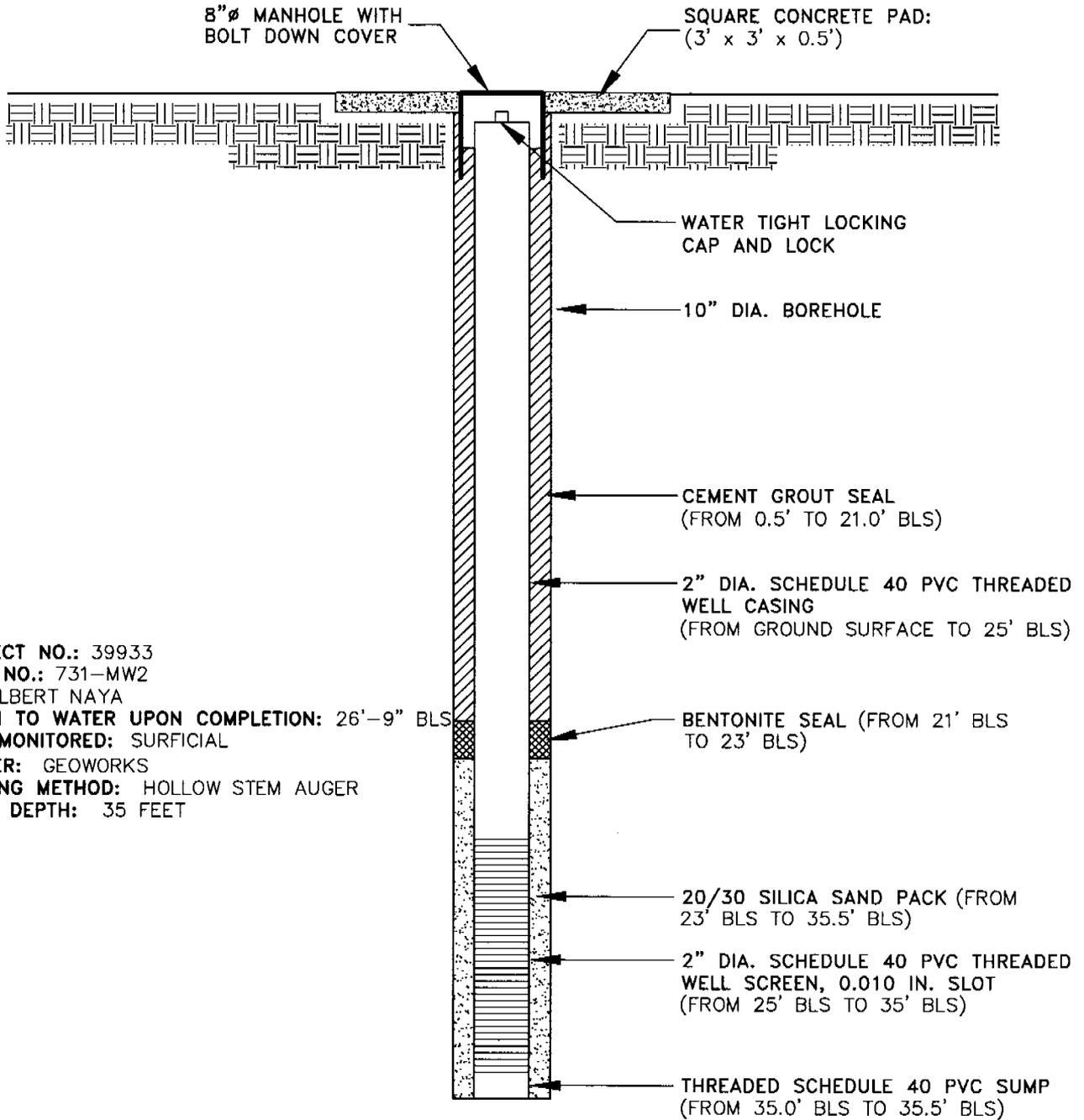
**MONITORING WELL 731-MW1
 CONSTRUCTION DETAILS**

BBL

BLASLAND, BOUCK & LEE, INC.
 engineers & scientists

FIGURE
1

731 - MW2



PROJECT NO.: 39933
 WELL NO.: 731-MW2
 BY: ALBERT NAYA
 DEPTH TO WATER UPON COMPLETION: 26'-9" BLS
 UNIT MONITORED: SURFICIAL
 DRILLER: GEOWORKS
 DRILLING METHOD: HOLLOW STEM AUGER
 TOTAL DEPTH: 35 FEET

(DRAWING NOT TO SCALE)

MSL = MEAN SEA LEVEL
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION
 CEIBA, PUERTO RICO
 SITE 731

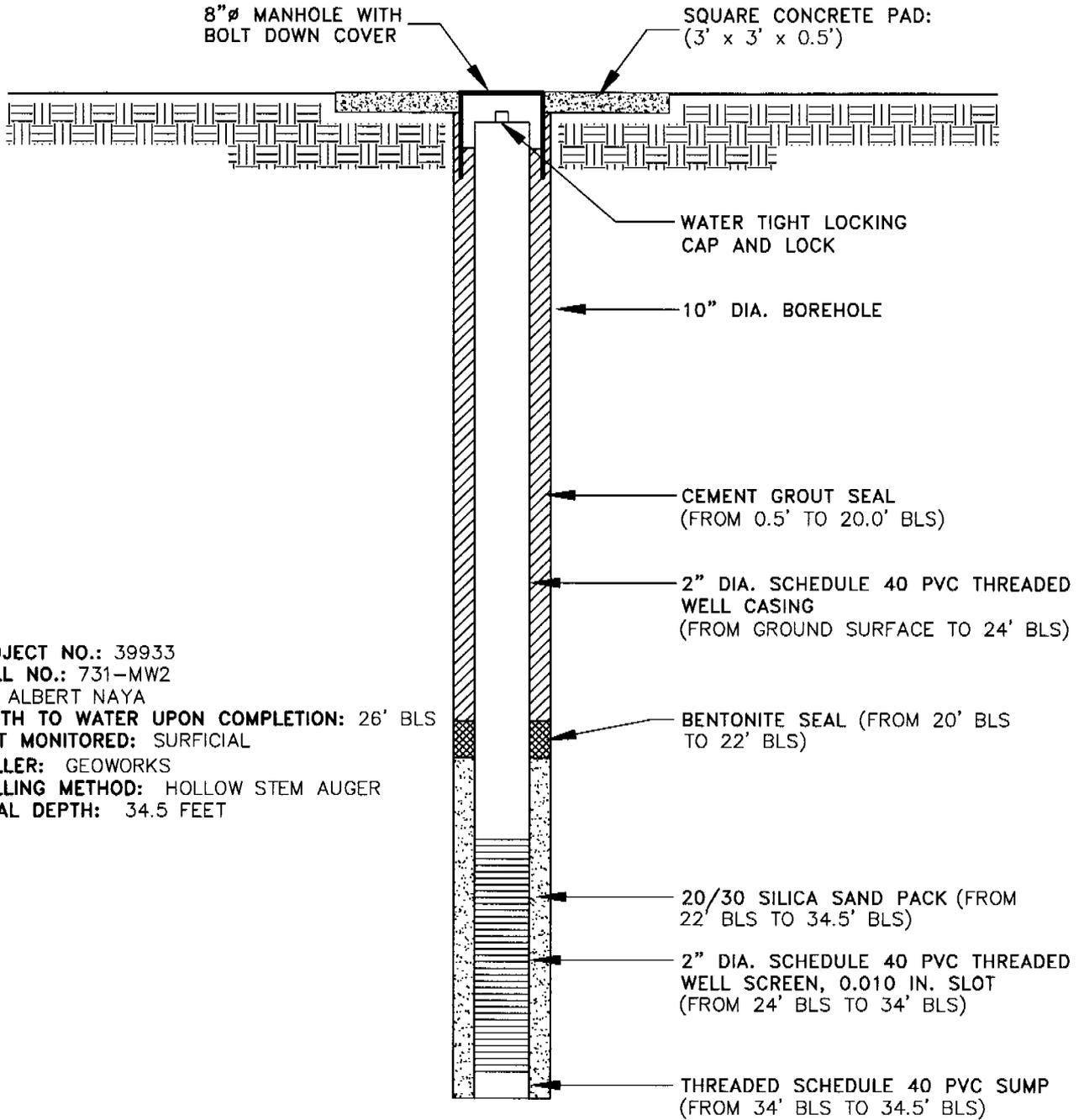
**MONITORING WELL 731-MW2
 CONSTRUCTION DETAILS**

BBL

BLASLAND, BOUCK & LEE, INC.
 engineers & scientists

FIGURE
2

731 - MW3



PROJECT NO.: 39933
 WELL NO.: 731-MW2
 BY: ALBERT NAYA
 DEPTH TO WATER UPON COMPLETION: 26' BLS
 UNIT MONITORED: SURFICIAL
 DRILLER: GEOWORKS
 DRILLING METHOD: HOLLOW STEM AUGER
 TOTAL DEPTH: 34.5 FEET

(DRAWING NOT TO SCALE)

MSL = MEAN SEA LEVEL
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION
 CEIBA, PUERTO RICO

SITE 731

**MONITORING WELL 731-MW3
 CONSTRUCTION DETAILS**

BBL

BLASLAND, BOUCK & LEE, INC.
 engineers & scientists

FIGURE
3

APPENDIX C
SLUG TEST RESULTS AND CALCULATIONS

Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

Well No.: 731-MW2
 Test Date: 03/24/98

Formation Tested: Surficial
 Falling Head Test

	<u>English Units</u>	<u>Metric Units</u>
Flush Mount	0.00 (ft)	0.00 (cm)
Static Water Level	26.38 (ft)	804.06 (cm)
Depth to Bottom of S (distance from ground level)	35.00 (ft)	1066.80 (cm)
Boring Diameter	8 (in)	20.32 (cm)
Casing Diameter	2 (in)	5.08 (cm)
Screen Diameter	2 (in)	5.08 (cm)
Screen Length	10 (ft)	304.8 (cm)
Depth to Boundary (b)	45 (ft)	1371.6 (cm)
Delta H at Time 0	5 (ft)	152.4 (cm)
Delta H at Time t	2 (ft)	60.96 (cm)
Time t	2700.00 (sec)	2700 (sec)
Ratio Kh/Kv	1	1
Porosity of Filter Pac	0.3	0.3

HYDRAULIC CONDUCTIVITY	cm/sec	ft/day	gpd/ft²
K (Bouwer-Rice)	4.2E-05	1.2E-01	8.9E-01
K (Hvorslev Time Lag)	1.4E-05	3.9E-02	2.9E-01
K (Hvorslev Variable Head)	1.4E-05	3.8E-02	2.9E-01

SLUG TEST WORKSHEET

Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

Well Number: 731-MW2

Test Date:

03/24/98

EQUATIONS USED

EQUATION 1: Bouwer-Rice Method

$$K = (((Rc^2) * \ln(Re/Rw)) / (2Le)) * (1/T) * \ln(H0/Ht)$$

where:

K = Hydraulic conductivity

Rc = Casing radius

Re = Effective well radius over which the drawdown is dissipated (this value is calculated from predetermined curves)

Rw = Borehole radius

Le = Saturated screen length

H0 = Drawdown in well at time zero: time zero is specified on the slug test curve

Ht = Drawdown in well at time "t": time "t" is specified on the slug test curve

T = Elapsed time from time zero to time "t"

Note: All equations are valid for any consistent set of units

VARIABLES USED

<u>Variables</u>	<u>English Units</u>	<u>Metric Units</u>
Rc	2 (in)	5.08 (cm)
Rw	4 (in)	10.16 (cm)
Le	10 (ft)	304.8 (cm)
H0	5 (ft)	152.4 (cm)
Ht	2.000 (ft)	60.96 (cm)
T	2700 (sec)	2700 (sec)
b	45 (ft)	1371.60 (cm)

SLUG TEST WORKSHEET

Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

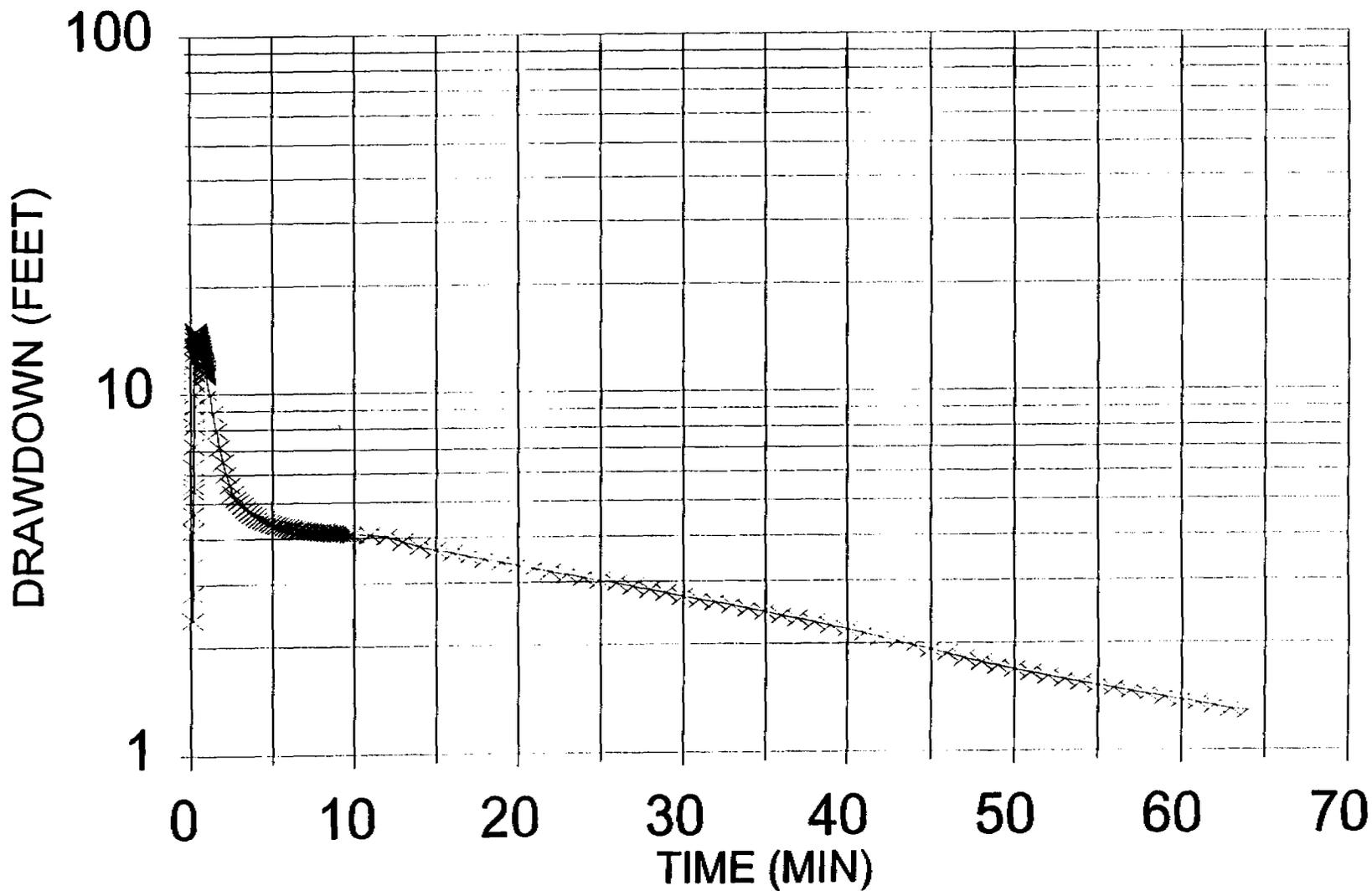
Well Number: 731-MW2

Test Date:

03/24/98

Time (min)	Depth (ft)	Time (min)	Depth (ft)	Time (min)	Depth (ft)
0.366	15.123	2.6	5.307	20.0	3.3277
0.3833	14.877	2.8	5.124	21.0	3.258
0.4	14.801	3.0	5.042	22.0	3.189
0.4166	14.688	3.2	4.928	23.0	3.132
0.4333	14.492	3.4	4.809	24.0	3.069
0.45	14.561	3.6	4.72	25.0	3.012
0.4666	14.398	4.0	4.582	26.0	2.955
0.4833	14.322	4.2	5.531	27.0	2.899
0.5	14.234	4.4	4.487	28.0	2.836
0.5166	14.145	4.6	4.443	29.0	2.779
0.5333	14.057	4.8	4.405	30.0	2.716
0.55	13.981	5.0	4.38	31.0	2.659
0.5666	13.899	5.2	4.348	32.0	2.615
0.5833	13.824	5.4	4.33	33.0	2.558
0.6	13.735	5.6	4.304	34.0	2.508
0.6166	13.647	5.8	4.285	35	2.451
0.6333	13.553	6.0	4.267	36	2.395
0.65	13.464	6.2	4.248	37	2.35
0.6666	13.376	6.4	4.235	38	2.294
0.6863	13.282	6.6	4.216	40	2.187
0.7	13.187	6.8	4.21	41	2.13
0.8	13.092	7.0	4.197	42	2.079
0.7	12.991	7.2	4.185	43	2.029
0.8	12.897	7.4	4.172	44	1.972
0.8	12.783	7.6	4.166	45	1.972
0.8	12.675	7.8	4.159	46	1.922
0.8	12.55	8.0	4.153	47	1.871
0.8	12.456	8.2	4.147	48	1.815
0.8	12.348	8.4	4.138	49	1.771
0.9	12.247	8.6	4.128	50	1.726
0.9	12.14	8.8	4.122	51	1.689
0.9	12.033	9.0	4.122	52	1.651
0.9	11.926	9.2	4.115	53	1.613
0.9	11.812	9.4	4.115	54	1.55
0.9	11.699	9.6	4.109	55	1.518
1.0	11.585	9.8	4.096	56	1.487
1.0	11.478	10.0	4.09	57	1.462
1.0	11.371	11.0	4.065	58	1.436
1.0	11.258	12.0	4.014	59	1.405
1.2	9.99	13.0	3.888	60	1.38
1.4	8.862	14.0	3.769	61	1.355
1.6	7.935	15.0	3.68	62	1.329
1.8	7.145	16.0	3.605	63	1.304
2.0	6.504	17.0	3.529	64	1.285
2.2	6	18.0	3.46		
2.4	5.607	19.0	3.39		

Slug Test Recovery Curve For 731-MW-2



Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

Well No.: 731-MW3
 Test Date: 03/24/98

Formation Tested: Surficial
 Falling Head Test

	<u>English Units</u>	<u>Metric Units</u>
Flush Mount	0.00 (ft)	0.00 (cm)
Static Water Level	27.42 (ft)	835.76 (cm)
Depth to Bottom of S (distance from ground level)	34.00 (ft)	1036.32 (cm)
Boring Diameter	8 (in)	20.32 (cm)
Casing Diameter	2 (in)	5.08 (cm)
Screen Diameter	2 (in)	5.08 (cm)
Screen Length	10 (ft)	304.8 (cm)
Depth to Boundary (b)	45 (ft)	1371.6 (cm)
Delta H at Time 0	9 (ft)	274.32 (cm)
Delta H at Time t	0.9 (ft)	27.432 (cm)
Time t	540.00 (sec)	540 (sec)
Ratio Kh/Kv	1	1
Porosity of Filter Pac	0.3	0.3

HYDRAULIC CONDUCTIVITY	cm/sec	ft/day	gpd/ft²
K (Bouwer-Rice)	6.2E-04	1.8E+00	1.3E+01
K (Hvorslev Time Lag)	2.1E-04	5.8E-01	4.4E+00
K (Hvorslev Variable Head)	2.0E-04	5.8E-01	4.3E+00

SLUG TEST WORKSHEET

Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

Well Number: 731-MW3

Test Date:

03/24/98

EQUATIONS USED

EQUATION 1: Bouwer-Rice Method

$$K = (((Rc^2) * \ln(Re/Rw)) / (2Le)) * (1/T) * \ln(H0/Ht)$$

where:

K = Hydraulic conductivity

Rc = Casing radius

Re = Effective well radius over which the
drawdown is dissipated (this value is
calculated from predetermined curves)

Rw = Borehole radius

Le = Saturated screen length

H0 = Drawdown in well at time zero: time
zero is specified on the slug test curveHt = Drawdown in well at time "t": time "t"
is specified on the slug test curve

T = Elapsed time from time zero to time "t"

Note: All equations are valid for
any consistent set of units

VARIABLES USED

<u>Variables</u>	<u>English Units</u>	<u>Metric Units</u>
Rc	2 (in)	5.08 (cm)
Rw	4 (in)	10.16 (cm)
Le	10 (ft)	304.8 (cm)
H0	9 (ft)	274.32 (cm)
Ht	0.900 (ft)	27.43 (cm)
T	540 (sec)	540 (sec)
b	45 (ft)	1371.60 (cm)

SLUG TEST WORKSHEET

Site 731
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

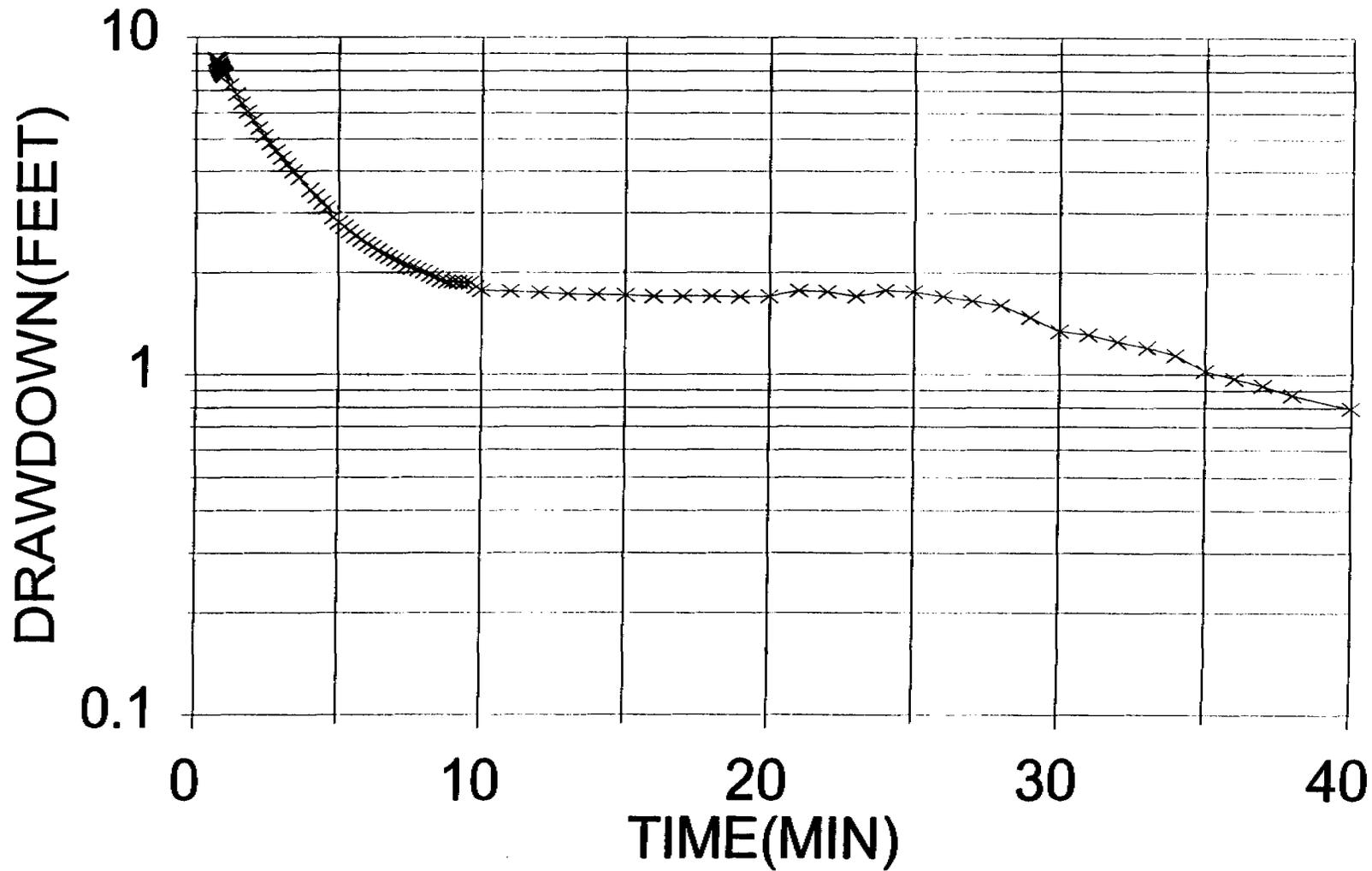
Well Number 731-MW3

Test Date:

03/24/98

Time (min)	Depth (ft)	Time (min)	Depth (ft)	Time (min)	Depth (ft)
0.7	8.7	3.6	3.8	10.0	1.8
0.8	8.6	4.0	3.5	11.0	1.8
0.7	8.6	4.2	3.4	12.0	1.7
0.8	8.5	4.4	3.2	13.0	1.7
0.8	8.4	4.6	3.1	14.0	1.7
0.8	8.3	4.8	2.9	15.0	1.7
0.8	8.3	5.0	2.8	16.0	1.7
0.8	8.2	5.2	2.7	17.0	1.7
0.8	8.2	5.4	2.6	18.0	1.7
0.9	8.1	5.6	2.6	19.0	1.7
0.9	8.1	5.8	2.5	20.0	1.7
0.9	8.0	6.0	2.4	21.0	1.8
0.9	8.0	6.2	2.4	22.0	1.8
0.9	7.9	6.4	2.3	23.0	1.7
0.9	7.9	6.6	2.3	24.0	1.8
1.0	7.8	6.8	2.2	25.0	1.8
1.0	7.8	7.0	2.2	26.0	1.7
1.0	7.8	7.2	2.1	27.0	1.6
1.0	7.8	7.4	2.1	28.0	1.6
1.2	7.2	7.6	2.1	29.0	1.5
1.4	6.8	7.8	2.0	30.0	1.3
1.6	6.4	8.0	2.0	31.0	1.3
1.8	6.0	8.2	2.0	32.0	1.2
2.0	5.7	8.4	1.9	33.0	1.2
2.2	5.4	8.6	1.9	34.0	1.1
2.4	5.1	8.8	1.9	35	1.027
2.6	4.8	= 9.0	1.9	36	0.976
2.8	4.6	9.2	1.9	37	0.926
3.0	4.4	9.4	1.9	38	0.869
3.2	4.2	9.6	1.9	40	0.794
3.4	4.0	9.8	1.8		

Slug Test Recovery Curve For 731-MW3



CALCULATIONS

EQUATION 1: $I = H/D$ Determination of Hydraulic Gradient (I), where:

I = Hydraulic Gradient
H = Difference in water table elevation between measuring points (ft)
D = Distance between measuring points in the direction of ground-water flow (ft)

DATA:

	<u>2/25/98</u>	<u>3/16/98</u>
H =	0.37	0.42
D =	16	16

RESULTS:

I = **0.023 ft/ft** **0.026 ft/ft**

**EQUATION 2: $V = K_{avg} I / n_e$ Determination of Ground-Water Flow Velocity (V),
where:**

K_{avg} = Average Hydraulic Conductivity (0.96 ft/day from slug test results)
I = Hydraulic Gradient (ft/ft)
 n_e = Effective Porosity (45% or .45, from C.W. Fetter)
V = Velocity (ft/day)

DATA:

	<u>2/25/98</u>	<u>3/16/98</u>
K_{avg} =	0.96	0.96
I =	0.023	0.026
n_e =	0.45	0.45

RESULTS:

V = **0.049 ft/day** **0.055 ft/day**

APPENDIX D

D-1. Utility Location/Well Permit

The tentative locations of the soil borings and monitoring well locations were presented to Caleb Romero (Facilities Management and Utilities Division, Public Works Department) before the initiation of drilling activities. A utility check in the proposed area of investigation was conducted by Mr. Romero. To avoid damaging any potential underground structures, the first two feet of each soil boring and monitoring well were installed with a post hole digger. In addition, a hand auger was used to collect samples from two feet to four feet BLS.

An application requesting well construction permits was submitted to the Puerto Rico Department of Natural Resources on February 17, 1998.

4330
NO2C-A411
Jan 20, 1998

MEMORANDUM

From: Facilities Management Division, PWD
To: Pitt T. Maner III, Blasland Bouck & Lee

Subj.: EXCAVATION PERMIT FOR N62470-93-D-4021, VARIOUS SITES
CHARACTERIZATIONS

Ref. : (a) Personal request

1. The excavation permit is approved based on the existing utilities information contained on existing filed drawings and on contract drawings.
2. Care must be observed during the excavation process and excavation by hand shall be performed whenever utilities are present as shown in project drawings.
3. The contractor will do arrangements for repairs of any utilities damaged or disconnected shown on enclosure(1) after notification to PWD is done.
4. Facilities 1691, 429R and 729 will be scanned prior to excavation by PWD.
5. This permit shall be available at the work site at all times with the provided exhibits if any.
6. For any additional information or assistance to perform excavation, please contact Mr. Caleb Romero, Utilities Engineer, at telephone extensions 4068/4268.

Caleb Romero

Received by: _____



DEPARTMENT OF THE NAVY
U.S. NAVAL STATION, ROOSEVELT ROADS
PSC 1008 BOX 3001
FPO AA 34051-0001

5090

Ser N02C-A64/ 0388

17 FEB 1998

Department of Natural Resources
Box 5887
Puerta de Tierra, PR 00906

Attention: Ms. Sara Cortez

SUBJECT: PERMIT APPLICATION AND FEE TO INSTALL 45 MONITORING
WELLS AT THE U.S. NAVAL STATION, ROOSEVELT ROADS

Enclosed is a permit application and fee to install 45 monitoring wells at the US Naval Station, Roosevelt Roads. These wells will be used to collect water samples for laboratory analysis as required by the Environmental Quality Board regulation for Underground Storage Tanks (USTs). The wells will not be used for any type of groundwater production.

Should you have any questions, please contact Mr. Pedro Ruiz, Pollution Abatement Program Manager, Environmental Engineering Division, at 865-4429.

Sincerely,

A handwritten signature in cursive script, appearing to read "D. L. Duren".

D. L. DUREN

Lieutenant Commander, CEC, U.S. Navy
Assistant Public Works Department
By direction of the
Commanding Officer

Enclosure: (1)

Estado Libre Asociado de Puerto Rico
DEPARTAMENTO DE RECURSOS NATURALES
San Juan, Puerto Rico

Secretaría Auxiliar de Planificación de Recursos

SOLICITUD PARA PERMISO DE CONSTRUCCION DE POZO

PARA USO DEL DEPARTAMENTO	
Número de Solicitud _____	Fecha de Recibo _____

Número de Franquicia _____ Número de Reclamo de Derecho Adquirido _____

1. Solicitante Seguro Social _____

Nombre US Naval Station Roosevelt Roads Teléfono (787)865-4429

Dirección Residencial Public Works Dep. Bldg. 31 NAVSTA Roos Rds. Ceiba PR
Calle Núm. Municipio Zona Postal

Urbanización o Barrio Núm. Carr. Km. Ha.

Dirección Postal Commanding Officer Attn. Public Works Officer. Code NO2C-A6
PSC 1008 Box 3021 FPO AA 34051-3021
Buzón Rural Núm. Apdo. Municipio Zona Postal

2. Propietario de los terrenos donde se construirá el pozo. De ser igual al solicitante, indique IGUAL.

Nombre SAME Teléfono _____

Dirección Residencial _____
Calle Núm. Municipio Zona Postal

Urbanización o Barrio Núm. Carr. Km. Ha.

Dirección Postal _____
Buzón Rural Núm. Apdo. Municipio Zona Postal

Relación del solicitante con el propietario (arrendatario, usufructuario, otro). _____

3. Pocero. De ser igual al solicitante, indique IGUAL.

Nombre GeoWorks Inc. Teléfono (787)261-0932

Dirección Residencial Pedro Arcillagos H-10 Septima Seccion, Levittown Toa
Calle Núm. Municipio Zona Postal

Baja 00950
Urbanización o Barrio Núm. Carr. Km. Ha.

Dirección Postal _____
Buzón Rural Núm. Apdo. Municipio Zona Postal

4. Localización del Pozo

Municipio Ceiba Barrio _____

Sector 18° 15' 00" Latitude Finca US Naw Roosevelt Roads
65° 39' 30" Longitude

Núm. Carr. _____ Km. _____ Ha. _____

5. Cantidad de Agua a Extraerse (en millones de galones al año (MGA))

(_____) X (_____) X (_____) X (_____) X (60/1,000,000) = _____ MGA
razón de extracción (gpm) horas/día días/semana semanas/año

6. Uso de Agua: () Doméstico () Comercial () Agrícola () Industrial

Describe brevemente la actividad en que se utilizará el agua.

The wells will be installed for monitoring purposes only. No water will be collected from them.

7. Tipo de Pozo:

() abasto (X) observación () reserva () barreno de prueba

8. Datos del Pozo:

Profundidad anticipada 25 pies Diámetro del barreno 8 pulg.

Diámetro de la camisa 2 pulg. Tipo de rejilla 0.010

9. Método de Construcción:

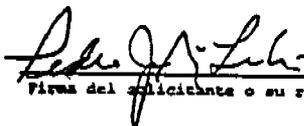
() a mano () percusión () rotario (X) OTRO Hollow Sten Auger (HSA)

AUTORIZACION

Autorizo al personal del Departamento de Recursos Naturales a entrar en los terrenos de mi propiedad o uso a inspeccionar el lugar donde se construirá el pozo aquí propuesto, así como cualquier otro lugar que pudiere afectarse con las obras en proyecto.

CERTIFICO: Que la información aquí expuesta es correcta, según mi mejor saber y entender.

28 Jan 98
FECHA


Firma del solicitante o su representante autorizado

Pedro J. Ruiz Lebron
Nombre del solicitante o su representante autorizado.
en letra de molde

D-2. Equipment Decontamination

The drilling rig and associated equipment was decontaminated before installing each soil boring and monitoring well. Decontamination procedures included removing loose soils from tools and steam cleaning the equipment. Potable water, from an on-site source, and Alconox (non-phosphate soap) were used in addition to steam cleaning. An equipment decontamination pit was temporarily built with short wooden walls and covered with plastic sheeting. The decontamination area was located next to the former gas station at Site 520.

Equipment decontamination was conducted in a 20-foot by 20-foot pit that had wooden walls with a minimum height of 6-inches . The pit was covered with plastic sheeting to contain any fluids. Decontamination water contained in the pit evaporated before it could be pumped into 55-gallon drums for disposal.

During the installation of the soil borings, the split-spoon sampling equipment was cleaned between each sampling interval by scrubbing the remaining soil off with a brush in soapy water and rinsing in fresh water. The split-spoon equipment was steam cleaned in the decontamination area after each boring was completed.

D-3. Air Monitoring

During the installation of the soil borings, the breathing zone around the drilling rig was routinely monitored with a Foxboro Model 128 OVA. Results of the daily air monitoring are presented in the table below. The breathing levels never exceeded 0 ppm during the soil borings installations.

PROJECT: <u>Roosevelt Roads U.S. Naval Station-Site 731</u>			
MONITORING INSTRUMENT: <u>128 Foxboro Organic Vapor Analyzer</u>			
AIR MONITOR: <u>Albert Naya</u>			
LEVEL OF PROTECTION: <u>Level D</u>			
ACTIVITY : <u>Soil Boring Installation</u>			
Date	Time	Boring Location	Instrument Reading (ppm)
2/9/98	08:00	731-SB1 Breathing zone behind rig	0
2/9/98	10:00	731-SB1 Breathing zone behind rig	0
2/9/98	12:00	731-SB1 Breathing zone behind rig	0
2/9/98	14:00	731-SB1 Breathing zone behind rig	0
2/9/98	16:00	731-SB1 Breathing zone behind rig	0
2/10/98	08:00	731-SB2 Breathing zone behind rig	0
2/10/98	10:00	731-SB2 Breathing zone behind rig	0
2/10/98	12:00	731-SB2 Breathing zone behind rig	0
2/10/98	14:00	731-SB2 Breathing zone behind rig	0
2/10/98	16:00	731-SB3 Breathing zone behind rig	0
2/11/98	08:00	731-SB3 Breathing zone behind rig	0
2/11/98	10:00	731-SB3 Breathing zone behind rig	0
2/11/98	12:00	731-SB3 Breathing zone behind rig	0
2/11/98	14:00	731-SB3 Breathing zone behind rig	0
2/11/98	16:00	731-SB3 Breathing zone behind rig	0
2/12/98	08:00	731-SB4 Breathing zone behind rig	0
2/12/98	10:00	731-SB4 Breathing zone behind rig	0
2/12/98	12:00	731-SB4 Breathing zone behind rig	0
2/12/98	14:00	731-SB4 Breathing zone behind rig	0
2/12/98	16:00	731-SB4 Breathing zone behind rig	0

D-4. OVA Field Screening Methodology

Field screening of the soils with an OVA involved the following: (1) two pint-sized mason jars were half filled with soil obtained from the split-spoon sampler; (2) the jar tops were covered with aluminum foil and sealed; (3) the jars were placed in a cool area for five minutes to allow the head space to equilibrate; and (4) the headspace was measured with an OVA. Two samples were collected from each interval to measure the head space with and without a charcoal filter; the filter allows differentiation between natural organic vapors (e.g., methane and ethane) and hydrocarbons vapors. The difference between the two readings is the net hydrocarbon vapor content attributed to non-naturally occurring sources.

D-5. Monitoring Well Construction

The three monitoring wells (731-MW-1, 731-MW-2, and 731-MW-3) were installed using hollow stem augers. The filter pack material consisted of 20/30 grade silica sand. Following the well casing and screen emplacement, the sand material was poured into each borehole annulus to least two feet above the top of the screen interval. To confirm that the filter pack was placed at the proper interval, the depth to sand was continuously measured. A weighted tape measure was used to determine the depth to sand. A 2 to 3-foot bentonite pellet seal was emplaced above the sand pack. Water was added to the bentonite pellets which were allowed to hydrate overnight. The remaining annular space around the well was filled with neat cement to land surface. The monitoring wells were completed with a concrete pad (3-ft x 3-ft x 0.6-ft deep), flush-mounted, bolt down manholes, locking watertight caps, and keyed-alike padlocks. Appendix B contains the construction logs for each of the monitoring wells.

D-6. Monitoring Well Development

The monitoring well development was performed by with a hand bailer. To obtain a representative water sample, development continued until the purge water was free of silt and sand. Well development dates and volumes developed are summarized in Table 3-3.

The development water was containerized in 55-gallon drums. Based on laboratory analytical data, the development water was discharged onto the asphalt road surface adjacent to the site to evaporate.

APPENDIX E
TEG LABORATORY ANALYTICAL RESULTS



World Leader In On-Site Sampling and Analysis

February 12, 1998
TEG Project #98I0211BBL

Mr. Pitt Maner
BBL, Inc.
185 N.W. Spanish River Blvd., Suite 110
Boca Raton, FL 33431

SUBJECT: DATA REPORT - ROOSEVELT ROADS PROJECT NO. 39933

Dear Pitt,

Please find enclosed the data report for samples collected by BBL staff from the above referenced project site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico-certified chemist conducted the following analyses:

- 2 water samples analyzed for TRPH by modified EPA test method 418.1.
- 1 trip blank water sample analyzed for TRPH.
- Laboratory QA/QC analyses for TRPH.

The results of the analyses are summarized in the attached table. Applicable detection limits, QA/QC data and a chain-of-custody are also included as attachments.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,
TEG

Kevin Shelburne
Principal

Attachments



World Leader In On-Site Sampling and Analysis

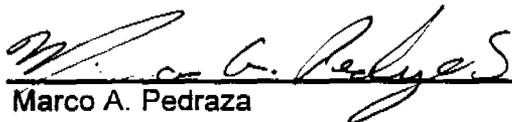
**BLASLAND, BOUCK & LEE, INC.
ROOSEVELT ROADS
CEIBA, P. R.**

TEG Project #9810211BBL

TRPH (EPA Method 418.1) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/L)
METHOD BLANK	2/12/98	ND
731 SB-1 (auger)	2/12/98	ND
731 SB-2 (auger)	2/12/98	ND
731 SB-2 (auger) rep.	2/12/98	ND
Trip Blank	2/12/98	ND
DETECTION LIMIT (mg/L)		10

SAMPLING PERFORMED BY BBL PERSONNEL
ND INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/L = MILLIGRAMS PER LITER
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE



Marco A. Pedraza
Laboratory Manager



Kevin Shelburne
Principal





QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #9810211BBL

BLASLAND, BOUCK & LEE, INC. 39933

DAILY CALIBRATION DATE : 2/12/98

PROJECT NAME: ROOSEVELT ROADS

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC	MS MSD CONC (ppm)	%REC	MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	250	216	87%	213	85%		2%	15%	80% - 120%

ppm = PARTS PER MILLION

MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE

% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX

RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO A. PEDRAZA

DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY

PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725

TELEPHONE (787) 720-0329 FAX 789-3858



QA/QC REPORT - CALIBRATION DATA

TEG Project #9810211BBL

BLASLAND, BOUCK & LEE, INC. 39933

DAILY CALIBRATION DATE : 2/12/98

PROJECT NAME: ROOSEVELT ROADS

COMPOUND	DETECTOR	CALIB RANGE	INITIAL		OPENING			CLOSING		
			RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	617.89	15.7%	0.371	673.9	9.1%	0.445	561.8	9.1%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA

DATA REVIEWED BY: KEVIN SHELBURNE

Client: BRL
 Address: 10000 Lakes, FL
 Phone: 561 750 3733 FAX: 757 800 4531
 Client Project #: 39933 Project Manager: A. Mour

Date: 2/11/98 Page 1 of 1
 TEG Project #: 9810211 BRL Outside Lab. # _____
 Location: Lawrence Road
 Collector: D. Moss Date of Collection: See Note

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI	FIELD NOTES / Date PRESERVATION	Total # of Containers
73155-1 Ager	-	0740	Aq	2x40.1					X										Ice 2/10/98	2
73156-2 Ager	-	0730	Aq	3x10.1					X										Ice 2/11/98	3
Trip Blank	-	-	-	1x40.1					X											1

RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time
<i>[Signature]</i>	2/11/98	<i>[Signature]</i>	2/11/98 4:50
RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time

Total # of containers	7	TEMPERATURE
Chain of Custody seals Y/N/NA	N/A	
Seals intact? Y/N/NA	N/A	
Received good conditions / cold	YES	24 Hour



World Leader In On-Site Sampling and Analysis

February 13, 1998
TEG Project #98I0212BBL

Mr. Pitt Maner
BBL, Inc.
185 N.W. Spanish River Blvd., Suite 110
Boca Raton, FL 33431

SUBJECT: DATA REPORT - ROOSEVELT ROADS PROJECT NO. 39933

Dear Pitt,

Please find enclosed the data report for samples collected by BBL staff from the above referenced project site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico-certified chemist conducted the following analyses:

- 2 water samples analyzed for TRPH by modified EPA test method 418.1.
- 1 trip blank water sample analyzed for TRPH.
- Laboratory QA/QC analyses for TRPH.

The results of the analyses are summarized in the attached table. Applicable detection limits, QA/QC data and a chain-of-custody are also included as attachments.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,
TEG

Kevin Shelburne
Principal

Attachments



World Leader In On-Site Sampling and Analysis

**BLASLAND, BOUCK & LEE, INC.
ROOSEVELT ROADS
CEIBA, P. R.**

TEG Project #98I0212BBL

TRPH (EPA Method 418.1) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/L)
METHOD BLANK	2/13/98	ND
731 SB-3 (auger)	2/13/98	ND
731 SB-4 (auger)	2/13/98	ND
731 SB-4 (auger) rep.	2/13/98	ND
Trip Blank	2/13/98	ND
DETECTION LIMIT (mg/L)		10

SAMPLING PERFORMED BY BBL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/L = MILLIGRAMS PER LITER
ANALYSES PERFORMED BY: RUTH DONES
DATA REVIEWED BY: KEVIN SHELBURNE

Ruth Dones
Quality Assurance/Control Manager

Kevin Shelburne
Principal





QA/QC REPORT - CALIBRATION DATA

TEG Project #9810212BBL

BLASLAND, BOUCK & LEE, INC. 39933

DAILY CALIBRATION DATE : 2/13/98

PROJECT NAME: ROOSEVELT ROADS

COMPOUND	DETECTOR	CALIB RANGE	INITIAL		OPENING			CLOSING		
			RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	617.89	15.7%	0.419	596.7	3.4%	0.416	601.0	2.7%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: RUTH DONES

DATA REVIEWED BY: KEVIN SHELBURNE



QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0212BBL

DAILY CALIBRATION DATE : 2/13/98

BLASLAND, BOUCK & LEE, INC. 39933

PROJECT NAME: ROOSEVELT ROADS

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC	MS MSD CONC (ppm)	%REC	MSD RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	250	236	94%	240	96%	2%	15%	80% - 120%

ppm = PARTS PER MILLION

MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE

% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX

RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: RUTH DONES

DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL, GEOCHEMISTRY

PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725

TELEPHONE (787) 720-0329 FAX 789-3858

APPENDIX F
GROUNDWATER SAMPLING PROCEDURES

F. Groundwater Sampling Procedures

Sampling Procedures

Before each new monitoring well was sampled, the wells were allowed to stabilize for at least 24 hours after installation. To avoid cross-contamination between wells, pre-cleaned, disposable, teflon bailers were used to collect groundwater samples. Prior to sampling groundwater from the new monitoring wells, depth to water was measured and each well was purged of at least three well volumes. The purge procedure was performed by hand bailing using a disposable bailer. During purging, multiple water-quality measurements of pH, temperature, and specific conductance were collected in the field until reaching stabilization. The complete well sampling logs are presented in this Appendix.

Groundwater samples were shipped in sealed coolers packed with ice via an overnight delivery service to Savannah Laboratories & Environmental Services, Inc (Savannah) in Deerfield Beach, Florida.

QA/QC Procedures

Field blanks were collected at the time that the monitoring wells were sampled. The field blanks were analyzed for BTEX by EPA Method 602 and for TPH by EPA Method 418.1. Field blank samples were collected by filling the appropriate laboratory containers with distilled water in the area of groundwater collection. No constituents were detected above the laboratory detection limits in any of the field blank samples.

An rinsate blank was collected from a decontaminated split-spoon sampler used to install soil borings. The sample was collected by pouring distilled water into an over the split-spoon sampler and by collecting the runoff in the appropriate laboratory container. No constituents were detected above the laboratory detection limits in either of the equipment blank samples.

Project/No. 399.33 Task 002 Page 1 of 3
 Site Location NAVSTA Roosevelt Rds. Site 731
 Site/Well No. 731 MW-3 Coded/ Replicate No. _____ Date 2/27/98

Weather Clear, hot, Upper 80s - 90s Time Sampling Began 1045 (start purge) Time Sampling Completed 1300 (collect sample)

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)
 Height of MP Below Land Surface _____ (feet) MP Elevation NA (feet)
 Total Sounded Depth (TD) of Well Below MP 35.15 (feet) Water-Level Elevation _____ (feet)
 Depth to Water (DTW) Below MP 26.88 (feet) Diameter of Casing/ Construction Type 2" Schedule 40 PVC
 Gallons Pumped/Bailed _____
 Water Column (WC) in Well (TD - DTW) 9.27 (feet) Prior to Sampling (GAL x 5 VOL x PUMP RATE) 7.5 gal.
 Gallons per Foot (GPF) 0.16
 Gallons in Well (WC x GPF) 1.32 Sampling Pump Intake NA/Bail (feet below land surface)

Evacuation Method Bail w Teflon bailer

V. pale grayish
 Color yellow Odor none Appearance Slightly turbid Temperature 27.4 °F

SAMPLING DATA/FIELD PARAMETERS

Other (specific ion; OVA; HNU; etc.) _____

Specific Conductance, umhos/cm 2780 pH 7.25

Sampling Method and Material teflon bailer (disposable)

Constituents Sampled	Container Description	Preservative
	From Lab <u>X</u> or BB&L	
1. EPA method 8020	3x 40ml glass	HCL
2. EPA method 610 PAH	1x 1 liter brown glass	HCL
3. EPA method 418.1 TPAH	1x 1 liter glass	HCL
4. Total Pb	1x 250ml plastic	HNO3
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____

Remarks 1230 - collect Field Blank 1240 - collect Rinsate Blank off bailer.

Sampling Personnel P. Maner - / D. Press BB&L

GAL./FT.	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

Project/No. 399.33 Task 002 Page 2 of 3
 Site Location NAVSTA Roosevelt Rds. Site 731
 Site/Well No. 731 MW-2 Coded/
 Replicate No. _____ Date 2/27/98

Weather clear hot, upper 80s-90 Time Sampling Began 1335 (start pump) Time Sampling Completed 1500 (collect sample)

EVACUATION DATA

Description of Measuring Point (MP)	Top of Casing (North Side)	MP Elevation	<u>NA</u>	(feet)
Height of MP Below Land Surface	_____ (feet)	Water-Level Elevation	_____	(feet)
Total Sounded Depth (TD) of Well Below MP	<u>34.37</u> (feet)	Diameter of Casing/	_____	
Depth to Water (DTW) Below MP	<u>25.85</u> (feet)	Construction Type	<u>2" Schedule 40 PVC</u>	
Water Column (WC) in Well (TD - DTW)	<u>8.52</u> (feet)	Gallons Pumped/Bailed	Prior to Sampling	_____
Gallons per Foot (GPF)	<u>0.16</u>	(GAL x 5 VOL x PUMP RATE)	<u>4.2 gal</u>	
Gallons in Well (WC x GPF)	<u>1.36</u>	Sampling Pump Intake	<u>NA/Bail</u>	(feet below land surface)

Evacuation Method Teflon bailer

SAMPLING DATA/FIELD PARAMETERS

Color pale yellow Odor none Appearance slightly turbid Temperature 27.4 °F

Other (specific ion; OVA; HNU; etc.) _____

Specific Conductance, umhos/cm 2610 pH 7.54

Sampling Method and Material Disposable teflon bailer

Constituents Sampled	Container Description		Preservative
	From Lab	X or BB&L	
1. <u>EPA method 8020</u>		<u>3x40ml glass</u>	<u>HCL</u>
2. <u>EPA method 610 PAH</u>		<u>1x1 liter brown glass</u>	<u>α</u>
3. <u>EPA method 418.1 TRPH</u>		<u>1x1 liter glass</u>	<u>HCL</u>
4. <u>Total Pb</u>		<u>1x250ml plastic</u>	<u>HNO₃</u>
5. _____		_____	_____
6. _____		_____	_____
7. _____		_____	_____

Remarks Well went dry after 4.2 gallon purge.

Sampling Personnel P. Maner / D. Press BB&L

GAL./FT.	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

Project/No. 399.33 Task 002 Page 3 of 3

Site Location NAVSTA Roosevelt Rds Site 731

Site/Well No. 731 MW-1 Coded/ Replicate No. _____ Date 2/27/98

Weather Clear, hot, upper 80s to 90 Time Sampling Began 1415 (start purge) Time Sampling Completed 1505 (Collect sample)

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)
 Height of MP Below Land Surface _____ (feet) MP Elevation NA (feet)
 Total Sounded Depth (TD) of Well Below MP 33.99 (feet) Water-Level Elevation _____ (feet)
 Depth to Water (DTW) Below MP 27.11 (feet) Diameter of Casing/ Construction Type 2" Schedule 40 PVC
 Gallons Pumped/Bailed Prior to Sampling _____
 Water Column (WC) in Well (TD - DTW) 6.88 (feet) (GAL x 5 VOL x PUMP RATE) 3.5
 Gallons per Foot (GPF) 0.16
 Gallons in Well (WC x GPF) 1.10 Sampling Pump Intake NA/Bail (feet below land surface)

Evacuation Method Teflon bailer

SAMPLING DATA/FIELD PARAMETERS

Color None Odor none Appearance clear Temperature 26.8 °F

Other (specific ion; OVA; HNU; etc.) _____

Specific Conductance, umhos/cm 2230 pH 7.40

Sampling Method and Material disposable teflon bailer

Constituents Sampled	Container Description		Preservative
	From Lab	X or BB&L	
1. <u>EPA method 8020</u>	<u>3</u>	<u>X 40ml glass</u>	<u>HCL</u>
2. <u>EPA method 610 PAH</u>	<u>1</u>	<u>X 1 liter brown glass</u>	<u>∅</u>
3. <u>EPA method 418-1 TRPH</u>	<u>1</u>	<u>X 1 liter glass</u>	<u>HCL</u>
4. <u>Total Pb</u>	<u>1</u>	<u>X 250 ml plastic</u>	<u>HNO₃</u>
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____

Remarks Well almost dry after 5 minutes of purging (ie. after 2 gallons purged). pH, conductivity + temp. stable (within 5%) for 3 readings.
 Sampling Personnel P. Maner / D. Press BB&L

GAL/FT.	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

APPENDIX G
SAVANNAH LABORATORY ANALYTICAL RESULTS

CERTIFICATE

I certify that I have reviewed and evaluated all analytical raw data concerning all the samples contained in the Laboratory Report of Analysis for Savannah Laboratories Log Number D8-40436.

I hereby certify that, to the best of my knowlege, the results for log number D8-40436, pages 1-8 (inclusive), signed by Paul Canevaro, are correct and reliable.



SL SAVANNAH LABORATORIES
 & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40436
 Received: 28 FEB 98
 Reported: 06 MAR 98

Mr. Pitt Maner
 Blasland Bouck & Lee, Inc.
 185 NW Spanish River Boulevard, Suite 110
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)
 Sampled By: PM/DP
 Code: 140580313
 Page 1

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED			
40436-1	MW-1	02-27-98/1505			
40436-2	MW-2	02-27-98/1500			
40436-3	MW-3	02-27-98/1300			
40436-4	Field Blank	02-27-98/1230			
PARAMETER	40436-1	40436-2	40436-3	40436-4	
Aromatic Volatiles (8020)					
Benzene, ug/l	<1.0	<1.0	<1.0	<1.0	
Chlorobenzene, ug/l	<1.0	<1.0	<1.0	<1.0	
1,2-Dichlorobenzene, ug/l	<1.0	<1.0	<1.0	<1.0	
1,3-Dichlorobenzene, ug/l	<1.0	<1.0	<1.0	<1.0	
1,4-Dichlorobenzene, ug/l	<1.0	<1.0	<1.0	<1.0	
Ethylbenzene, ug/l	<1.0	<1.0	<1.0	<1.0	
Toluene, ug/l	<1.0	<1.0	<1.0	<1.0	
Xylenes, ug/l	<2.0	<2.0	<2.0	<2.0	
Methyl-tert-butyl ether (MTBE), ug/l	<10	<10	<10	<10	
Date Analyzed	03.02.98	03.02.98	03.02.98	03.02.98	

Validated & Certified by: *Blasland*
 License No.: 2314

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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LOG NO: D8-40436
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Project: #399.33 (Roosevelt Rds)
Sampled By: PM/DP
Code: 140580313
Page 2

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED			
40436-1	MW-1	02-27-98/1505			
40436-2	MW-2	02-27-98/1500			
40436-3	MW-3	02-27-98/1300			
40436-4	Field Blank	02-27-98/1230			
PARAMETER		40436-1	40436-2	40436-3	40436-4
Polynuclear Aromatic Hydrocarbons (610)					
Acenaphthene, ug/l		<10	<10	<10	<10
Acenaphthylene, ug/l		<10	<10	<10	<10
Anthracene, ug/l		<10	<10	<10	<10
Benzo(a)anthracene, ug/l		<4.0	<4.0	<4.0	<4.0
Benzo(a)pyrene, ug/l		<4.0	<4.0	<4.0	<4.0
Benzo(b)fluoranthene, ug/l		<4.0	<4.0	<4.0	<4.0
Benzo(g,h,i)perylene, ug/l		<10	<10	<10	<10
Benzo(k)fluoranthene, ug/l		<5.0	<5.0	<5.0	<5.0
Chrysene, ug/l		<5.0	<5.0	<5.0	<5.0
Dibenzo(a,h)anthracene, ug/l		<5.0	<5.0	<5.0	<5.0
Fluoranthene, ug/l		<10	<10	<10	<10
Fluorene, ug/l		<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene, ug/l		<5.0	<5.0	<5.0	<5.0
Naphthalene, ug/l		<5.0	<5.0	<5.0	<5.0
Phenanthrene, ug/l		<10	<10	<10	<10
Pyrene, ug/l		<10	<10	<10	<10
2-Methylnaphthalene, ug/l		<10	<10	<10	<10
1-Methylnaphthalene, ug/l		<10	<10	<10	<10
Date Extracted		03.03.98	03.03.98	03.03.98	03.03.98
Date Analyzed		03.05.98	03.05.98	03.05.98	03.05.98
Petroleum Hydrocarbons (418.1)					
Petroleum Hydrocarbons, mg/l		<1.0	<1.0	<1.0	<1.0
Date Extracted		03.02.98	03.02.98	03.02.98	03.02.98
Date Analyzed		03.02.98	03.02.98	03.02.98	03.02.98

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414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40436
 Received: 28 FEB 98
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Mr. Pitt Maner
 Blasland Bouck & Lee, Inc.
 185 NW Spanish River Boulevard, Suite 110
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)
 Sampled By: PM/DP
 Code: 140580313
 Page 3

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED			
40436-1	MW-1	02-27-98/1505			
40436-2	MW-2	02-27-98/1500			
40436-3	MW-3	02-27-98/1300			
40436-4	Field Blank	02-27-98/1230			
PARAMETER		40436-1	40436-2	40436-3	40436-4
Lead (7421)					
Lead, mg/l		<0.0050	<0.0050	<0.0050	<0.0050
Date Analyzed		03.02.98	03.02.98	03.02.98	03.02.98

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Project: #399.33 (Roosevelt Rds)
 Sampled By: PM/DP
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 Page 4

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	
40436-5	Rinsate Blank	
PARAMETER		40436-5
Polynuclear Aromatic Hydrocarbons (610)		
Acenaphthene, ug/l		<10
Acenaphthylene, ug/l		<10
Anthracene, ug/l		<10
Benzo(a)anthracene, ug/l		<4.0
Benzo(a)pyrene, ug/l		<4.0
Benzo(b)fluoranthene, ug/l		<4.0
Benzo(g,h,i)perylene, ug/l		<10
Benzo(k)fluoranthene, ug/l		<5.0
Chrysene, ug/l		<5.0
Dibenzo(a,h)anthracene, ug/l		<5.0
Fluoranthene, ug/l		<10
Fluorene, ug/l		<10
Indeno(1,2,3-cd)pyrene, ug/l		<5.0
Naphthalene, ug/l		<5.0
Phenanthrene, ug/l		<10
Pyrene, ug/l		<10
2-Methylnaphthalene, ug/l		<10
1-Methylnaphthalene, ug/l		<10
Date Extracted		03.03.98
Date Analyzed		03.05.98
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		<1.0
Date Extracted		03.02.98
Date Analyzed		03.02.98
Lead (7421)		
Lead, mg/l	=	<0.0050
Date Analyzed		03.02.98

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Project: #399.33 (Roosevelt Rds)

Sampled By: PM/DP

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REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , LIQUID SAMPLES

40436-6 Trip Blank

PARAMETER

40436-6

Aromatic Volatiles (8020)

Benzene, ug/l <1.0

Chlorobenzene, ug/l <1.0

1,2-Dichlorobenzene, ug/l <1.0

1,3-Dichlorobenzene, ug/l <1.0

1,4-Dichlorobenzene, ug/l <1.0

Ethylbenzene, ug/l <1.0

Toluene, ug/l <1.0

Xylenes, ug/l <2.0

Methyl-tert-butyl ether (MTBE), ug/l <10

Date Analyzed 03.02.98

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Project: #399.33 (Roosevelt Rds)
 Sampled By: PM/DP
 Code: 140580313
 Page 6

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40436-7 Method Blank
 40436-8 Accuracy (%Rec)
 40436-9 Precision (%RPD)
 40436-10 Reporting Limit (RL)

PARAMETER	40436-7	40436-8	40436-9	40436-10
Aromatic Volatiles (8020)				
Benzene, ug/l	<1.0	84 %	2.4 %	1.0
Chlorobenzene, ug/l	<1.0	82 %	2.4 %	1.0
1,2-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l	<1.0	---	---	1.0
Ethylbenzene, ug/l	<1.0	---	---	1.0
Toluene, ug/l	<1.0	85 %	2.4 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	03.02.98	---	---	---

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Project: #399.33 (Roosevelt Rds)
Sampled By: PM/DP
Code: 140580313
Page 7

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES			
40436-7	Method Blank			
40436-8	Accuracy (%Rec)			
40436-9	Precision (%RPD)			
40436-10	Reporting Limit (RL)			
PARAMETER	40436-7	40436-8	40436-9	40436-10
Polynuclear Aromatic Hydrocarbons (610)				
Acenaphthene, ug/l	<10	84 %*F82	6.0 %	10
Acenaphthylene, ug/l	<10	---	---	10
Anthracene, ug/l	<10	---	---	10
Benzo(a)anthracene, ug/l	<4.0	---	---	4.0
Benzo(a)pyrene, ug/l	<4.0	100 %*F82	8.0 %	4.0
Benzo(b)fluoranthene, ug/l	<4.0	---	---	4.0
Benzo(g,h,i)perylene, ug/l	<10	---	---	10
Benzo(k)fluoranthene, ug/l	<5.0	---	---	5.0
Chrysene, ug/l	<5.0	---	---	5.0
Dibenzo(a,h)anthracene, ug/l	<5.0	---	---	5.0
Fluoranthene, ug/l	<10	---	---	10
Fluorene, ug/l	<10	84 %*F82	5.9 %	10
Indeno(1,2,3-cd)pyrene, ug/l	<5.0	---	---	5.0
Naphthalene, ug/l	<5.0	82 %*F82	8.5 %	5.0
Phenanthrene, ug/l	<10	---	---	10
Pyrene, ug/l	<10	94 %*F82	5.3 %	10
2-Methylnaphthalene, ug/l	<10	---	---	10
1-Methylnaphthalene, ug/l	<10	---	---	10
Date Extracted	03.03.98	---	---	10
Date Analyzed	03.04.98	---	---	---
Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/l	<1.0	86 %	3.5 %	1.0
Date Extracted	03.02.98	---	---	---
Date Analyzed	03.02.98	---	---	---

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LOG NO: D8-40436
 Received: 28 FEB 98
 Reported: 06 MAR 98

Mr. Pitt Maner
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 185 NW Spanish River Boulevard, Suite 110
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)

Sampled By: PM/DP

Code: 140580313

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REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40436-7 Method Blank
 40436-8 Accuracy (%Rec)
 40436-9 Precision (%RPD)
 40436-10 Reporting Limit (RL)

PARAMETER	40436-7	40436-8	40436-9	40436-10
Lead (7421)				
Lead, mg/l	<0.0050	105 %	0 %	0.0050
Date Analyzed	03.02.98	---	---	---

Comprehensive Quality Assurance Plan #890142G.

SL Certifications: E86221/86371

Method References: EPA 600/4-79-020, EPA 40 CFR Part 136 and EPA SW-846.

*F82 = Insufficient sample volume was available to perform a batch-specific matrix spike. However, an LCS analyzed with the sample batch met control criteria.


 Paul Canevaro, Project Manager

Validated & Certified by: Abraham Ortiz
 License No.: 2314

Final Page Of Report

Laboratories in Savannah, GA • Tallahassee, FL • Tampa, FL • Deerfield Beach, FL • Mobile, AL

CERTIFICATE

I certify that I have reviewed and evaluated all analytical raw data concerning all the samples contained in the Laboratory Report of Analysis for Savannah Laboratories Log Number D8-40299.

I hereby certify that , to the best of my knowlege, the results for log number D8-40299, pages 1-5 (inclusive), signed by Paul Canevaro, are correct and reliable.



SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

- 5102 LaRoche Avenue, Savannah, GA 31404
- 2846 Industrial Plaza Drive, Tallahassee, FL 32301
- 414 SW 12th Avenue, Deerfield Beach, FL 33442
- 900 Lakeside Drive, Mobile, AL 36693
- 6712 Benjamin Road, Suite 100, Tampa, FL 33634
- 100 Alpha Drive, Suite 110, Destrehan, LA 70047

- Phone: (912) 354-7858 Fax: (912) 352-0165
- Phone: (904) 878-3994 Fax: (904) 878-9504
- Phone: (954) 421-7400 Fax: (954) 421-2584
- Phone: (334) 666-6633 Fax: (334) 666-6696
- Phone: (813) 885-7427 Fax: (813) 885-7049
- Phone: (504) 764-1100 Fax: (504) 725-1163

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

PROJECT REFERENCE: *Roosevelt Roads DOD* PROJECT NO.: *39933* P.O NUMBER: _____

MATRIX TYPE: _____ REQUIRED ANALYSES: _____ PAGE | OF |

PROJECT LOC. (State): *P.R.* SAMPLER(S) NAME: *M Nays / Dan Aress* PHONE: *561 750 3733*

FAX: _____

CLIENT NAME: *BISL* CLIENT PROJECT MANAGER: *P. Manner*

CLIENT ADDRESS (CITY, STATE, ZIP): *Boca Raton, FL*

SAMPLE: _____ SL NO.: _____

DATE	TIME	SL NO.	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS SUBMITTED						REMARKS	
				AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (Oil solvent, etc)				
<i>2/10/98</i>	<i>0755</i>		<i>731 SB-1 (33-35)</i>	<i>X</i>			<i>1</i>	<i>1</i>			
<i>2/10/98</i>	<i>1400</i>		<i>Resate Blank</i>	<i>X</i>			<i>3</i>	<i>1</i>			
<i>2/11/98</i>	<i>0745</i>		<i>731 SB-2 (23-25)</i>	<i>X</i>			<i>1</i>	<i>1</i>			
<i>2/10/98</i>	<i>1145</i>		<i>731 SB-2 (2-6)</i>				<i>1</i>	<i>1</i>			
-	-		<i>Trip Blank</i>	<i>X</i>				<i>3</i>			
<i>2/11/98</i>	<i>1400</i>		<i>731 SB-3 (2-6)</i>	<i>X</i>			<i>1</i>	<i>1</i>			
<i>2/11/98</i>	<i>1500</i>		<i>Resate Blank</i>	<i>X</i>				<i>3</i>	<i>1</i>		
<i>2/11/98</i>	<i>1530</i>		<i>731 SB-3 (23-25)</i>	<i>X</i>			<i>1</i>	<i>1</i>			
<i>2/11/98</i>	-		<i>731 DUP-1</i>	<i>X</i>			<i>1</i>	<i>1</i>			

RELINQUISHED BY: (SIGNATURE) _____ DATE: _____ TIME: _____

RECEIVED BY: (SIGNATURE) _____ DATE: *2/11/98* TIME: *1600*

RECEIVED FOR LABORATORY BY: (SIGNATURE) _____ DATE: *2/12/98* TIME: _____

LABORATORY USE ONLY

CUSTODY INTACT: YES NO

CUSTODY SEAL NO.: *D811-299*

SL LOG NO.: _____

LABORATORY REMARKS: _____

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40299
Received: 12 FEB 98
Reported: 16 FEB 98

Mr. Pitt Maner
Blasland Bouck & Lee, Inc.
185 NW Spanish River Boulevard, Suite 110
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)
Sampled By: MN/DP
Code: 134680313
Page 1

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED				
40299-1	731 SB-1 (33-35)	02-10-98/0755				
40299-2	731 SB-2 (23-25)	02-11-98/0745				
40299-3	731 SB-2 (2-6)	02-10-98/1145				
40299-4	731 SB-3 (2-6)	02-11-98/1400				
40299-5	731 SB-3 (23-25)	02-11-98/1530				
PARAMETER	40299-1	40299-2	40299-3	40299-4	40299-5	
Aromatic Volatiles (8020)						
Benzene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
Chlorobenzene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
1,2-Dichlorobenzene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
1,3-Dichlorobenzene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
1,4-Dichlorobenzene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
Ethylbenzene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
Toluene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
o-Xylene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
m&p-Xylene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
Methyl tert-butyl ether (MTBE), ug/kg	<50	<50	<50	<50	<50	
Date Analyzed	02.14.98	02.14.98	02.14.98	02.14.98	02.14.98	
Method Number	EPA 8020	EPA 8020	EPA 8020	EPA 8020	EPA 8020	
Petroleum Hydrocarbons (9073)						
Petroleum Hydrocarbons, mg/kg	<10	<10	<10	69	<10	
Date Extracted	02.12.98	02.12.98	02.12.98	02.12.98	02.12.98	
Date Analyzed	02.12.98	02.12.98	02.12.98	02.12.98	02.12.98	
Method Number	EPA 9073	EPA 9073	EPA 9073	EPA 9073	EPA 9073	

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LOG NO: D8-40299
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 Sampled By: MN/DP
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Page 2

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
40299-6	731 DUP-1	02-11-98
PARAMETER	40299-6	
Aromatic Volatiles (8020)		
Benzene, ug/kg		<5.0
Chlorobenzene, ug/kg		<5.0
1,2-Dichlorobenzene, ug/kg		<5.0
1,3-Dichlorobenzene, ug/kg		<5.0
1,4-Dichlorobenzene, ug/kg		<5.0
Ethylbenzene, ug/kg		<5.0
Toluene, ug/kg		<5.0
o-Xylene, ug/kg		<5.0
m&p-Xylene, ug/kg		<5.0
Methyl tert-butyl ether (MTBE), ug/kg		<50
Date Analyzed		02.14.98
Method Number		EPA 8020
Petroleum Hydrocarbons (9073)		
Petroleum Hydrocarbons, mg/kg		<10
Date Extracted		02.12.98
Date Analyzed		02.12.98
Method Number		EPA 9073

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Project: #399.33 (Roosevelt Rds)

Sampled By: MN/DP

Code: 134680313

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES			
40299-7	Rinsate Blank (2-10-98)			
40299-8	Rinsate Blank (2-11-98)			
40299-9	Trip Blank			
PARAMETER		40299-7	40299-8	40299-9
Aromatic Volatiles (8020)				
Benzene, ug/l		<1.0	<1.0	<1.0
Chlorobenzene, ug/l		<1.0	<1.0	<1.0
1,2-Dichlorobenzene, ug/l		<1.0	<1.0	<1.0
1,3-Dichlorobenzene, ug/l		<1.0	<1.0	<1.0
1,4-Dichlorobenzene, ug/l		<1.0	<1.0	<1.0
Ethylbenzene, ug/l		<1.0	<1.0	<1.0
Toluene, ug/l		<1.0	<1.0	<1.0
Xylenes, ug/l		<2.0	<2.0	<2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10	<10	<10
Date Analyzed		02.12.98	02.12.98	02.12.98
Method Number		EPA 8020	EPA 8020	EPA 8020
Dilution factor		1	1	1
Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/l		<1.0	<1.0	NS
Date Extracted		02.12.98	02.12.98	---
Date Analyzed		02.12.98	02.12.98	---
Method Number		EPA 418.1	EPA 418.1	---

Analyzed & Certified by: *Abraham Ortiz*

Lab No.: 3314

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40299
Received: 12 FEB 98
Reported: 16 FEB 98

Mr. Pitt Maner
Blasland Bouck & Lee, Inc.
185 NW Spanish River Boulevard, Suite 110
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)

Sampled By: MN/DP

Code: 134680313

Page 4

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID				
40299-10	Method Blank				
40299-11	Accuracy (%Rec)				
40299-12	Precision (%RPD)				
40299-13	Reporting Limit (RL)				
PARAMETER		40299-10	40299-11	40299-12	40299-13
Aromatic Volatiles (8020)					
Benzene, ug/kg		<5.0	84 %	6.0 %	5.0
Chlorobenzene, ug/kg		<5.0	81 %	2.5 %	5.0
1,2-Dichlorobenzene, ug/kg		<5.0	---	---	5.0
1,3-Dichlorobenzene, ug/kg		<5.0	---	---	5.0
1,4-Dichlorobenzene, ug/kg		<5.0	---	---	5.0
Ethylbenzene, ug/kg		<5.0	---	---	5.0
Toluene, ug/kg		<5.0	82 %	6.1 %	5.0
o-Xylene, ug/kg		<5.0	---	---	5.0
m&p-Xylene, ug/kg		<5.0	---	---	5.0
Methyl tert-butyl ether (MTBE), ug/kg		<50	---	---	50
Date Analyzed		02.14.98	---	---	---
Method Number		EPA 8020	---	---	---
Petroleum Hydrocarbons (9073)					
Petroleum Hydrocarbons, mg/kg		<10	62 %	2.0 %	10
Date Extracted		02.12.98	---	---	---
Date Analyzed		02.12.98	---	---	---
Method Number		EPA 9073	---	---	---

Validated & Certified by: Abraham Ortiz
License No.: 2314

LOG NO: D8-40299
 Received: 12 FEB 98
 Reported: 16 FEB 98

Mr. Pitt Maner
 Blasland Bouck & Lee, Inc.
 185 NW Spanish River Boulevard, Suite 110
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)
 Sampled By: MN/DP
 Code: 134680313

REPORT OF RESULTS

Page 5

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40299-14 Method Blank
 40299-15 Accuracy (%Rec)
 40299-16 Precision (%RPD)
 40299-17 Reporting Limit (RL)

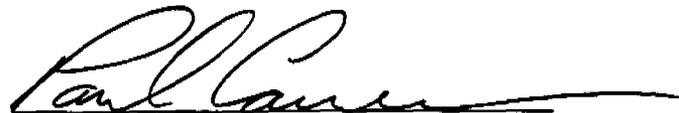
PARAMETER	40299-14	40299-15	40299-16	40299-17
Aromatic Volatiles (8020)				
Benzene, ug/l	<1.0	94 %*F76	4.2 %	1.0
Chlorobenzene, ug/l	<1.0	100 %*F76	3.0 %	1.0
1,2-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l	<1.0	---	---	1.0
Ethylbenzene, ug/l	<1.0	---	---	1.0
Toluene, ug/l	<1.0	100 %*F76	8.0 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	02.12.98	---	---	---
Method Number	EPA 8020	---	---	---
Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/l	<1.0	64 %	6.0 %	1.0
Date Extracted	02.12.98	---	---	---
Date Analyzed	02.12.98	---	---	---
Method Number	EPA 418.1	---	---	---

Comprehensive Quality Assurance Plan #890142G.

SL Certifications: E86221/86371

Method References: EPA SW-846 and EPA 600/4-79-020.

*F76 = Spike compounds were inadvertently omitted prior to extraction; therefore, matrix spike recoveries are unavailable for reporting.


 Paul Canevaro, Project Manager

Validated & Certified by: 
 License No.: 2314

CERTIFICATE

I certify that I have reviewed and evaluated all analytical raw data concerning all the samples contained in the Laboratory Report of Analysis for Savannah Laboratories Log Number D8-40271.

I hereby certify that , to the best of my knowlege, the results for log number D8-40271, pages 1-4 (inclusive), signed by Paul Canevaro, are correct and reliable.



SL SAVANNAH LABORATORIES
 & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40271
 Received: 10 FEB 98
 Reported: 12 FEB 98

Mr. Pitt Maner
 Blasland Bouck & Lee, Inc.
 185 NW Spanish River Boulevard, Suite 110
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)
 Sampled By: DP/AN

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED		
40271-1	734 SB-8 (2-6)	02-09-98/1035		
40271-2	734 SB-8 (12-14)	02-09-98/1100		
40271-3	731 SB-1 (2-6)	02-09-98/1325		
PARAMETER		40271-1	40271-2	40271-3
Aromatic Volatiles (8020)				
Benzene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
Chlorobenzene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
1,2-Dichlorobenzene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
1,3-Dichlorobenzene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
1,4-Dichlorobenzene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
Ethylbenzene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
Toluene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
Xylenes, ug/kg		<5.0*F78	<5.0*F78	<25*F34
Date Analyzed		02.11.98	02.11.98	02.11.98
Method Number		EPA 8020	EPA 8020	EPA 8020
Dilution factor		1	1	5
Petroleum Hydrocarbons (9073)				
Petroleum Hydrocarbons, mg/kg		<10	<10	1300
Date Extracted		02.09.98	02.09.98	02.09.98
Date Analyzed		02.09.98	02.09.98	02.09.98
Method Number		EPA 9073	EPA 9073	EPA 9073

Validated & Certified by: Abraham Ortiz

License No.: 3314

LOG NO: D8-40271
 Received: 10 FEB 98
 Reported: 12 FEB 98

Mr. Pitt Maner
 Blasland Bouck & Lee, Inc.
 185 NW Spanish River Boulevard, Suite 110
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)
 Sampled By: DP/AN

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40271-4	731 Rinsate Blank	02-09-98/1430
PARAMETER		40271-4
Aromatic Volatiles (8020)		
Benzene, ug/l		<1.0
Chlorobenzene, ug/l		<1.0
1,2-Dichlorobenzene, ug/l		<1.0
1,3-Dichlorobenzene, ug/l		<1.0
1,4-Dichlorobenzene, ug/l		<1.0
Ethylbenzene, ug/l		<1.0
Toluene, ug/l		<1.0
Xylenes, ug/l		<2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10
Date Analyzed		02.10.98
Method Number		EPA 8020
Dilution factor		1
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		<1.0
Date Extracted		02.10.98
Date Analyzed		02.11.98
Method Number		EPA 418.1

Validated & Certified by: Abraham Ortiz
 License No.: 2314

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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LOG NO: D8-40271
Received: 10 FEB 98
Reported: 12 FEB 98

Mr. Pitt Maner
Blasland Bouck & Lee, Inc.
185 NW Spanish River Boulevard, Suite 110
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)
Sampled By: DP/AN

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID			
40271-5	Method Blank			
40271-6	Accuracy (%Rec)			
40271-7	Precision (%RPD)			
40271-8	Reporting Limit (RL)			
PARAMETER	40271-5	40271-6	40271-7	40271-8
Aromatic Volatiles (8020)				
Benzene, ug/kg	<5.0	120 %	0 %	5.0
Chlorobenzene, ug/kg	<5.0	110 %	18 %	5.0
1,2-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
1,3-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
1,4-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
Ethylbenzene, ug/kg	<5.0	---	---	5.0
Toluene, ug/kg	<5.0	115 %	8.7 %	5.0
Xylenes, ug/kg	<5.0	---	---	5.0
Date Analyzed	02.11.98	---	---	---
Method Number	EPA 8020	---	---	---
Petroleum Hydrocarbons (9073)				
Petroleum Hydrocarbons, mg/kg	<10	62 %	2.0 %	10
Date Extracted	02.09.98	---	---	---
Date Analyzed	02.09.98	---	---	---
Method Number	EPA 9073	---	---	---

Validated & Certified by: Blasland

License No.: 2314

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40271
Received: 10 FEB 98
Reported: 12 FEB 98

Mr. Pitt Maner
Blasland Bouck & Lee, Inc.
185 NW Spanish River Boulevard, Suite 110
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)
Sampled By: DP/AN

REPORT OF RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES			
40271-9	Method Blank			
40271-10	Accuracy (%Rec)			
40271-11	Precision (%RPD)			
40271-12	Reporting Limit (RL)			
PARAMETER	40271-9	40271-10	40271-11	40271-12
Aromatic Volatiles (8020)				
Benzene, ug/l	<1.0	90 %	1.1 %	1.0
Chlorobenzene, ug/l	<1.0	97 %	2.1 %	1.0
1,2-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l	<1.0	---	---	1.0
Ethylbenzene, ug/l	<1.0	---	---	1.0
Toluene, ug/l	<1.0	96 %	3.1 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	02.10.98	---	---	---
Method Number	EPA 8020	---	---	---
Dilution factor	1	---	---	---
Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/l	<1.0	82 %	1.0 %	1.0
Date Extracted	02.10.98	---	---	---
Date Analyzed	02.11.98	---	---	---
Method Number	EPA 418.1	---	---	---

Comprehensive Quality Assurance Plan #890142G.

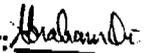
SL Certifications: E86221/86371

Method References: EPA SW-846 and EPA 600/4-79-020.

*F34 = Due to the abundance of organics in the sample, dilution was required.

*F78 = Sample results are reported on an "as is" basis.


Paul Canevaro, Project Manager

Validated & Certified by: 

License No.: 2314

Final Page Of Report

Laboratories in Savannah, GA • Tallahassee, FL • Tampa, FL • Deerfield Beach, FL • Mobile, AL

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

- 5102 LaRoche Avenue, Savannah, GA 31404 Phone: (912) 354-7858 Fax: (912) 352-0165
- 2846 Industrial Plaza Drive, Tallahassee, FL 32301 Phone: (904) 878-3994 Fax: (904) 878-9504
- 14 SW 12th Avenue, Deerfield Beach, FL 33442 Phone: (954) 421-7400 Fax: (954) 421-2584
- 900 Lakeside Drive, Mobile, AL 36693 Phone: (334) 666-6633 Fax: (334) 666-6696
- 6712 Benjamin Road, Suite 100, Tampa, FL 33634 Phone: (813) 885-7427 Fax: (813) 885-7049
- 100 Alpha Drive, Suite 110, Destrehan, LA 70047 Phone: (504) 764-1100 Fax: (504) 725-1163

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

PROJECT REFERENCE Roosevelt Roads		PROJECT NO. 39933	PO NUMBER	MATRIX TYPE	REQUIRED ANALYSES	PAGE () OF ()
PROJECT LOC. (State) P.R.	SAMPLER(S) NAME D. Press / A. Naya	PHONE 561 750 3733	FAX 787 860 4538	ARQUEOUS (WATER) SOLID OR SEMISOLID NONAQUEOUS LIQUID (oil, solvent, etc) 418.1 250 amber BO 20 3000ml 418.1 glass BO 20 glass 4 oz glass		
CLIENT NAME BBL		CLIENT PROJECT MANAGER A. Manor				
CLIENT ADDRESS (CITY, STATE, ZIP) Boca Raton, FL						<input type="checkbox"/> STANDARD REPORT DELIVERY <input checked="" type="checkbox"/> EXPEDITED REPORT DELIVERY (surcharge) Date Due: 2/11/98

SAMPLE		SL NO.	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS SUBMITTED						REMARKS	
DATE	TIME			1	2	3	4	5	6		
2/9/98	1035		734 SB-8 (2-6)	X							
	1100		734 SB-8 (12-14)	X							
	1325		731 SB-1 (2-6)	X							
	1420		731 Rinse Blank	X		1	3				
			Trip Blank	X			3				Do not run unless Rinse Blank shows kits

RELINQUISHED BY: (SIGNATURE) <i>[Signature]</i>	DATE 2/9/98	TIME 1700	RELINQUISHED BY: (SIGNATURE) <i>[Signature]</i>	DATE 2/9/98	TIME 1700	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
RECEIVED BY: (SIGNATURE) <i>[Signature]</i>	DATE 2/8/98	TIME 1700	RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

LABORATORY USE ONLY								
RECEIVED FOR LABORATORY BY: (SIGNATURE) <i>[Signature]</i>	DATE 2/10/98	TIME 1030	CUSTODY INTACT <input type="checkbox"/> YES <input type="checkbox"/> NO	CUSTODY SEAL NO.	SL LOG NO. D840271	LABORATORY REMARKS:		

ORIGINAL

SL SAVANNAH LABORATORIES
 & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40181
 Received: 28 JAN 98
 Reported: 29 JAN 98

Mr. Pitt Maner
 Blasland Bouck & Lee, Inc.
 185 NW Spanish River Boulevard, Suite 110
 Boca Raton, FL 33431

Project: 39933 (Roosevelt Rds. 734)
 Sampled By: Pitt Maner

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED			
40181-1	734 SB-6 (2-6')	01-27-98/0900			
40181-2	734 SB-6 (12-14')	01-27-98/0940			
40181-3	734 SD-6 (12-14')	01-27-98/0940			
PARAMETER			40181-1	40181-2	40181-3
Aromatic Volatiles (8020)					
Benzene, ug/kg			<5.0	<5.0	<5.0
Chlorobenzene, ug/kg			<5.0	<5.0	<5.0
1,2-Dichlorobenzene, ug/kg			<5.0	<5.0	<5.0
1,3-Dichlorobenzene, ug/kg			<5.0	<5.0	<5.0
1,4-Dichlorobenzene, ug/kg			<5.0	<5.0	<5.0
Ethylbenzene, ug/kg			<5.0	<5.0	<5.0
Toluene, ug/kg			<5.0	<5.0	<5.0
Xylenes, ug/kg			<5.0	<5.0	<5.0
Methyl-tert-butyl ether (MTBE), ug/kg			<50	<50	<50
Date Analyzed			01.28.98	01.28.98	01.28.98
Method Number			EPA 8020	EPA 8020	EPA 8020
Dilution factor			1	1	1
Petroleum Hydrocarbons (418.1)					
Petroleum Hydrocarbons, mg/kg			<10	<10	<10
Date Extracted			01.28.98	01.28.98	01.28.98
Date Analyzed			01.28.98	01.28.98	01.28.98
Method Number			EPA 9073	EPA 9073	EPA 9073

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40181
Received: 28 JAN 98
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185 NW Spanish River Boulevard, Suite 110
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Project: 39933 (Roosevelt Rds. 734)
Sampled By: Pitt Maner

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40181-4	SB-5	01-27-98/0900
PARAMETER		40181-4
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		19
Date Extracted		01.28.98
Date Analyzed		01.28.98
Method Number		EPA 418.1

LOG NO: D8-40181
 Received: 28 JAN 98
 Reported: 29 JAN 98

Mr. Pitt Maner
 Blasland Bouck & Lee, Inc.
 185 NW Spanish River Boulevard, Suite 110
 Boca Raton, FL 33431

Project: 39933 (Roosevelt Rds. 734)
 Sampled By: Pitt Maner

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40181-5	Rinsate Blank	01-27-98/1515
PARAMETER		40181-5
Aromatic Volatiles (8020)		
Benzene, ug/l		<1.0
Chlorobenzene, ug/l		<1.0
1,2-Dichlorobenzene, ug/l		<1.0
1,3-Dichlorobenzene, ug/l		<1.0
1,4-Dichlorobenzene, ug/l		<1.0
Ethylbenzene, ug/l		<1.0
Toluene, ug/l		<1.0
Xylenes, ug/l		<1.0
Methyl-tert-butyl ether (MTBE), ug/l		<10
Date Analyzed		01.28.98
Method Number		EPA 8020
Dilution factor		1
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		<1.0
Date Extracted		01.28.98
Date Analyzed		01.28.98
Method Number		EPA 418.1

LOG NO: D8-40181
Received: 28 JAN 98
Reported: 29 JAN 98

Mr. Pitt Maner
Blasland Bouck & Lee, Inc.
185 NW Spanish River Boulevard, Suite 110
Boca Raton, FL 33431

Project: 39933 (Roosevelt Rds. 734)
Sampled By: Pitt Maner

REPORT OF RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	
40181-6	Trip Blank	
PARAMETER		40181-6
Aromatic Volatiles (8020)		
Benzene, ug/l		<1.0
Chlorobenzene, ug/l		<1.0
1,2-Dichlorobenzene, ug/l		<1.0
1,3-Dichlorobenzene, ug/l		<1.0
1,4-Dichlorobenzene, ug/l		<1.0
Ethylbenzene, ug/l		<1.0
Toluene, ug/l		<1.0
Xylenes, ug/l		<1.0
Methyl-tert-butyl ether (MTBE), ug/l		<10
Date Analyzed		01.28.98
Method Number		EPA 8020
Dilution factor		1

LOG NO: D8-40181
 Received: 28 JAN 98
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Mr. Pitt Maner
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 185 NW Spanish River Boulevard, Suite 110
 Boca Raton, FL 33431

Project: 39933 (Roosevelt Rds. 734)
 Sampled By: Pitt Maner

REPORT OF RESULTS

Page 5

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES			
40181-7	Method Blank			
40181-8	Accuracy (%Rec)			
40181-9	Precision (%RPD)			
40181-10	Reporting Limit (RL)			
PARAMETER	40181-7	40181-8	40181-9	40181-10
Aromatic Volatiles (8020)				
Benzene, ug/l	<1.0	100 %	3.0 %	1.0
Chlorobenzene, ug/l	<1.0	93 %	2.2 %	1.0
1,2-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l	<1.0	---	---	1.0
Ethylbenzene, ug/l	<1.0	---	---	1.0
Toluene, ug/l	<1.0	92 %	1.1 %	1.0
Xylenes, ug/l	<1.0	---	---	1.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	01.28.98	---	---	---
Method Number	EPA 8020	---	---	---
Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/l	<1.0	85 %	2.3 %	1.0
Date Extracted	01.28.98	---	---	---
Date Analyzed	01.28.98	---	---	---
Method Number	EPA 418.1	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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LOG NO: D8-40181
Received: 28 JAN 98
Reported: 29 JAN 98

Mr. Pitt Maner
Blasland Bouck & Lee, Inc.
185 NW Spanish River Boulevard, Suite 110
Boca Raton, FL 33431

Project: 39933 (Roosevelt Rds. 734)
Sampled By: Pitt Maner

REPORT OF RESULTS

Page 6

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID

40181-11 Method Blank
40181-12 Accuracy (%Rec)
40181-13 Precision (%RPD)
40181-14 Reporting Limit (RL)

PARAMETER	40181-11	40181-12	40181-13	40181-14
Aromatic Volatiles (8020)				
Benzene, ug/kg	<5.0	92 %	16 %	5.0
Chlorobenzene, ug/kg	<5.0	91 %	11 %	5.0
1,2-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
1,3-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
1,4-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
Ethylbenzene, ug/kg	<5.0	---	---	5.0
Toluene, ug/kg	<5.0	94 %	19 %	5.0
Xylenes, ug/kg	<5.0	---	---	5.0
Methyl-tert-butyl ether (MTBE), ug/kg	<50	---	---	50
Date Analyzed	01.28.98	---	---	---
Method Number	EPA 8020	---	---	---
Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/kg	<10	80 %	1.2 %	10
Date Extracted	01.28.98	---	---	---
Date Analyzed	01.28.98	---	---	---
Method Number	EPA 9073	---	---	---

Comprehensive Quality Assurance Plan #890142G.
SL Certifications: E86221/86371
Method Reference: EPA SW-846.


Paul Canevaro, Project Manager

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

Roosevelt Rds Site 734

PROJECT REFERENCE Roosevelt Rds Site 734		PROJECT NO. 39933	P.O. NUMBER 561-750-3733	MATRIX TYPE	REQUIRED ANALYSES	PAGE	OF
PROJECT LOC. (State)	SAMPLER(S) NAME	PHONE	FAX	MATRIX TYPE TRPH 418.1 B27 8020 40mL Slugs TRPH 418.1 11/12/98 8020 40mL Slugs TRPH 418.1 9/15/98 8020 40mL Slugs		<input type="checkbox"/> STANDARD REPORT DELIVERY <input checked="" type="checkbox"/> EXPEDITED REPORT DELIVERY (surcharge) Date Due: _____	
CLIENT NAME BBL	CLIENT PROJECT MANAGER Pitt Maner						
CLIENT ADDRESS (CITY, STATE, ZIP) Boca Raton, FL.							

SAMPLE DATE	TIME	SL NO.	SAMPLE IDENTIFICATION	MATRIX TYPE						NUMBER OF CONTAINERS SUBMITTED				REMARKS	
				AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (oil, solvent, etc)	OTHER	OTHER	OTHER	OTHER	OTHER	OTHER		
1/27/98	1515		Rinsate Blank	X							3	1			
			trip Blank	X								2			
1/27/98	0900		734 SB-6 (2-6')	X			1					1		} 24HR RUSH TAT	
1/27/98	0940		734 SB-6 (12-14')	X			1					1			
1/27/98	0940		734 SD-6 (12-14')	X			1					1			
1/27/98	0900		SB-5	X								3		} 48HR RUSH	
RUSH TAT															

RELINQUISHED BY: (SIGNATURE) <i>Kamberly Q. [Signature]</i>	DATE 1/27/98	TIME 1800	RELINQUISHED BY: (SIGNATURE) <i>Pitt 2 Maner [Signature]</i>	DATE 1/27/98	TIME 1600	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

LABORATORY USE ONLY						
RECEIVED FOR LABORATORY BY: (SIGNATURE) <i>T. [Signature]</i>	DATE 1/28/98	TIME 1030	CUSTODY INTACT <input type="checkbox"/> YES <input type="checkbox"/> NO	CUSTODY SEAL NO.	SL LOG NO. D840181	LABORATORY REMARKS:

ORIGINAL